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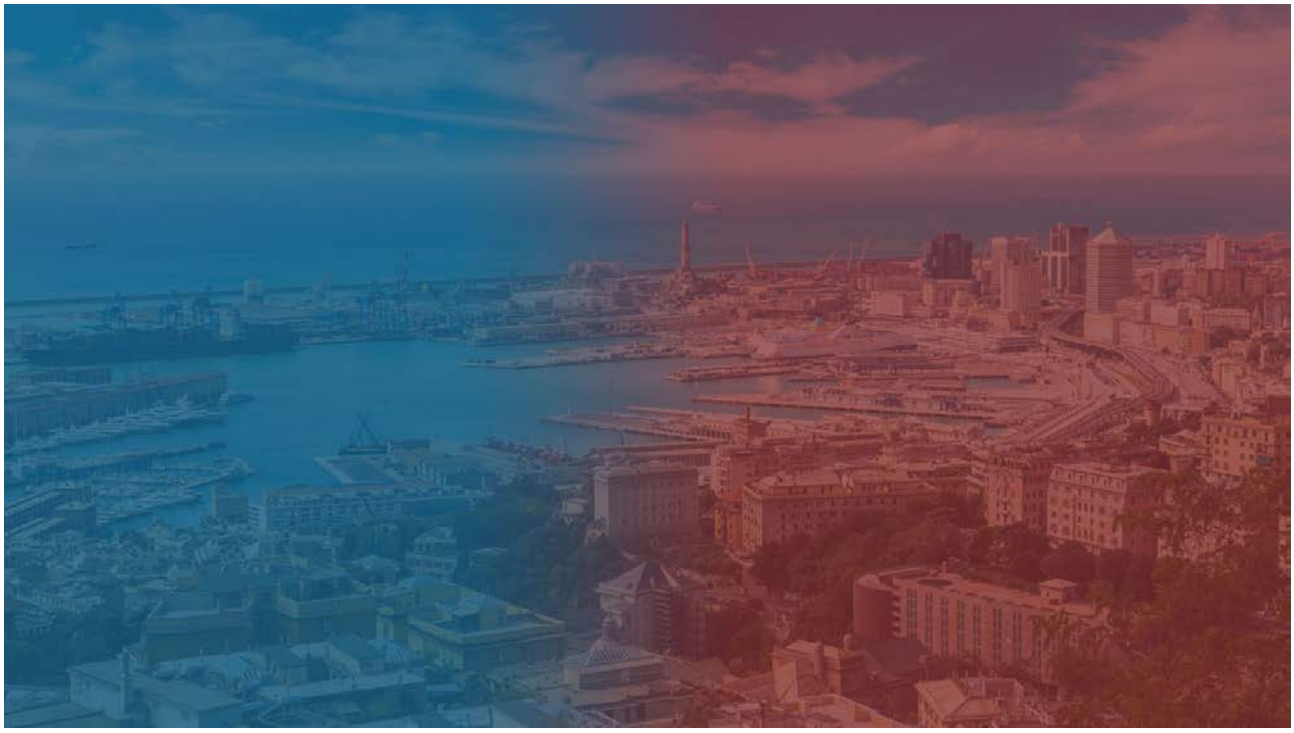
Management Conference



Tertiarization & sustainability new challenges for management in the digital era

Conference Proceedings

Long Papers

Genova (Italy)

12-13 June 2025

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Tertiarization & sustainability new challenges for management in the digital era

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edited by

Arabella Mocciaro Li Destri, Marta Ugolini and Lara Penco

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To the reader,

this volume contains the long papers of the Sinergie-SIMA 2025 Management Conference, hosted by the University of Genova on June 12th and 13th 2025.

Tertiarization is one of the most salient profiles of the structural change and economic development that have characterized the recent decades (Jorgenson & Timmer, 2011). The growth of the service industry affects multiple sectors, e.g. wholesaling/retailing, tourism/hospitality, transport and logistics, health services, public administration, education, communication, banking and financial services, and B2B services (Baines *et al.*, 2017; Barrett *et al.*, 2015).
This growing relevance of services in the economy and the society has stimulated a broader interdisciplinary debate, e.g., the impact of tertiarization on the performance of the entire economic system, the innovation and digitalization of services, and the applicability of service management issues for the transformation of product-based business models.
Based on these premises, the 2025 Sinergie-SIMA Conference aims to explore the role of services as part of the evolution of society in terms of relevance, growth, competitiveness, innovation, but also sustainability and well-being. The lens of analysis used to explore this phenomenon will be digitalization, as it is shaping service innovation in more traditional sectors (e.g., social and sanitary services, tourism, retailing, etc.) and it is boosting knowledge-intensive business services (KIBS). Thus, digitalization is a key driver of the business model transformation, facilitating the transition of manufacturing firms towards digital servitization, enabling a new automation frontier (Frank *et al.*, 2019; Kastalli & Van Looy, 2013; Liu *et al.*, 2024), and paving the way for new opportunities for value creation within the global economy (Ostrom *et al.*, 2015).
The application of digital technologies to services (e.g., Artificial Intelligence, Big Data Analytics, Internet of Things, Machine Learning, Additive Manufacturing, Virtual Reality, Augmented Reality, Metaverse) also facilitates the pursuit of relevant environmental and social issues, for example contributing significantly to the achievement of greater systemic efficiency that help attain the Sustainable Development Goals (SDGs) and circular economy (Xing & Liu, 2023). Leveraging advanced technologies enables the extraction of valuable insights from vast amounts of information, facilitating informed decision-making, personalized service offerings, optimizing service delivery processes, and enhanced customer experiences (Chauhan *et al.*, 2022). Big data plays a strategic role in developing novel solutions that address evolving societal challenges, while driving sustainable growth and innovativeness in the digital era (Cappa *et al.*, 2022; Ciampi *et al.*, 2021; Mikalef *et al.*, 2019). Therefore, the real challenge today is to harness the application of digitalization to enhance the service-oriented approach and empower companies' economic, social, and environmental performances, generating and consolidating greater trust and loyalty among their employees, customers, and suppliers for a more sustainable, inclusive, and better society (Shaukat *et al.*, 2016).
AIDEA devoted a Conference to the tertiarization and new challenges for management and governance 25 years ago in Genoa, and many scholars focused on these topics from multiple perspectives and with original approaches.
The 2025 Sinergie-SIMA Genoa Conference, in continuity with the past, is an excellent opportunity to discuss our community's research efforts in the service economy and management, in order to identify new effective solutions suitable to face the current digital era. Different theories, methodological approaches, and units of analysis are required to generate scientific research impacting theories but also outlining wide-ranging strategies that can offer valuable insights to business leaders, companies, and institutions. More precisely, the Conference was a great occasion to discuss the research efforts of our research community within tracks related to the:

- Conference theme (Tertiarization & sustainability. New challenges for management in the digital era),
- SIMA thematic groups (Artificial intelligence in management, Entrepreneurship, Innovation & Technology Management, International Business, Marketing, Purpose-driven Businesses,

Retailing & Service Management, Small & Family Business, Strategic Communication, Strategy & Governance, Supply Chain Management, Logistics & Operations, Sustainability, and Tourism & Culture Management),
- Management Case Studies.

The Conference call for papers gave the opportunity to submit either short and long papers. Overall, the editorial staff received 311 submissions of which 263 short papers and 49 long papers.

For the *short and long papers*, the evaluation followed the peer review process, with a double-blind review performed by, respectively, one and two referees - university lecturers and experts about the topic - selected among SIMA and the community of Sinergie members.

In detail, the referees applied the following criteria to evaluate the submissions:
- clarity of the research aims,
- accuracy of the methodological approach,
- contribution in terms of originality/innovativeness,
- theoretical and practical contribution,
- clarity of communication,
- significance of the bibliographical basis.

The *peer review* process resulted in full acceptance or rejection of the submissions. In the case of disagreement among reviewers' evaluations, the decision was taken by the Chairs of the SIMA thematic groups or conference track. Each work was then sent back to the Authors together with the referees' reports. The suggestions received by the referees were used by the Authors during the presentation of their research works at the Conference.

The evaluation process ended with the acceptance of 293 papers (249 short papers and 44 long papers). This volume proposes the short papers whose Authors have authorized their publication.

All the short papers published in this volume were presented and discussed during the Conference and published online on the web portal of Sinergie-SIMA Management Conference (**https://www.sijmsima.it/**).

While thanking all the Authors, Chairs, and participants, we hope that this volume will contribute to advancing knowledge about tertiarization and sustainability in management.

The Conference Chairs

Lara Penco, Arabella Mocciaro Li Destri, and Marta Ugolini

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Track 1 - Artificial Intelligence in Management

Harnessing Human and Artificial Intelligence for Firm Resilience: Developing a Preliminary Conceptual Framework[1]

ALESSANDRA RUSSO[2] GABRIELLA LEVANTI[3] PASQUALE MASSIMO PICONE[4]

Abstract

Frame of the research. *Over the past five years, artificial intelligence (AI) has become increasingly pervasive in the business world, while firm resilience has emerged as a crucial meta-capability for navigating major exogenous shocks and temporary competitive advantages.*

Purpose of the paper. *In this paper, we explore how AI can be leveraged to enhance firm resilience, highlighting its pivotal role in shaping resilience.*

Methodology. *We propose a conceptual framework drawing on AI literature, which conceptualizes the human-AI interplay in terms of automation and augmentation. Additionally, we build on the taxonomy proposed by Conz and Magnani (2020), identifying six core micro-capabilities underlying firm resilience: redundancy, robustness, agility, flexibility, adaptability, and resourcefulness. By disentangling AI's role in shaping each micro-capability, we present a conceptual framework that highlights AI's role in fostering resilience.*

Results. *We develop a preliminary conceptual framework that appraises AI's role in each of the micro-capabilities identified by Conz and Magnani (2020). This framework advances AI research by assessing the impact of both human intelligence and AI on firm resilience. Furthermore, this paper offers a novel perspective on the antecedents of firm resilience, complementing existing multi-level and multi-theoretical approaches.*

Research limitations. *Since our paper is conceptual, empirical testing is necessary to validate its practical applicability across various industries.*

Managerial implications. *By clarifying AI's role in shaping firm resilience, we provide managers with insights into AI's potential.*

Originality of the paper. *We adopt a dialectical approach to examine AI capabilities and strategies in the formation of firm resilience. Specifically, the originality of this paper lies in disentangling the automation, augmentation, and human-centricity spaces that emerge in the development of firm resilience.*

Key words: *firm resilience; artificial intelligence; automation space; augmentation space; human-centricity space*

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1. Introduction

The advent of AI is revolutionizing the business landscape by driving a transformative shift, reshaping industries, and redefining how value is created within firms (Aagaard & Tucci, 2024; Gama & Magistretti, 2023). AI possesses the ability to process enormous amounts of data and transform them into information (Prasetyo *et al.*, 2024) with a level of precision and speed that far surpasses human capabilities (Kaplan & Haenlein, 2020). In sharp contrast to this, human intelligence relies on heuristics to process information, which can lead to distortions and errors, frequently referred to as cognitive biases (Krakowski *et al.*, 2022). At the same time, human intelligence embodies boundless creativity, intuition, and emotional insight (Jarrahi, 2018). Overall, AI and human intelligence appear oriented toward different activities (Aggarwal, 2023) and are distinguished by fundamentally peculiar opportunities and challenges (Shepherd & Majchrzak, 2022).

Understanding the potential and risks of AI is crucial for both scholars and practitioners. Accordingly, this paper aims to explicitly examine *the role of AI in shaping firm resilience* (Hillmann, 2021; Kantur & İşeri-Say, 2012; Su & Junge, 2023). Over the past decades, firm resilience has gained prominence due to unpredictable, high-impact exogenous shocks (Williams *et al.*, 2017) on the one hand, and the increasingly transient nature of sources of competitive advantage, on the other hand (Dagnino *et al.*, 2021).

Conz and Magnani (2020) indicate that resilience represents a meta-capability encompassing six key micro-capabilities: redundancy, robustness, agility, flexibility, adaptability, and resourcefulness. We can imagine that AI may serve as a "milestone," fundamentally reshaping each of these micro-capabilities within firms to better face adverse conditions. This transformation occurs as AI plays a crucial role in reshaping the micro-capabilities through which firm resilience is designed and achieved. Accordingly, in this paper, we examine how AI, either independently or in combination with human intelligence, exerts its impact on each of the six key micro-capabilities underpinning firm resilience.

In disentangling the role of AI in boosting resilience, we adopt a dialectical approach (Smith & Lewis, 2011) and assume the dual AI approaches of automation and augmentation. In the *automation* approach, machines take over tasks previously performed by humans (Raisch & Krakowski, 2021). In contrast, the *augmentation* approach involves humans collaborating closely with machines to complete tasks (Raisch and Krakowski, 2021). In this case, the output generated by machines becomes the input for human activities, which, in turn, serves as the input for machines in an iterative process - continuing until the process is interrupted by human intervention. Based on a conceptual investigation, our framework elucidates the role of AI via an automation approach in fostering redundancy and robustness; we reveal the role of AI via an augmentation approach in enabling flexibility, agility, and adaptability; and finally, we emphasize the role of human intelligence in driving resourcefulness. In so doing, we offer two key contributions. First, we advance AI research by examining the impact of human intelligence and AI on firm resilience through the dual lenses of automation and augmentation (Raisch & Krakowski, 2021). Remarkably, drawing on Ketchen *et al.* (2007), we emphasize that AI holds only potential value unless it is complemented by human intelligence. We enrich the debate on AI as both a "player and a coach" of firm capabilities, in general, and the antecedents of resilience, in particular. Second, we contribute to resilience literature by arguing that AI can effectively help firms mitigate exogenous threats and recover performance. We offer an innovative perspective on the antecedents of firm resilience, complementing existing multi-level and multi-theoretical approaches in the literature (Aversa *et al.*, 2024).

The remainder of the paper is organized as follows. First, we review the literature on AI and firm resilience. Next, we present a conceptual framework illustrating the role of AI and human intelligence in shaping the six core micro-capabilities that drive firm resilience (Conz & Magnani, 2020) through the dual lenses of automation and augmentation approaches. Finally, the paper concludes with a discussion and the identification of potential directions for future research.

2. Literature background

2.1 Artificial intelligence

AI employs various techniques, such as machine learning, neural networks, and deep learning (Aggarwal, 2023; Haenlein & Kaplan, 2019; LeCun *et al.*, 2015). *Machine learning* focuses on teaching machines to learn from data by developing algorithms that can uncover patterns and make predictions (Choi *et al.*, 2020). *Neural networks* are "machine learning techniques that simulate the mechanism of learning in biological organisms" (Aggarwal, 2023, p. 1). Nonetheless, while learning in biological organisms relies on external stimuli, in artificial neural networks, this stimulus comes from training data (Aggarwal, 2023). *Deep learning* has proven effective in uncovering complex structures within data, enabling models to recognize patterns and extract meaningful features without the need for explicit human guidance (LeCun *et al.*, 2015). More precisely, deep learning is a specific category of machine learning that exploits neural networks, distinguished by its "depth," which refers to the significant number of hidden layers among the input and output layers of the network (Haenlein & Kaplan, 2019; Secchi, 2022). Furthermore, a new form of AI, distinct from traditional AI, is gaining increasing importance today: generative AI. Whereas traditional AI systems are mainly utilized for data analysis and predictive modeling, generative AI takes this step further by generating new data that closely resembles the characteristics of the training set (Aagaard & Tucci, 2024).

In exploring the role of AI in strategy, scholars have identified two main approaches. The first is the *automation* approach, which heightens the tension between humans and AI rather than exploring potential areas of integration. The automation approach places humans and AI in an "either/or" relationship, where the broader adoption of AI corresponds to a diminished role for human intelligence within the firm. Thus, the automation approach is conceptually built on the tensions between humans and AI rather than their hybridization. The tension between humans and AI reaches its apex when an automation approach is no longer perceived as a complementary tool to enhance human capabilities, but rather as an approach designed solely to supplant human workers.

The second is the *augmentation approach*, which manages the tension between humans and AI as a trigger for a new attitude rooted in an "either/and" perspective (Raisch & Krakowski, 2021) between humans and AI. In today's competitive context, the exclusive adoption of AI for automation reflects an anachronistic adherence to a past model addressing pervasive uncertainty with inadequate tools. Consequently, such a choice exposes firms to significant imitation risks and exacerbates their vulnerability (Raisch & Krakowski, 2021), while human-machine collaboration and "augmented" intelligence integrate the advantages of both human and artificial intelligence.

Building on this, we argue that the augmentation approach and the coexistence of automation and augmentation adopt the Hegelian dialectical approach on the relationship between opposites. Dialectics resolves contradictory elements-thesis and antithesis-through synthesis. The thesis-antithesis-synthesis movement represents a process of knowledge progression, where each synthesis becomes the thesis of a triadic process confronted by a subsequent antithesis, resolved into a new synthesis in a continuous spiral mechanism. Following this line of reasoning, the augmentation between humans and AI is conceptualized within the model as the Hegelian *Aufhebung*, the moment of synthesis that unifies thesis and antithesis. Consequently, in the spiral mechanism, the goal is coexistence between this first synthesis, which is the augmentation approach, and the automation, as antithesis.

Overall, automation and augmentation should not be viewed as neatly separate approaches (Raisch & Krakowski, 2021), but rather as "both contradictory and interrelated" (Smith & Lewis, 2011, p. 387). Given their interrelated nature, we adopt a dialectical approach (Smith & Lewis, 2011) to address the underlying both paradoxical (Raisch & Krakowski, 2021) and dialectical tension. Specifically, "synthesis stresses their similarities, neglecting valued differences" and, for this reason, "integration is temporary" (Smith & Lewis, 2011, p. 387) culminating in a continuous interplay. Therefore, it is essential for firms to concurrently integrate automation, augmentation, and human

intelligence to develop the core micro-capabilities underpinning firm resilience (Conz & Magnani, 2020); through this integration, firms can effectively strengthen their overall resilience.

Acknowledging the interrelation between automation and augmentation approaches highlights the "co-evolutionary process during which humans learn from machines and machines learn from humans" (Raisch & Krakowski, 2021, p. 195), which is specifically associated with the augmentation approach.

In this regard, augmentation holds paramount significance, as human cognitive processes extend beyond mere data collection and processing; they are also shaped by what Carl Jung referred to as "intuitive intelligence" (Jarrahi, 2018). Accordingly, nowadays it is widely accepted that human reasoning is not purely a conscious or deliberate process. Indeed, modern cognitive science posits that a significant portion of human cognition, including many higher-level cognitive functions, operates unconsciously (Hodgkinson *et al.*, 2009). In this context, it is essential to distinguish intuitive intelligence from instinct. On the one hand, intuitive intelligence is closely tied to "intuition" i.e., "thoughts, conclusions and choices produced largely or in part through non-conscious mental processes" (Hodgkinson *et al.*, 2009, p. 280). Instinct, on the other hand, refers merely to innate, reflex reactions (Hodgkinson *et al.*, 2009).

2.2 Firm resilience

Resilience enables firms to address unpredictable exogenous events (Taleb, 2010) and moments of discontinuity in their lifecycle that can undermine performance or threaten survival (Ramezani & Camarinha-Matos, 2020). Wars, pestilences, earthquakes, and hurricanes have shaped human history, both in the past and in the present. As a result, firms need to develop resilience capabilities to handle continuous challenges (Hillmann, 2021; Kantur & İşeri-Say, 2012; Su & Junge, 2023). Furthermore, the ongoing processes of globalization, coupled with institutional, demand, and technological uncertainties, make firms even more vulnerable. To survive, firms must transition from one temporary competitive advantage to another (Dagnino *et al.*, 2021) by exercising their resilience capabilities.

Over time, scholars have devoted significant attention to resilience, offering various definitions (Conz & Magnani, 2020) from multiple theoretical angles and across disciplines (Aversa *et al.*, 2024). This literature recognizes multiple antecedents, such as entrepreneurs' psychological factors (Williams *et al.*, 2021), firm characteristics (Hillmann & Guenther, 2021), and supply chain contributions (Iftikhar *et al.*, 2021).

Summarizing prior literature, Hepfer and Lawrence (2022, p. 15) describe strategic resilience as a firm's "ability to anticipate and respond to threats to its strategy and long-term goals." Accordingly, we distinguish two types of resilience: proactive and reactive. *Proactive* resilience reflects the firm's readiness in times of adversity and embodies the sensitivity of its organizational "epidermis," enabling the early detection of potential disruptions (Williams *et al.*, 2017). Strengthening this sensitivity requires providing the firm with the necessary tools to implement anticipation strategies for effectively managing unforeseen events (Williams *et al.*, 2017). Proactive resilience enhances awareness of vulnerabilities and potential threats, thereby facilitating the adoption of proactive strategies (Erol *et al.*, 2010). Temporally, proactive resilience takes place before an event materializes (Conz & Magnani, 2020). Hence, it plays a crucial role in mitigating the consequences of disruptive events by anticipating them (i.e., acting *ex-ante*). For instance, a retail firm can demonstrate proactive resilience if it anticipates shifts in consumer preferences or invests in redundancy, foreseeing disruptive changes. On the other hand, *reactive* resilience becomes essential when a firm must address disruption's consequences *ex-post* (Boin & Van Eeten, 2013; Conz & Magnani, 2020). For instance, in response to the COVID-19 disruption, firms in the travel and tourism industry demonstrated reactive resilience. Although they initially experienced a decline in performance, they were able to recover (Munoz *et al.*, 2022) successfully.

Additionally, resilience can be disentangled into absorptive and adaptive resilience (Conz & Magnani, 2020). *Absorptive* resilience refers to the capability to mitigate new exogenous conditions,

emphasizing a firm's ability to withstand external changes (Iftikhar *et al.*, 2021). This concept is rooted in mechanical engineering studies (Rankine, 1867). We argue that absorptive resilience is based on redundancy and robustness micro-capabilities and reflects a static dimension of resilience related to firms' capability to minimize changes' consequences to facilitate the restoration of the *status quo ante* (Iftikhar *et al.*, 2021). For example, a firm characterized by absorptive resilience possesses financial redundancies that enable it to absorb negative consequences and minimize the decline in performance following a disruptive event.

On the other hand, *adaptive* resilience highlights the evolutionary response to new exogenous conditions by adopting an ecological perspective (Holling, 1973). Adaptive resilience refers to the capability to adjust and undergo metamorphosis in response to disruption, achieving multiple new equilibria (Conz & Magnani, 2020; Morais-Storz & Nguyen, 2017). Hence, a firm demonstrating adaptive resilience change its business model in response to disruption, leveraging new technologies or consumer trends to evolve its operations and ensure long-term sustainability. Firms may elect to adopt either absorptive or adaptive resilience in response to disruptions, as both strategies are equally effective (Conz & Magnani, 2020).

Since resilience is a multifaced and multidimensional meta-capability, to investigate the relationship between AI and firm resilience thoroughly, it is crucial to identify the various core micro-capabilities that constitute the meta-capability of resilience. Among the various taxonomies, the one proposed by Conz and Magnani (2020) is mostly relevant, as it facilitates a comprehensive exploration of these micro-capabilities. This taxonomy distinguishes six core capabilities of firms' resilience: redundancy, robustness, agility, flexibility, adaptability, and resourcefulness (Conz & Magnani, 2020).

i. *Redundancy* refers to the micro-capability to keep and orchestrate "some resources in reserve to be used in case of a disruption" (Rice & Sheffi, 2005, p. 44).
ii. *Robustness* refers to the micro-capability to absorb negative consequences of disruptive events without sustaining any damage (Erol *et al.*, 2010) or by minimizing potential harm. It leverages the excess of resources (namely, the redundancy) "to withstand pressure on performance and remain insensitive to disruption" (Munoz *et al.*, 2022, p. 3).
iii. *Agility* refers to the micro-capability to respond to emerging turbulence by effectively overcoming obstacles, (Ismail *et al.*, 2011) while also demonstrating strategic sensitivity (Doz & Kosonen, 2008).
iv. *Flexibility* refers to the micro-capability to learn quickly and to rapidly adjust plans in response to shifts (Pal *et al.*, 2014). Hence, it enables a firm to change strategies rapidly (Conz & Magnani, 2020). Specifically, we focus on strategic flexibility, which is defined as the timeliness of decision-making processes (Pal *et al.*, 2014).
v. *Adaptability* refers to the micro-capability to promptly and effectively adjust in response to disruptions.
vi. *Resourcefulness* refers to the micro-capability to coordinate resources in a creative way to capitalize on opportunities and address challenges (Williams *et al.*, 2021).

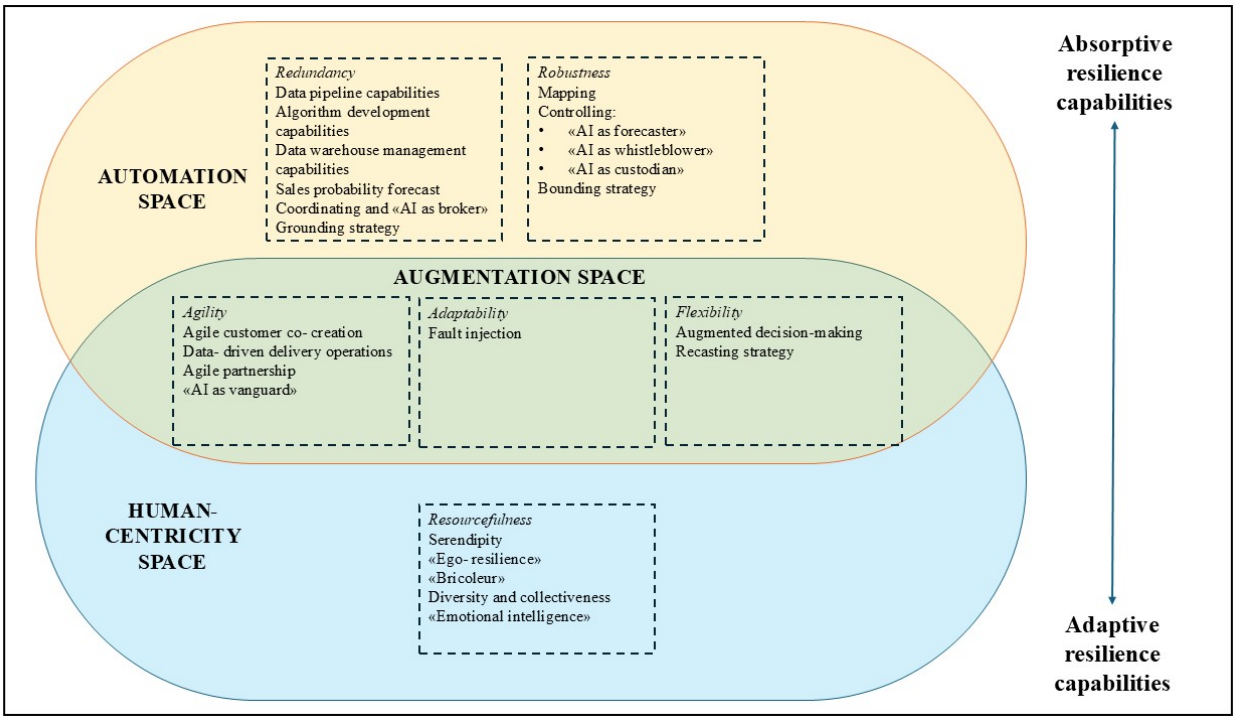
More specifically, *redundancy* and *robustness* are absorptive resilience capabilities because they are primarily focused on withstanding and buffering the consequences of disruptive events without involving change or evolution. At the same time, *adaptability* and *flexibility* are adaptive resilience capabilities (Conz & Magnani, 2020) that make firms able to change in response to disruptive exogenous events. Meanwhile, the bulk of the literature has considered *agility* as an absorptive resilience capability (Conz & Magnani, 2020). However, considering our conceptual framework, we argue that agility is both absorptive and adaptive, as it enables firms to swiftly overcome obstacles in response to changes in demand or technology (Dagnino *et al.*, 2021). *Resourcefulness* stands out as an adaptive micro-capability that facilitates not only adaptation but also metamorphosis. Conz and Magnani (2020) define resourcefulness as "the capability to accumulate different diversified assets and resources" (p. 409). It evocates, thus, the firm's capability to creatively utilize resources (Williams *et al.*, 2021).

3. Toward a conceptual framework

The genesis of firm resilience micro-capabilities is inextricably shaped by intelligence, derived from the Latin *intelligentia* (Castiglioni & Mariotti, 1996), which evokes the capability to discern, comprehend, and effectively navigate changes. Accordingly, in our framework, we investigate two forms of intelligence: human and artificial. We contend that human intelligence is irreplaceable in fostering firm resilience micro-capabilities, such as resourcefulness, which are generated within the human-centricity space. In parallel, we conceptualize the genesis of redundancy and robustness within the automation space where machines take over tasks previously performed by humans (Raisch and Krakowski, 2021), and humans' role is primarily situated upstream, in the training of AI algorithms (Sjodin *et al.*, 2021). Meanwhile, the augmentation space (Raisch & Krakowski, 2021) concerns the genesis of elasticity-related firms' resilience capabilities, namely agility, flexibility, and adaptability.

Figure 1 presents our conceptual framework. In the following sections, we will discuss the impact of AI on each core micro-capabilities underlying resilience, as identified by Conz and Magnani (2020).

Fig. 1: Conceptual framework



Source: our elaboration

3.1 Redundancy

The literature reveals that resilience necessitates slack resources-particularly in the form of redundancy -which are inherently costly to maintain. Redundancy refers to keeping reserve resources available for use in case of disruption (Rice & Sheffi, 2005). These resources may hold latent functionality, which becomes fully evident in adverse situations (Munoz *et al.*, 2022), thereby serving their risk-protection role. This latent functionality underscores the tension between resilience and financial performance, stemming in part from the trade-off between redundancy and efficiency (Iftikhar *et al.*, 2021; Mariani *et al.*, 2023).

Firm efficiency is primarily achieved through the minimization of the resources held by the firm (e.g., inventory, financial resources). For instance, Just-in-Time (JIT) models are emblematic of

efficiency as "the reason for the adoption of JIT was to make the facility more efficient and reactive to the product-market environment," primarily through inventory reduction (Huson & Nanda, 1995, p. 305). Redundancy relies on the availability of slack resources, whereas efficiency is based on the minimization of resource deployment within the firm. Consequently, a fundamental trade-off arises between these two concepts.

Hence, firms must navigate this inherent tension carefully, as building redundancy remains essential to absorb the negative impacts of disruptions. This situation typically manifests in holding additional financial resources, inventory stocks, and/or maintaining relationships with secondary suppliers. Each of these measures may entail significant costs (Rice & Sheffi, 2005). As a result, redundancy often manifests in increased costs and potential inefficiencies, despite its value in enhancing firm resilience.

First, the literature has identified a weaker positive relationship between firm resilience and financial performance (Yu *et al.*, 2019; Iftikhar *et al.*, 2021). This suggests that investments in building firm resilience may incur financial costs, potentially undermining financial penalties (Yu *et al.*, 2019). Second, the literature identifies a stronger positive relationship between firm resilience and non-financial performance (Yu *et al.*, 2019; Iftikhar *et al.*, 2021). Resilience is essential for enhancing operational performance, creating customer value, and achieving competitive advantage (Chowdhury & Quaddus, 2016). Third, the role of AI in enhancing efficiency is widely acknowledged in the literature, highlighting its potential to generate significant cost reductions and efficiency gains (Mariani *et al.*, 2023).

Building on these insights, we argue that AI helps mitigate the tension between firm resilience and financial performance by addressing the underlying trade-off between efficiency and redundancy. Specifically, AI capabilities, such as AI's "data pipeline capability" (Sjodin *et al.*, 2021, p. 578), contribute to the genesis of redundancy by allowing firms to define the balance between redundancy and efficiency.

AI is pivotal in mapping all areas within the firm that underutilize resources to enhance efficiency and reduce operational costs (Aagaard & Tucci, 2024). For instance, data warehouse management capabilities enable the creation of a real-time accessible data warehouse, efficiently developing a data catalog (Sjodin *et al.*, 2021). Furthermore, AI serves as a basis for generating forecasts and analytically determining the equilibrium point between redundancy and efficiency. Accordingly, AI plays a crucial role in the generation of redundancy by supporting inventory control and storage management. The application of AI in demand forecasting and planning processes (Lolli *et al.*, 2019), as well as in inventory management, helps reduce stockout days and increase inventory turnover rates (Cantini *et al.*, 2024) by identifying the level of redundancy that makes a firm both resilient and efficient. Therefore, AI is pivotal in optimizing inventory control and logistics (Aagaard & Tucci, 2024) by enhancing efficiency (Brynjolfsson *et al.*, 2018).

To fully embrace the potential of AI in generating redundancy, it becomes appropriate to shift from the "traditional warehouse" to the "automated robotic warehouse" (Aagaard & Tucci, 2024). Furthermore, the escalating relevance of AI in enhancing firm resilience goes beyond the management of logistics and data warehouses; it also strengthens security levels and enables the monitoring of the firm's "financial health" (Ramezani & Camarinha-Matos, 2020), particularly in relation to financial redundancy. In fact, by contributing to the monitoring of a firm's financial health, AI can serve as a key tool for guiding firms on the level of financial redundancy to maintain in the face of uncertainty.

Remarkably, for the automation of redundancy genesis and the mitigation of its conflict with efficiency, another essential capability of AI is its "algorithms development capability" (Sjodin *et al.*, 2021; Shrestha *et al.*, 2021), which enables the creation of contextualized AI and the reconfiguration of AI, anchoring it to the unique and distinctive knowledge of the firm through "grounding" strategy (Kemp, 2023). AI employs analytical capabilities to sift through data and uncover relationships that can be used in forecasting, such as predicting sales probabilities (Jarrahi *et al.*, 2023).

Specifically, AI enables the autonomous processing of collected data, including data gathered through advanced sensors and equipment. Thus, the application of AI in forecasting sales probabilities has the potential to achieve a synthesis between the strengths of JIT efficiency models and redundancy, while also mitigating the trade-off between them.

In sum, if "AI can improve the efficiency of resource allocation" (Broekhuizen *et al.*, 2023, p. 3; Mariani *et al.*, 2023), it can also generate redundancy by efficiently allocating resources. *Ergo*, by leveraging AI, firms can generate redundancy within the automation space defining the reserve and in-excess resources to maintain. This role is facilitated by AI as a "broker" with a coordinating function capable of enhancing "supply chain management by assisting firms in effectively allocating resources" (Broekhuizen *et al.*, 2023, p. 7). Thus, AI represents an "information tool to anticipate changes in demand forecasting" (Broekhuizen *et al.*, 2023, p. 3) that plays a proactive role in generating redundancy.

Once the strengths of AI have been highlighted, however, it is essential to recognize the limitations of forecasting models that utilize AI. In fact, AI forecasting models rely on data collected in the past and use it to predict future trends, risking biases (Krakowski *et al.*, 2022). Definitively, AI enhances efficiency and facilitates the coordination and integration of diverse partners, such as supply chain management, through predictive models (Broekhuizen *et al.*, 2023).

Overall, we recognize the critical role of AI involved in the potential automation of redundancy genesis through "data pipeline capability" (Sjodin *et al.*, 2021, p. 578), algorithms development capabilities (Sjodin *et al.*, 2021, p. 578; Shrestha *et al.*, 2021), sales probability forecast, efficient allocation of resources through AI as "broker" (Broekhuizen *et al.*, 2023), and "grounding" strategy (Kemp, 2023).

3.2 Robustness

Robustness can be conceptualized in two ways-either as a distinct capability that enables the complete avoidance of performance degradation during disruptive events (Munoz *et al.*, 2022), or as an intrinsic micro-capability within the broader construct of firm resilience, which supports the minimization of such degradation. In our study, we adopt the latter view, framing robustness as a micro-level firm resilience capability.

AI affects robustness, enabling firms to anticipate and address risks, for example, by applying AI as a forecasting tool (Broekhuizen *et al.*, 2023) to predict such disruptive events. The genesis of robustness is intrinsically tied to AI, mainly through its mapping and controlling functions (Broekhuizen *et al.*, 2023; Jarrahi *et al.*, 2023).

On the one hand, the mapping function facilitates the scanning of internal and external environments and address organizational issues by analyzing extensive databases to identify firms' weaknesses (Broekhuizen *et al.*, 2023). It enables the implementation of preventive strategies aimed at minimizing response times (Erol *et al.*, 2010).

On the other hand, the controlling function facilitates the detection of anomalies and the anticipation of potentially detrimental consequences (Broekhuizen *et al.*, 2023). Specifically, this function can enhance robustness by leveraging AI acting as a "forecaster," "whistleblower," and "custodian" of knowledge (Broekhuizen *et al.*, 2023, p. 5), in conjunction with a "bounding" strategy (Kemp. 2023).

i. AI as a "forecaster" refers to its predictive capabilities. Notably, the decrease in prediction costs (Agrawal *et al.*, 2018) enables firms to imagine alternative scenarios by supporting proactive simulation processes, which play a central role in identifying potential futures and detecting possible obstacles (Jarrahi *et al.*, 2023). By providing environmental, technological, competitive, and supply chain information, AI can help anticipate and prevent disruptive events (Agrawal *et al.*, 2018), enhancing robustness.
ii. AI as a "whistleblower" allows firms to have a rapid warning system (Broekhuizen *et al.*, 2023). For instance, AI can be adopted to perform sentiment analysis to "analyze inter-partner

communication or negative customer feedback to detect negative sentiments" (Broekhuizen *et al.*, 2023, p. 6).

iii. AI, as a "custodian" of knowledge, protects and makes robust firms together with the "bounding" strategy (Kemp, 2023). Both AI as a "custodian" of knowledge (Broekhuizen *et al.*, 2023) and a "bounding" strategy aim to counter the notion of AI as a form of explicit knowledge (Kemp, 2023). AI as a "custodian" allows to monitor and avoid intellectual property violations, especially in the case of open innovation (Broekhuizen *et al.*, 2023), and cooperative or coopetitive strategies. Thus, the genesis of robustness is also enhanced by the "bounding" strategy (Kemp, 2023), which encompasses encryption, cybersecurity measures, and confidentiality agreements with suppliers, employees, competitors, and coopetitors.

3.3 Agility

We adopt the definition of agility as a firm's capability to swiftly respond to emerging turbulence by effectively overcoming obstacles (Ismail *et al.*, 2011) while demonstrating strategic sensitivity (Doz & Kosonen, 2008). To generate agility, it is essential to systematically monitor AI predictions (Sjodin *et al.*, 2021), thereby enabling the effective augmentation of human and AI capabilities. Hence, AI enhances the human ability to effectively predict and manage environmental and social transformations (Minà & Michelini, 2024) through data-driven and customer-oriented managerial approaches.

In today's transformative and uncertain landscape, it is imperative to shift to a "holistic and human-centric approach that addresses the technological, organizational, and strategic facets of AI deployment for enduring success and competitiveness" (Aagaard & Tucci, 2024, p. 303). Specifically, the adoption of AI allows a strategic transition "toward data-driven, customer-centric, and flexible business practices" sailing toward a new era (Aagaard & Tucci, 2024, p. 297).

In detail, the adoption of predictive analytics powered by AI to gain a deep understanding of customers' preferences strengthens agility. For instance, the literature recognizes an archetype of AI application called "experience innovators," which adopt AI to engage and customize products and services, "prioritizing customer-centric AI applications over internal optimization" (Aagaard & Tucci, 2024, p. 307). Thus, if AI tools can be applied to identify unmet needs (Lanzolla *et al.*, 2021) or to align with customer preferences, they can also foster agility.

We account for agile customer co-creation, data-driven delivery operations (Sjodin *et al.*, 2021), agile partnership, and AI as "vanguard" (Broekhuizen *et al.*, 2023), as key capabilities and strategies of AI that enable the genesis and enhancement of agility.

i. Agile customer co-creation involves the adoption of the augmentation strategy transcending firms' boundaries. Hence, customers and firms iteratively co-create new solutions by leveraging AI (Sjodin *et al.*, 2021). Agility by means of customer co-creation enables the early deployment of AI microservices even before their development and testing are complete, fostering cooperation between firms and customers for final development (Sjodin *et al.*, 2021). This dimension of agility opens new frontiers in human-machine interactions in the context of augmentation, establishing an interactive relationship characterized by transparency and reciprocal exchange, even beyond firm boundaries. On the one hand, "customer co-creation," which allows the development of new solutions leveraging AI, constitutes a pivotal element for cooperation between firms and customers. On the other hand, the advent of generative AI makes it imperative to embrace the constant evolution of new forms of AI to personalize the relationship with customers creatively. Therefore, generative AI enables a heightened form of personalization, known as "hyper-personalization", allowing firms to quickly tailor products or services to match the preferences of each customer (Aagaard & Tucci, 2024).

ii. Data-driven delivery operations (Sjodin *et al.*, 2021) concern the alignment of firms' products and services with customers' preferences, processing real-time data through AI to promptly respond to customer needs. These operations are carried out through an augmentation

approach, which involves skilled engineers assessing the recommendations generated by AI (Raisch & Krakowski, 2021).

iii. Agile partnership enables the construction of strategic partnership networks between firms aimed at jointly exploring opportunities offered by AI. Hence, co-creation through AI extends beyond mere customer involvement, and it has the potential to broaden the firm's boundaries and include other actors (Gama & Magistretti, 2023). Specifically, agile partnerships can take the form of open innovation, cooperation, or coopetition between firms. To ensure the success of such partnerships, AI can also play a key role as a "custodian" to safeguard knowledge and prevent opportunistic behaviors (Broekhuizen *et al.*, 2023).

iv. AI as a "vanguard" (Broekhuizen *et al.*, 2023) may contribute to firms' agility by mitigating firms' exposure to demand uncertainty. Mainly, AI as a "vanguard" enables the assessment of new business opportunities and the monitoring of emerging trends, thereby fostering the dimension of agility known as "strategic sensitivity" (Doz & Kosonen, 2008).

3.4 Flexibility

Flexibility constitutes a micro-capability of firm resilience, enabling the firm to quickly shift its strategies (Conz & Magnani, 2020). Specifically, strategic flexibility concerns the timeliness of decision-making processes (Pal *et al.*, 2014). This micro-capability is essential in times of high uncertainty in both demand and supply because it enables tempestive judgements and decisions in response to changes (Iftikhar *et al.*, 2021).

Against this backdrop, AI is inherently flexible because it evolves with emerging trends, reconfigures itself to adapt to the diverse needs of users, and develops new solutions beyond those initially envisaged (Sjodin *et al.*, 2021). For instance, Haenlein and Kaplan (2019) describe AI as a means that allows firms to learn from existing data and to fit flexibly into the environment.

We acknowledge that the distinct roles of humans and AI in fostering flexible decision-making processes must be explored through the integration of analytical reasoning and intuitive (Akinci & Sadler-Smith, 2012) processes (Shrestha *et al.*, 2021; Jarrahi, 2018). In this context, the role of strategic flexibility and augmented decision-making results from the relationship between analytical and intuitive decision-making (Jarrahi, 2018). AI enhances human decision-making capabilities, facilitates new modes of interaction with customers (Wilson & Daugherty, 2018), and increases creativity and organizational performance (Mikalef & Gupta, 2021).

Reasoning, problem-solving, and decision-making have traditionally been viewed as core human cognitive functions (Broekhuizen *et al.*, 2023). However, literature acknowledges that these capabilities can be augmented through AI (Raisch & Krakowski, 2021), supporting the emergence of flexibility. As such, AI is a paramount tool for enhancing human decision-making (Jarrahi, 2018), thereby enabling the development of strategic flexibility.

The emergence of strategic flexibility draws upon the same capabilities that underpin the development of redundancy and robustness, such as AI as a "forecaster" (Broekhuizen *et al.*, 2023), "data pipeline capabilities," and algorithms development capabilities (Sjodin *et al.*, 2021, p. 578; Shrestha *et al.*, 2021). However, to foster flexibility, these capabilities are not employed through an automation approach but rather through augmentation (Raisch & Krakowski, 2021). Hence, this complementarity entails an augmentation approach in which AI extends human cognition by processing computational information with an analytical approach (Shrestha *et al.*, 2021). Conversely, humans adopt a holistic and intuitive approach to decision-making (Jarrahi, 2018), transcending mere information and embracing an unconscious yet visionary perspective.

Overall, in a real-world context governed by entropy, exclusive reliance on probabilistic and analytical thinking proves limiting (Jarrahi, 2018). Similarly, exclusive reliance on intuition and unconscious decision-making heuristics risks irreparably harming the firm, as intuition is prone to biases and guided by tacit learning derived from errors and prior experimentation (Jarrahi, 2018). In light of these considerations, analytical decision-making, an attribute of AI, offers superior and faster

decision quality (Wilson & Daugherty, 2018; Fügener *et al.*, 2022). Nevertheless, despite the potential of AI in augmenting decision-making processes, we argue that nowadays, humans are irreplaceable in decision-making. For instance, irreplaceability is demonstrated by "responsibility" as an inherently human capability (Floridi, 2008), as well as by the fact that rational and analytical decisions could, physiologically or pathologically, be influenced by subjective and political elements within the firm (Jarrahi, 2018). Effectively managing these elements requires human intelligence, encompassing emotional intelligence (Goleman, 1995), sensemaking (Weick *et al.*, 1999), subconscious thinking models, empathy, and personality traits that guide intuition (Jarrahi, 2018). These unique human capabilities (Jarrahi, 2018) must form a symbiosis (Inga *et al.*, 2023) with the capabilities of AI to generate flexibility, agility, and adaptability. Hence, this reflection on the role of the augmentation approach in fostering flexibility also underscores distinctively human capabilities, such as intuition, sociality, empathy, and emotional sensitivity.

Additionally, to develop strategic flexibility, a "recasting" strategy is essential, as AI must be embedded "in a firm's system of task, strategic, and relational interdependencies" (Kemp, 2023, p. 8) to align with a firm's strategy and enhance flexibility.

3.5 Adaptability

Firms' adaptability is inherently tied to the human capability to "see" environmental changes by developing physical, cognitive, and behavioral skills essential for survival and recovery. Nevertheless, we argue that firm's adaptability can be further "augmented" (Raisch & Krakowski, 2021) by AI, which enhances human adaptability, particularly via techniques such as fault injection.

The intentional exposure to errors and induced failures enhances firms' adaptability by equipping them to respond and adapt promptly and effectively to analogous or similar disruptions in the future (Ramezani & Camarinha-Matos, 2020). Humans interpret the results of fault injection tests, develop strategies to address vulnerabilities and ensure these strategies align with broader organizational goals, values, and ethical considerations.

By leveraging mechanisms such as fault injection, AI enhances firms' adaptability by complementing the inherent adaptive capabilities of humans. In fault injection, humans excel in unstructured situations where ambiguity is intentionally constructed, data is incomplete, and creativity and human-machine collaboration are essential. In this context, the critical role of human emotions in building trust in AI emerges, as human beings tend to react more negatively to AI errors than to human mistakes (Fügener *et al.*, 2022). Emotional responses significantly influence how people perceive AI's reliability and effectiveness, making trust inherently fragile. While trust in AI strengthens when its capability to enhance firms' resilience capabilities, such as adaptability, is demonstrated, it remains vulnerable due to "algorithm aversion" (Fügener *et al.*, 2022). Therefore, fostering trust requires not only showcasing AI's potential to improve adaptability but also addressing the emotional barriers that can lead to skepticism and reluctance toward its adoption.

On the one hand, fault injection involves tests of unforeseen failures; on the other hand, managing fault injection becomes essential as it facilitates human-machine collaboration in contexts requiring teamwork, customer engagement, and handling sensitive situations.

3.6 Resourcefulness

Resourcefulness involves the creative orchestration of resources to seize opportunities and overcome obstacles (Williams *et al.*, 2021). Leveraging the connections among resourcefulness and concepts such as serendipity, "ego resilience," (Oshio *et al.*, 2018, p. 54), "bricoleur" (Levi-Strauss, 1966), diversity and collectiveness (Conz & Magnani, 2020) and emotional intelligence (Goleman, 1995; Busch, 2024), this study emphasizes the indispensable role of human intelligence in cultivating resourcefulness. Resourcefulness is an inherently human resilience capability, enabling behaviors that

transcend boundaries to create and appropriate unplanned sources of value (Williams *et al.*, 2021). In detail, we analyze the connections between resourcefulness and the concepts mentioned above.

First, resourcefulness can manifest as a firm's ability to improvise and serendipity, particularly when firms face resource constraints (Denrell *et al.*, 2003). As defined by Denrell *et al.* (2003), serendipity emerges from a combination of effort, luck, readiness, and flexibility within a process that precedes unplanned discoveries. The "trigger" of serendipity is the unexpected. Humans interpret the potential of the unexpected subjectively through processes such as "association" (Busch, 2024) - the formation of mental connections - and "bisociation," which refers to the simultaneous association of objects or ideas typically considered unrelated (Busch, 2024).

Second, "ego-resilience" refers to a dynamic capability to temporarily modify one's reactions and perceptions in response to the emerging circumstances (Oshio *et al.*, 2018). A person characterized by high levels of "ego-resilience" is enterprising and capable of adapting to new situations and changes by modifying behavior in a versatile manner employing new cognitive and social procedures (Oshio *et al.*, 2018). "Ego-resilience" is a typical trait of individuals who, in highly stressful situations, do not act rigidly and persistently by repeating their mistakes, but instead adjust to difficulties (Oshio *et al.*, 2018).

Third, "bricoleur," a term introduced by anthropologist Lévi-Strauss (1966), describes the human capability to leverage available resources to solve problems. Consequently, it plays a crucial role in creatively utilizing existing resources to generate and seize new or unplanned value-creating opportunities within the entrepreneurial process (Williams *et al.*, 2021).

Fourth, human diversity within the firm in terms of gender, ethnicity, and cultural background fosters and enhances creativity, innovation, and resourcefulness (Aggarwal *et al.*, 2019). Collectiveness entails coordination and interaction among individuals both within and outside the firm, the promotion of a shared and positive vision enhancing creative problem-solving (Conz & Magnani, 2020). Hence, human diversity (Aggarwal *et al.*, 2019) and interaction among individuals within the firm foster the promotion of a shared and positive vision, while active participation in community planning contributes to creative problem-solving (Conz & Magnani, 2020).

Finally, a critical enabler of resourcefulness is a particular dimension of human intelligence: emotional intelligence. The concept of "emotional intelligence," introduced by Goleman (1995), is indispensable for understanding the role of human intelligence in fostering firm resilience. Emotional intelligence is the ability to handle emotions. It plays a pivotal role in human resilience to stress (Schneider *et al.*, 2013), enhancing the ability to navigate disruptions and crises with resilience.

At the extant stage of the development of AI, generative AI serves as a valuable tool for augmenting human creativity and fostering innovation. Still, it cannot generate true resourcefulness. In fact, resourcefulness is closely tied to identity-related characteristics that are exclusively human, such as empathy, sentiment, emotion, intuitive and emotional intelligence. Thus, we argue that resourcefulness is exclusively rooted in human intelligence.

4. Discussion and conclusion

In this paper, we have presented a conceptual framework that offers a comprehensive understanding of the interplay between AI and human intelligence within firms. The growing importance of AI has the potential to notably revolutionize automation by fostering redundancy and robustness. However, automation is not introduced in our conceptual paper to increase efficiency by reducing human presence. In sharp contrast to this, we argue that developing redundancy and robustness through automation enables humans to dedicate their time to strengthening other firm resilience micro-capabilities-agility, flexibility, and adaptability-as well as the one in which the human role remains irreplaceable: resourcefulness.

4.1. Implications for Theory

Our paper offers a twofold contribution. First, we enrich previous studies on AI by investigating AI's impact on firm resilience through the dual lenses of automation and augmentation (Raisch & Krakowski, 2021). On the one hand, we argue that the genesis of robustness and redundancy should occur through automation, as the most valuable resources for value creation within firms are human beings whose knowledge, capabilities, and time are scarce resources. On the other hand, we propose that redundancy and robustness should be developed through automation because these firms' resilience capabilities are primarily built by leveraging large datasets and adopting predictive algorithms (Aagaard & Tucci, 2024), which are strengths of AI rather than of human beings. Therefore, the idea is that the development of firms' resilience capabilities should be aligned with the strengths and weaknesses respectively of AI and humans. The genesis of capabilities based on AI's strengths and human weaknesses-such as redundancy and robustness-should occur in the automation space. Conversely, the genesis of capabilities rooted in human strengths and AI's limitations-such as resourcefulness-should take place within the human-centricity space. This does not imply that the development of these capabilities-redundancy and robustness- cannot be augmented. However, the underlying rationale is that generating them through augmentation would consume human time, a scarce resource. This time-based reasoning specifically applies to the genesis of redundancy and robustness, rather than to the genesis of resourcefulness. Hence, concerning resourcefulness, the reasoning differs as it pertains to capabilities that are exclusive to humans and beyond the reach of AI. Thus, the integration of AI into firms necessitates a holistic organizational restructuring (Bresnahan, 2021) and the automation of activities where human involvement does not contribute significant added value.

Second, we contribute to existing studies on the antecedents of firm resilience by enlightening the role of AI. Specifically, the study of human-AI symbiosis (Inga *et al.*, 2023) in the context of resilience provides valuable insight into how firms can harness AI to strengthen their survival while maintaining essential human qualities such as emotional intelligence, intuition, and empathy. From this perspective, we enrich the literature by complementing existing multi-level and multi-theoretical approaches (Aversa *et al.*, 2024). We argue that the transition from the automation space to the augmentation space and human-centricity space fosters the genesis of adaptive resilience capabilities. In contrast, absorptive resilience capabilities, which are more closely associated with automation, become less relevant in the augmentation and human-centricity space. The reverse is true when moving from the human-centricity space to the automation space.

4.2. Implications for Practice

Our research findings offer an actionable guide for managers to make informed and deliberate use of AI as a tool to navigate major exogenous shocks and temporary competitive advantages. Accordingly, we elucidate the role of AI in shaping each key micro-capability that underpins firm resilience (Conz & Magnani, 2020), thereby providing managers with valuable insights into how AI can be strategically leveraged by firms to enhance resilience. Specifically, our framework provides managers with a conceptual map to support the effective strategic allocation of human and AI resources, which may have practical applicability across various industries. For instance, in industries where balancing redundancy and efficiency is of paramount importance-such as the automotive industry-managers may address the well-established trade-off within an automation space by leveraging "data pipeline capabilities", algorithm development capabilities and data warehouse management capabilities (Sjodin *et al.*, 2021 p. 578; Aagaard & Tucci, 2024). Additionally, managers may recognize that AI capabilities, including sales probabilities forecast, can support firms in mitigating the risks associated with stockouts and in ensuring the continuity of production lines. Overall, AI may enable firms to build redundancy, for example by maintaining safety stock, without compromising efficiency.

Similarly, in industries primarily characterized by high demand uncertainty-such as fashion or consumer electronics-managers may foster agility within the augmentation space through AI capabilities namely "agile customer co-creation" (Sjodin *et al.*, 2021) and "AI as vanguard" (Broekhuizen *et al.*, 2023), thereby enabling firms to promptly respond to changes in customer preferences.

Ultimately, it may be incumbent upon managers to acknowledge the strategic relevance of human resources marked by resourcefulness and diversity, and more specifically, by human capabilities such as ego-resilience (Oshio *et al.*, 2018) and emotional intelligence (Goleman, 1995), as fundamental enablers of firm resilience.

4.3. Limitations and Future Research Opportunities

Overcoming the limitations of the present theoretical paper, while leveraging and extending the proposed framework, holds significant potential to stimulate further scholarly inquiry. First and foremost, our conceptual framework requires empirical validation to assess its practical applicability across a variety of industries. Future empirical investigations focusing on firms operating in diverse industries could prove valuable in illustrating how the relationship between AI adoption-both in terms of automation and augmentation-and firm resilience micro-capabilities differs across industries, while also identifying potential moderating factors in this relationship. Additionally, future research could empirically examine the role of AI in addressing the trade-off between redundancy and efficiency (Iftikhar *et al.*, 2021; Mariani *et al.*, 2023).

Second, our framework has been developed under the assumption that the adoption of AI yields exclusively positive effects. While this is a reasonable perspective, it also represents a missed opportunity. Specifically, we do not account for the possibility of a "dark side" of AI (Cheng *et al.*, 2022) in the context of firm resilience. Accordingly, AI may be implemented in ways that unintentionally undermine resilience, potentially increasing firms' vulnerability rather than mitigating it. While our conceptual framework aims to explore how AI can be leveraged to strengthen resilience capabilities, future research should empirically investigate whether, under certain conditions, the use of AI might instead exacerbate exposure to disruptions. Specifically, the relationship between AI adoption and firm resilience could also be negative, with AI amplifying risks rather than assisting in their management.

Third, it is also important to note that the framework is inherently tied to the current historical period, and the rapid pace of AI development presents both opportunities and challenges for its future relevance. The evolution of AI over the next two decades, or potentially even sooner, is expected to give rise to new forms of augmentation far beyond what we currently envision. With advancements in generative AI, it is foreseeable that the capabilities of AI will expand significantly, enabling even more sophisticated interactions between humans and AI. Such advancements may lead to the emergence of new AI capabilities, decision-making processes, and innovations, which could surpass our current framework.

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AI-Driven Decision-Making in Entrepreneurship: A Systematic Review and Research Agenda

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Abstract

Frame of the research. *Artificial intelligence (AI) revolutionizes how entrepreneurs find opportunities and make strategic decisions. Nevertheless, business AI research is still fragmented. Thus, academic research needs a more comprehensive approach that brings existing knowledge and sets a clear direction for future research.*

Purpose of the paper. *This study analyzes previous research on the application of AI in entrepreneurial scenarios to identify the main concerns at the nexus of entrepreneurship and AI.*

Methodology. *We conducted a systematic literature review on 219 peer-reviewed articles published in English between 2010 and 2025. Using content analysis and thematic coding, we identify the most relevant research directions, theoretical perspectives, and gaps in the literature.*

Results. *The study identified five main areas where AI and entrepreneurship intersect: (1) how AI promotes identifying new business opportunities; (2) how AI transforms business models; (3) how AI affects financial decisions; (4) how AI supports business development; and (5) how AI promotes cooperation within entrepreneurial ecosystems.*

Research limitations. *First, only peer-reviewed papers published in English are used. Second, by focusing on the years 2010–2025, the analysis does not include any advancements that occurred after this time. Lastly, this research does not directly test AI's impact on entrepreneurial success.*

Managerial implications. *AI empowers entrepreneurs with better decision-making, scaling, and forecasting. From a managerial perspective, this study highlights the growing importance of integrating AI into entrepreneurial decision-making.*

Originality of the paper. *We provide the AI-Driven Entrepreneurial Decision-Making framework to highlight how AI facilitates relevant entrepreneurial tasks including identifying opportunities, developing business models, and interacting with systems.*

Keywords: *Artificial intelligence; entrepreneurship; Systematic Literature Review; AI-Driven Entrepreneurial Decision-Making Framework; AI-Driven Business Models; AI applications*

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1. Introduction

It has long been recognized that entrepreneurship plays a crucial role in fostering innovation, market dynamism, and social change (Audretsch, 2012; Teece, 2016; Chin *et al.*, 2023). As industries shift in response to technological advancements, artificial intelligence (AI) has emerged as a major force changing the entrepreneurial landscape. Unlike past waves of digitalization, AI promotes strategic decision-making, the development of new business initiatives, and the growth of business models (Al-Surmi *et al.*, 2022). In an environment that is changing quickly, AI-driven tools-including machine learning, neural networks, deep learning, and generative AI-are revolutionizing how entrepreneurs find opportunities, evaluate risks, and grow their businesses (Cockburn *et al.*, 2018). By adopting AI-driven predictive analytics to assist with market analysis, customer segmentation, and demand forecasting, entrepreneurs may be able to make more strategic decisions. According to Abrardi *et al.* (2022), startups and small businesses can now improve processes, customize client interactions, and attain cost reductions that were previously exclusive to major firms due to AI-driven automation that is revolutionizing traditional business models.

It is possible to examine how AI is affecting entrepreneurship from both cognitive and operational perspectives. By applying the cognitive lens, AI greatly improves business decision-making through combining enormous amounts of data, recognizing patterns, and providing targeted insights (Jarrahi *et al.*, 2023). Entrepreneurs can improve market research and react proactively to emerging trends by utilizing AI-driven solutions (Chalmers *et al.*, 2021). Additionally, natural language processing technology and AI-driven tools enable the quick product-development process, allowing entrepreneurs to test new ideas before making large investments (Vecchiarini & Somià, 2023). These cognitive advantages provide entrepreneurs with more confidence while managing complexity by promoting a more adaptable and data-driven approach to creating new businesses. On the other hand, by applying the operational lens, AI is revolutionizing business performance by increasing consumer interaction and allocating resources optimally (Tkachenko *et al.*, 2019). AI-driven automation minimizes time-consuming tasks, allowing firms to operate with leaner structures and achieve high levels of efficiency (Modgil *et al.*, 2022). In this vein, AI-driven chatbots, virtual assistants, and highly customized marketing tools are revolutionizing how firms interact with their customers and how they improve user experiences. Moreover, supply chain optimization and AI-driven predictive logistics increase efficiency by reducing waste and enhancing response to demand variations (Di Vaio *et al.*, 2023). These AI developments have given startups the flexibility and scalability that were previously only available to major corporations (Giuggioli & Pellegrini, 2023).

AI is also affecting business operations and the entrepreneurial environment (Weber *et al.*, 2022). By improving algorithms for matching investors with businesses and increasing crowdfunding success rates, AI-driven platforms are revolutionizing access to financing. Moreover, AI contributes to the creation of emerging businesses (Kanbach *et al.*, 2024). These AI-native businesses, which operate in industries including cybersecurity, algorithmic trading, automated content creation, and autonomous systems, represent a fundamental change in the entrepreneurial landscape.

In this scenario, there are pressing issues that need scholarly attention when AI is integrated into business ecosystems. Algorithmic bias, privacy, and transparency are morally risky issues since unchecked AI usage might lead to discriminatory practices, data security breaches, and unanticipated socioeconomic consequences (Lee, 2020). As entrepreneurs assign increasingly complicated tasks to autonomous systems, the rising dependence on AI for decision-making also calls into question responsibility. Additionally, there is an ongoing discussion on how AI-driven automation may affect labor markets, with worries about worker displacement and the necessity of upskilling to match the demands of an AI-enhanced economy (Tiwari, 2023). To ensure that entrepreneurship stays inclusive and feasible despite these challenges, regulatory frameworks that strike a balance between innovation and responsible AI use must be developed.

Additionally, there are significant context-dependent differences in the implications of AI for entrepreneurship across sectoral, institutional, and geographic dimensions. According to Kutesa *et al.*

(2024), developing countries have structural obstacles to employing AI-driven entrepreneurship. Yet, entrepreneurs in developing countries may find it difficult to take advantage of AI-driven possibilities due to legal restrictions, limited access to high-quality data, and a lack of AI competence. These scenarios show how important it is to have an in-depth understanding of how AI impacts business ecosystems in various socioeconomic settings.

As AI technologies develop, their impact on entrepreneurship continues to grow. Scholars, practitioners, and governments are increasingly interested in developing integrative frameworks that optimize AI's potential while mitigating its challenges. Indeed, despite the growing interest in AI's role in entrepreneurship, the academic literature remains fragmented, with studies often focusing on specific applications without a holistic understanding of AI's broader impact on entrepreneurial ecosystems. While some scholars have examined the role of AI in innovation management, venture financing, and business model development, comprehensive frameworks integrating these perspectives are still lacking.

This paper aims to fill this gap by conducting a comprehensive review of the literature on AI and entrepreneurship. Specifically, we seek to address three key research questions:

1) How is AI shaping entrepreneurial processes and decision-making?

2) What are the primary benefits and challenges associated with AI adoption in entrepreneurship?

3) What are the key areas for future research in this rapidly evolving domain?

By systematically analyzing existing studies and identifying theoretical and practical implications, this review contributes to the ongoing debate on AI-driven entrepreneurship. The findings of this study will be valuable for scholars, policymakers, and practitioners seeking to understand the intersection of AI and the entrepreneurial ecosystem. As AI technologies continue to evolve, future research must explore how entrepreneurs adapt to these changes and how ecosystems can be structured to balance the benefits of AI with the need for ethical and regulatory oversight.

The remainder of this paper is structured as follows. Section 2 highlights the theoretical background of the study. Section 3 provides an overview of the methodology used for the literature review. Section 4 synthesizes the key themes emerging from the existing literature, while Section 5 introduces the theoretical framework of AI-Driven Entrepreneurial Decision-Making; Section 6 outlines the theoretical, managerial, and policy implications, while Section 7 provides the future research agenda of AI adoption in entrepreneurship. Finally, conclusions are described in Section 8.

2. Theoretical Background: AI-driven entrepreneurship ecosystem

The concept of the entrepreneurship ecosystem is a fundamental framework for understanding the environmental elements that either encourage or hinder entrepreneurial activity (Stam, 2015; Cobben *et al.*, 2022). According to Autio *et al.* (2014), an entrepreneurial ecosystem is made up of interrelated components that influence the success and scalability of new businesses. These components include financial capital, human resources, institutions, market dynamics, and networks. Traditional theoretical perspectives on entrepreneurial ecosystems place a strong emphasis on the role that human agency, social capital, and institutional support have in fostering innovation and venture development (Colombo *et al.*, 2019; Cavallo *et al.*, 2019). However, the rapid advancement of AI is changing these dynamics by introducing new approaches to decision-making, resource allocation, and business model innovation (Kanbach *et al.*, 2024). The use of AI in the entrepreneurial ecosystem is fundamentally altering how firms are conceived, developed, and scaled in a global economy that is becoming more digitally connected and interconnected (Roundy, 2022). Nowadays, due the AI tools, entrepreneurs are better equipped to make data-driven choices, maximize operational effectiveness,

and interact with markets in new ways. The combination of big data, AI-driven automation, and cloud computing lowers barriers to entry and creates new opportunities for innovative business models (Richter *et al.*, 2017).

An AI-driven entrepreneurial environment involves several fundamental changes. First, by lowering uncertainty and increasing prediction accuracy, AI influences entrepreneurial decision-making as a cognitive augmentation tool (March, 2021). The foundation of AI-driven entrepreneurship is algorithmic insights obtained through massive datasets. Thus, the reshaping of decision-making processes is at the heart of an ecosystem of entrepreneurship driven by AI (Widayanti & Meria, 2023; Magni *et al.*, 2024). AI enables managers to obtain valuable insights that would be hard to obtain with conventional analytical procedures by using vast amounts of both structured and unstructured data (Giuggioli & Pellegrini, 2023). Hence, AI enhances market knowledge by allowing organizations to foresee demand shifts, detect inefficiencies in their value chains, and find new consumer trends. Second, digital platforms, AI-driven automation, and data-centric strategies are changing industrial structures and reducing barriers to entry (Nambisan *et al.*, 2017). In this approach, AI-driven businesses employ data as a fundamental strategic asset to develop new competitive dynamics (Jarrahi *et al.*, 2023). This trend challenges traditional resource-based theories of entrepreneurship (Barney, 1996), prompting a rethinking of how to maintain competitive advantage in an AI-business landscape. Lastly, the network architecture in entrepreneurial ecosystems is changing because of AI. Conventional ecosystems depend on networks of investors, mentors, and social interactions to promote financial access and knowledge sharing (Spigel, 2017). Today, through algorithmic business advising services, AI-driven investment platforms, and automated matching are increasingly mediating these connections (Obschonka & Audretsch, 2020). Although efficiency and scalability are improved by AI technologies, they also raise concerns about digital inequality and the diminishing role of human decision-making in entrepreneurial ecosystems. For instance, concerns about the future of human judgment in financing choices and the possible dangers of algorithmic biases in capital allocation are raised (Jia *et al.*, 2022). Similarly, AI-driven entrepreneurial education platforms and digital accelerators are changing how entrepreneurs learn and grow, further decentralizing conventional support systems (Weber *et al.*, 2022). Therefore, AI is a transformative force that is rewriting the core foundations of entrepreneurial ecosystems, not merely a tool for entrepreneurship and management.

Moreover, AI facilitates deeper connections between stakeholders, such as investors, startups, incubators, accelerators, and legislators, which benefits the larger entrepreneurship ecosystem (Stahl, 2022). AI-driven systems increase the accuracy of investor-startup matching and use predictive analytics to evaluate the likelihood of early-stage venture success, hence optimizing access to venture financing. This reduces information asymmetry and improves fundraising process efficiency, especially for entrepreneurs in underdeveloped areas or emerging markets. Automating governmental and regulatory processes using AI has also reduced administrative constraints for startups and sped up the time to market for creative ideas (Filieri *et al.*, 2021). Due to digital infrastructure, AI also facilitates the creation of smart entrepreneurial ecosystems where a wide variety of players may interact, exchange information, and collaborate in real-time. By increasing innovation networks, this interconnectedness fosters an environment in which businesses can rapidly develop and adapt to the requirements of the global market (Kolbjørnsrud *et al.*, 2016).

Despite its revolutionary potential, the spread of AI in entrepreneurial ecosystems poses several issues that need to be managed. One of the most pressing issues is algorithmic bias, which can lead to biased recruiting, finance, and customer targeting decisions (Kassir *et al.*, 2023). Due to their training on historical data, AI systems have the potential to reinforce structural obstacles within entrepreneurial ecosystems and penalize minority entrepreneurs, therefore reinforcing current disparities. Furthermore, concerns about data privacy, cybersecurity, and intellectual property rights are raised by the growing dependence on AI (Giuggioli & Pellegrini, 2023). The dominance of AI expertise in large digital firms also increases the risk of monopolization, which can prevent startups and small businesses from having access to key AI-driven technologies. The digital gap in AI

adoption, which shows differences across countries, sectors, and firm sizes, is another major issue (Lutz, 2019). While AI-driven entrepreneurship is still expanding in technologically advanced economies, many developing countries struggle with widespread AI integration due to a lack of funding, infrastructure, and qualified workers (Lutz, 2019). This unequal distribution of AI talents might exacerbate global entrepreneurial inequities by expanding the gaps in economic development, market access, and innovation potential. Policymakers have a critical role in developing AI governance frameworks that strike a balance between innovation and ethics, ensuring that AI-driven entrepreneurship stays accessible and useful to a diverse range of stakeholders.

3. Methodology

To investigate the function of AI in the ecosystem of entrepreneurship, this study employs a systematic literature review (SLR) methodology. A SLR ensures rigor and transparency in the research process by offering an organized and repeatable technique for finding, choosing, and evaluating pertinent academic papers (Tranfield *et al.*, 2003).

3.1 Research Design and Search Strategy

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework (Moher *et al.*, 2009) is employed in the study. The review focuses on peer-reviewed journal articles published in English between 2010 and 2025. The literature search was conducted using multiple academic databases, including Scopus, Web of Science, and IEEE Xplore. These databases were chosen for their comprehensive coverage of business, management, and technology-related research. The search strategy involved the use of predefined keywords related to AI and entrepreneurship, including but not limited to:

- “Artificial Intelligence” OR “AI”
- “Entrepreneurship” OR “Entrepreneurial Ecosystem”
- “Machine Learning” OR “Deep Learning”
- “Innovation” AND “Startups”
- “AI-driven Business Models”
- “Technology-based Entrepreneurship”

Boolean operators (AND/OR) were used to refine the search queries and ensure comprehensive coverage of relevant literature. The initial search yielded 1,245 papers.

3.2 Inclusion and Exclusion Criteria

To ensure the relevance and quality of the selected studies, predefined inclusion and exclusion criteria were applied. The inclusion criteria were limited to peer-reviewed journal publications to maintain academic rigor. The selected papers addressed the use of AI in business innovation and entrepreneurship, covering a range of topics related to how AI affects entrepreneurial processes. Additionally, both empirical and conceptual studies were included.

On the other hand, articles that just discussed technological developments in AI without mentioning entrepreneurship were not included in the study. To ensure the reliability of the results, non-peer-reviewed sources such as preprints, white papers, and dissertations were also excluded. Papers published in languages other than English were not considered. Furthermore, studies with inadequate data and duplicates were removed from the final list.

After applying these criteria, 219 papers were retained for further analysis.

3.3 Data Extraction and Analysis

A structured data extraction template was developed to systematically analyze the selected papers. Key variables included:

- Author(s), year, and journal
- Research objectives and questions
- Methodological approach (qualitative, quantitative, mixed-methods)
- AI technologies
- Entrepreneurial context (startups, SMEs, corporate entrepreneurship)
- Key findings and contributions

To find recurrent topics, patterns, and gaps in the literature we performed a bibliometric analysis using Biblioshiny for Bibliometrix (Aria & Cuccurullo, 2017), which facilitated network analysis, co-citation mapping, and the identification of key research clusters. The main themes were synthesized to develop a conceptual framework outlining the current state of the art of AI in entrepreneurship and to provide a future research agenda.

3.4 Reliability and Validity

To ensure reliability and validity, multiple researchers independently conducted the literature selection and data extraction processes. Discrepancies were resolved through discussion and consensus. Furthermore, citation and co-citation analyses were performed using bibliometric tools (e.g., VOSviewer and Biblioshiny for Bibliometrix) to validate key research clusters and influential studies in the field. The integration of bibliometric techniques ensured a data-driven approach to mapping the existing literature and identifying potential research gaps.

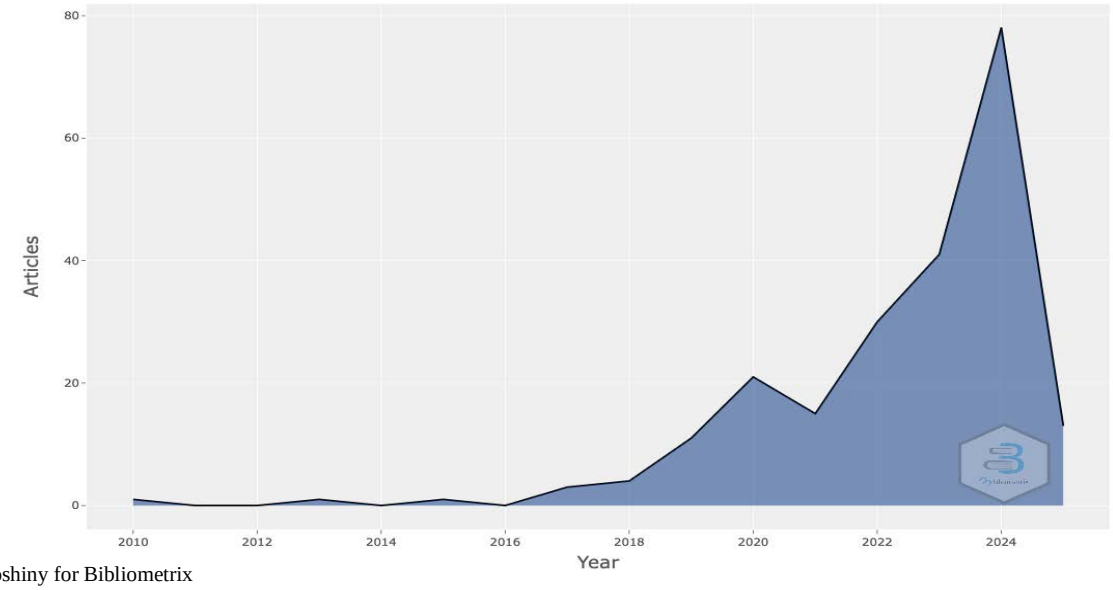
This methodological rigor ensures that the findings of this study provide a comprehensive and reliable synthesis of the role of AI in the entrepreneurship ecosystem, offering valuable insights for scholars and practitioners alike.

4. Bibliometric analysis

A bibliometric analysis was carried out using Biblioshiny for Bibliometrix to give a thorough evaluation of the research landscape on AI in the entrepreneurial ecosystem. This approach facilitates a methodical assessment of the field's conceptual framework, key figures, and thematic development (Aria & Cuccurullo, 2017). The bibliometric analysis used a variety of methodologies, including citation analysis, keyword co-occurrence analysis, and co-authorship network mapping, to provide a more in-depth knowledge of the evolution and interconnections in this topic.

Trends in research output over time were identified through the first phase, which describes the yearly scientific production. The annual trend in scientific productivity is shown in Figure 1 and Table 1.

Fig. 1: Annual Scientific Production Plot



Source: Biblioshiny for Bibliometrix

Tab. 1: Annual Scientific Production table

Year	Articles
2010	1
2013	1
2015	1
2017	3
2018	4
2019	11
2020	21
2021	15
2022	30
2023	41
2024	78
2025	13

Source: Authors development

Over the past ten years, there has been a notable increase in the yearly research output about the function of AI in the ecosystem of entrepreneurship. According to the analysis of the distribution of publications published annually, research interest in this area has increased, especially in the previous five years. Only a few publications were published on the topic between 2010 and 2017 (one in 2010, one in 2013, one in 2015, and three in 2017), indicating that the field received little academic interest during this time. However, there has been a noticeable rise in publications since 2018. From four articles in 2018 to eleven in 2019, the number of articles has almost quadrupled from 2018 and 2020. The increase is consistent with a global interest in AI that has been driven by advancements in big data, automation, and machine learning. The pattern persisted with 15 publications in 2021, then there was a significant increase in 2022 and 2023 (30 and 41 articles, respectively). This trend, which shows a convergence of AI research in entrepreneurship, is likely driven mainly by technological advancements and the integration of AI tools into entrepreneurial ecosystems. 2024 had the biggest spike, with 78 publications published, suggesting an exponential increase in scholarly interest. The growing adoption of AI-driven business strategies, automation tools, and decision-support systems may be the reason for this peak, which shows that AI has become a significant topic in entrepreneurship studies.

The global distribution of influential research on AI in entrepreneurship is shown by the analysis of the top-referenced nations (Table 2).

Tab. 2: Most cited countries table

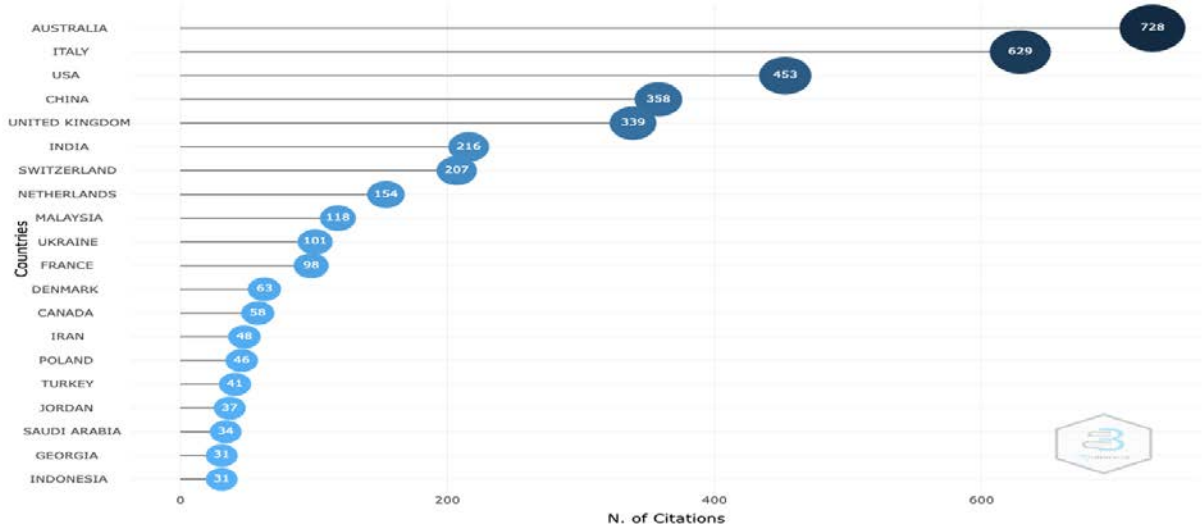
Country	Total Citations	Average Article Citations
Australia	728	56.00
Italy	629	104.83
USA	453	23.84
China	358	14.32
United Kingdom	339	56.50
India	216	13.50
Switzerland	207	207.00
Netherlands	154	38.50
Malaysia	118	19.67
Ukraine	101	33.67
France	98	19.60
Denmark	63	63.00
Canada	58	11.60
Iran	48	24.00
Poland	46	23.00
Turkey	41	13.67
Jordan	37	7.40
Saudi Arabia	34	34.00
Georgia	31	31.00
Indonesia	31	10.33

Source: Authors development

Australia leads the list with 728 citations, with an average of 56 citations per paper, indicating its strong research output and significant influence in this field. Italy comes in second with 629 citations and the highest average citation rate (104.83), indicating a concentration of significant research. The US has a relatively low average citation rate (23.84) while providing a significant volume of research, indicating an increased but less citation-dense contribution. Notable contributors include China (358 citations, 14.32 average) and the UK (339 citations, 56.50 average), with the latter having a larger impact per paper. Switzerland is notable for having an exceptionally high average number of citations per article (207), which demonstrates the impact of a small but very influential scientific hub. Despite publishing fewer studies, Saudi Arabia (34 citations, 34 per article) and Denmark (63 citations, 63 per article) have comparable high citation densities, suggesting that their contributions have a significant influence on the field. Global participation in AI and entrepreneurship research is demonstrated by the other significant contributors, which include the Netherlands (154 citations, 38.50 average), Malaysia (118 citations, 19.67 average), and Ukraine (101 citations, 33.67 average).

Figure 2 shows a graphic way the most cited countries in this study. The citation analysis reveals a blend of established research powerhouses and emerging contributors, emphasizing the importance of international collaboration in advancing knowledge on AI-driven entrepreneurship.

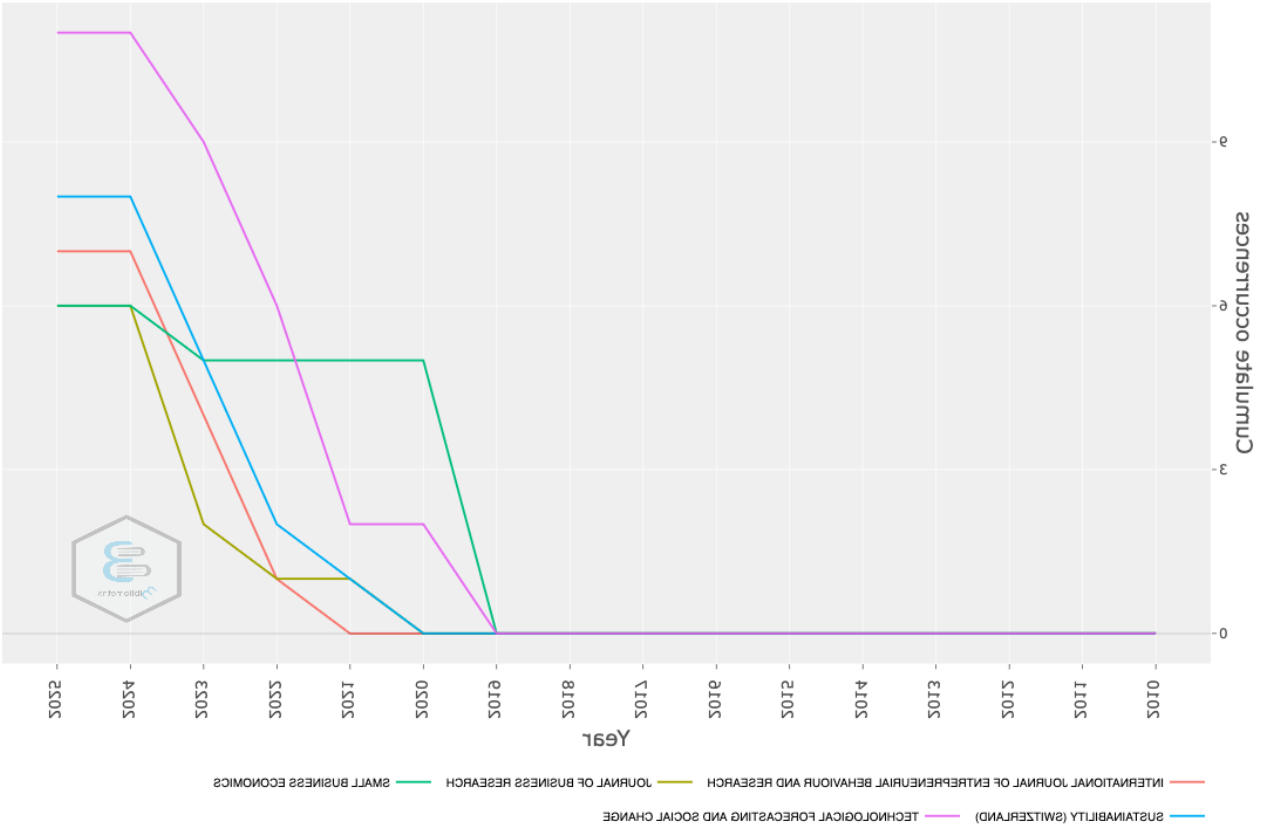
Fig. 2: Most cited countries



Source: Biblioshiny for Bibliometrix

The source growth analysis (Figure 3) sheds light on the growing scholarly attention given to AI in entrepreneurship across different journals. According to the data, publications from a variety of sources increased significantly beginning in 2018 and peaked in 2024.

Fig. 3: Source growth

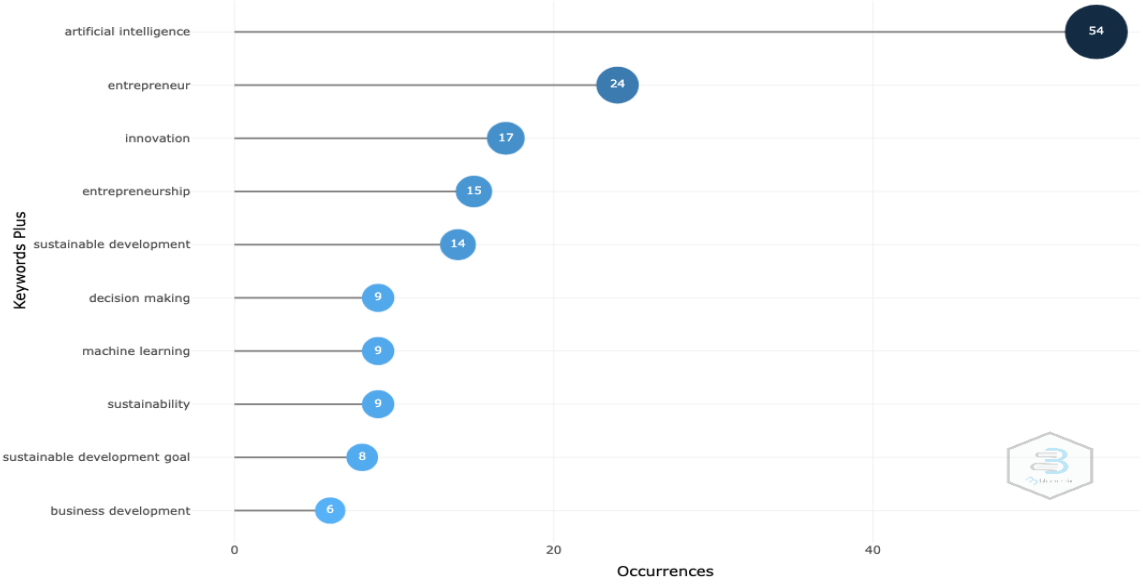


Source: Biblioshiny for Bibliometrix

Sustainability (Switzerland), one of the most popular journals, has grown the fastest, with cumulative occurrences rising dramatically over the last five years. A notable increase is also shown in *Technological Forecasting and Social Change*, highlighting the role that AI plays in identifying and influencing future business trends. Other key contributors include *Small Business Economics*, the *Journal of Business Research*, and the *International Journal of Entrepreneurial Behaviour and Research*. These journals' increasing focus on AI-driven entrepreneurship suggests that the priorities of business and management research are changing. The growing number of AI research in these sources highlights how AI is influencing corporate innovation, economic development, and entrepreneurial activities.

Figure 4 lists the most relevant keywords used in the research. "Artificial intelligence" emerges as the most frequently occurring term, reinforcing its central role in the discourse. The frequent use of the terms "entrepreneur" and "entrepreneurship" indicates that the impact of AI on business environments and innovation processes is becoming a growing field of interest.

Fig. 4: Most relevant words



Source: Biblioshiny for Bibliometrix

Themes related to “innovation” and “sustainable development” indicate that there is growing interest in how AI may encourage both financially successful and socially and environmentally responsible entrepreneurship. Words like “decision making” and “machine learning” emphasize how useful AI-driven analytical tools are for improving entrepreneurial decision-making and business strategy optimization. Furthermore, the use of terms like “business development,” “technological development,” and “digital technologies” implies an emphasis on the ways AI is changing existing sectors, creating new business opportunities, and transforming business landscapes. The terms “students” and “engineering education” are used to indicate a new line of study into the application of AI to entrepreneurship education and the training of future innovators. Overall, the keyword analysis reflects a multi-dimensional research focus, spanning AI’s technological advancements, its impact on entrepreneurial success, and its role in fostering innovative business practices.

The word cloud visualization provides a graphical representation of the most frequently occurring terms in the literature on AI in the entrepreneurship ecosystem. Figure 5 graphics the word cloud of the research.

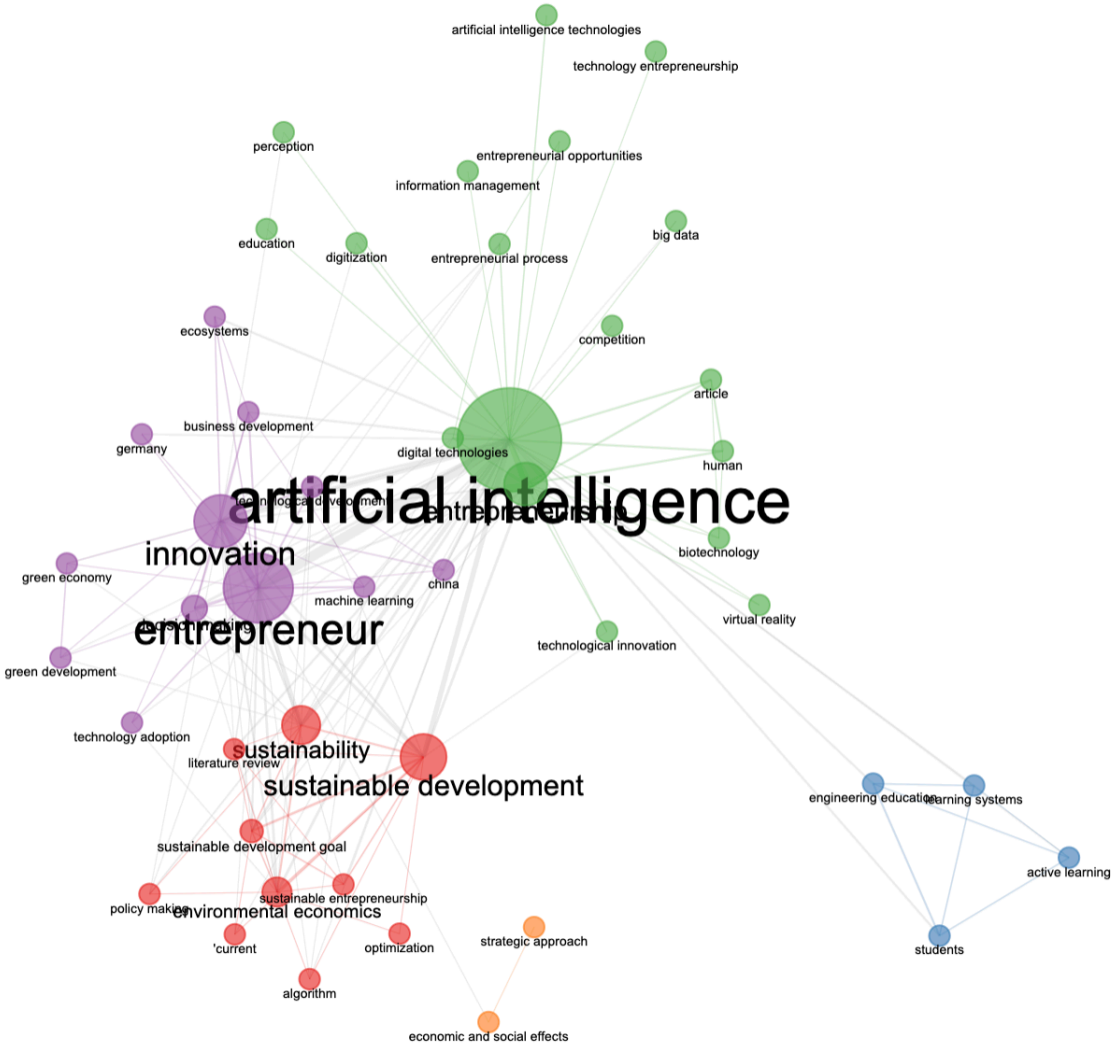
Fig. 5. WordCloud

Source: Biblioshiny for Bibliometrix

The prominence of “AI”, “artificial intelligence”, and “intelligence” underscores the central role of AI technologies in shaping entrepreneurial processes, decision-making, and innovation. Key terms such as “entrepreneur”, “entrepreneurial”, and “business” highlight the focus on how AI is influencing startups, business models, and economic opportunities. The terms “innovation” and “digital” are heavily used, which underlines AI’s function as a catalyst for technical advancement and a competitive edge in business activities. The terms “research”, “study”, and “education” all suggest that scholarly research investigates how AI affects entrepreneurship both theoretically and practically, including how it promotes learning and skill improvement. Additionally, the recurrence of terms such as “sustainable”, “social”, and “development” suggests an increasing focus on AI’s potential to contribute to sustainability and socially responsible entrepreneurship. This aligns with the growing global interest in AI-driven solutions that address economic, environmental, and societal challenges. Overall, the word cloud confirms the multidimensional nature of AI’s impact on entrepreneurship, spanning technological, economic, educational, and sustainability perspectives.

The co-occurrence network visualization (Figure 6) illustrates the interconnectedness of key research themes in AI and entrepreneurship. The size of the nodes represents the frequency of terms, while the edges (lines) indicate relationships between concepts.

Fig. 6: Co-occurrence network



Source: Biblioshiny for Bibliometrix

"Artificial intelligence" is the key subject at the network's core, highlighting its importance in the field of study. Terms like "entrepreneur," "innovation," and "entrepreneurship," which are closely linked, suggest a heavy emphasis on how AI promotes startup success, innovation, and business development.

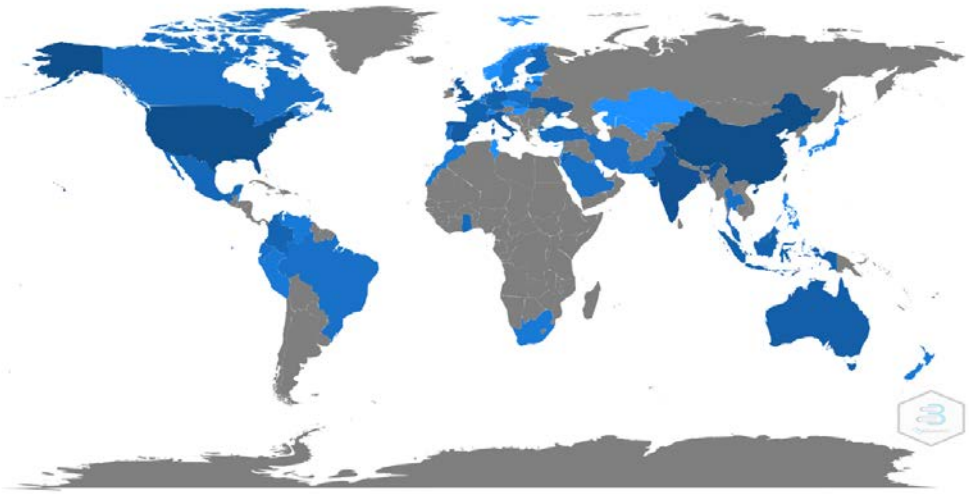
Additionally, the network identifies five specific theme clusters:

1. *Technological and Business Development* (Green Cluster): The first cluster includes terms like "digital technologies", "big data", "entrepreneurial opportunities", and "competition", which highlight how AI may improve market competitiveness, process automation, and business decision-making.
2. *Sustainability and Economic Impact* (Red Cluster): Keywords like "sustainable development", "sustainability", "environmental economics", and "policymaker" imply that research should focus on how AI supports sustainable entrepreneurship and its wider impacts on the economy and environment.
3. *Innovation and Learning* (Purple Cluster): The terms "business development," "machine learning", "technology adoption", and "ecosystems" bring focus to the relationship between AI technologies and the adoption of these technologies in entrepreneurial ecosystems.
4. *Education and Human Factors* (Blue Cluster): The terms "students", "engineering education", and "learning systems" all refer to a growing interest in the use of AI in entrepreneurial education and the training of future innovators.
5. *Strategic and Social Approaches* (Orange Cluster): Terms like "economic and social effects", and "strategic approach" suggest an emphasis on how AI affects business strategy and socioeconomic changes.

The co-occurrence network and the five clusters highlight a multi-faceted research landscape, emphasizing AI's role in business strategy, technological innovation, sustainable entrepreneurship, and education.

There is a significant concentration in technologically advanced and innovation-driven countries, according to the geographic distribution of AI and entrepreneurship research (Figure 7). The map highlights the countries contributing the most to this field, with leading research hubs in North America, Europe, and Asia. The significant appearance of the US, China, and several European countries including the UK, Germany, and Italy is indicative of their robust AI research ecosystems. Emerging markets such as Brazil, India, and South Africa also show significant contributions, indicating a growing interest in AI-driven entrepreneurship beyond traditionally dominant regions.

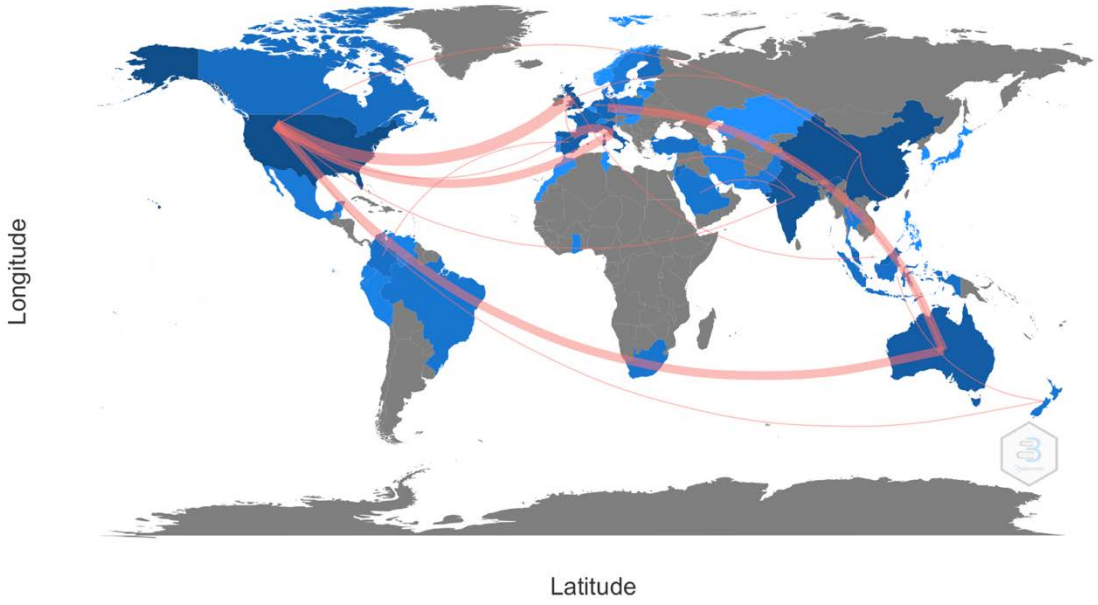
Fig. 7: Country specific production



Source: Biblioshiny for Bibliometrix

The United States emerges as a prominent node linking several nations in Figure 8, which shows patterns of international collaboration. The US and Europe have strong research linkages, especially with Germany, Italy, and the UK, indicating a high level of cross-border knowledge sharing. Similarly, China has established important collaborations with countries in Asia and Europe, demonstrating its dual position as a pioneer in application-driven AI and a research hub. Additionally, Australia seems to be a significant research collaborator, connecting research networks throughout the Asia-Pacific area. The density of these connections suggests that AI and entrepreneurship research is increasingly globalized, with knowledge sharing and co-authorships spanning multiple continents. This international network facilitates the contamination of ideas related to AI topics worldwide.

Fig. 8: Country collaboration map



Source: Biblioshiny for Bibliometrix

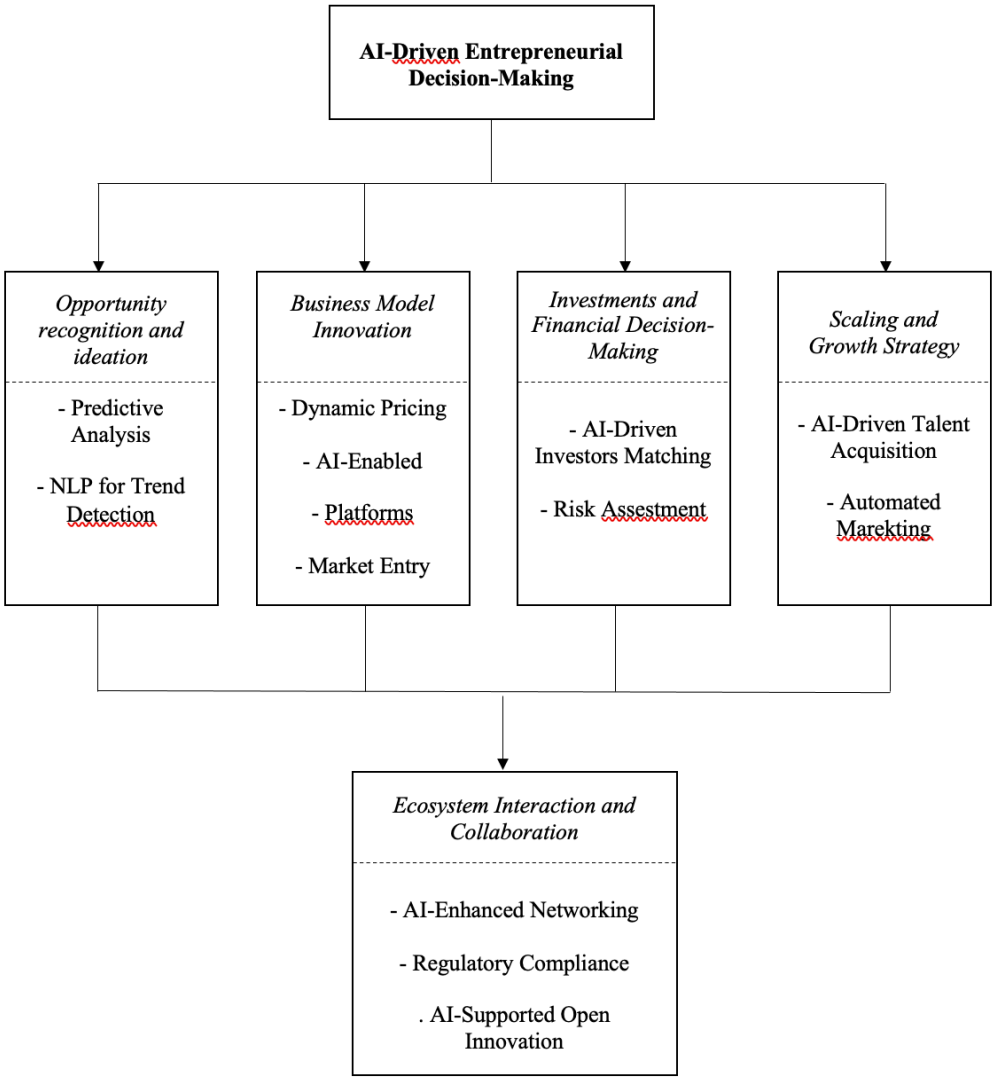
By employing these bibliometric techniques, this study provides a structured and data-driven assessment of the AI and entrepreneurship research landscape. The results provide insightful information about significant contributions, hot research topics, and potential directions for further study, which eventually advances the comprehension of how AI is influencing the entrepreneurial environment.

5. AI-Driven Entrepreneurial Decision-Making Framework

The literature review identified five main areas where AI and entrepreneurship intersect: (1) how AI promotes identifying new business opportunities; (2) how AI transforms business models; (3) how AI affects financial decisions; (4) how AI supports business development; and (5) how AI promotes cooperation within entrepreneurial ecosystems.

Although previous research has discussed each of these topics separately, there is no cohesive framework showing how AI affects entrepreneurial decision-making. To bridge this gap, we developed the AI-Driven Entrepreneurial Decision-Making Framework, a comprehensive framework that identifies AI's transformative impact across the entrepreneurial process. This framework is designed to be a practical tool for entrepreneurs, policymakers, and investors, as well as a foundation for further academic exploration. Figure 9 offers a visual representation of the framework.

Fig. 9: AI-Driven Entrepreneurial Decision-Making Framework



Source: Authors development

The first dimension focuses on identifying opportunities and generating ideas (*opportunity recognition and ideation*). AI tools, such as predictive analytics and natural language processing, help entrepreneurs sift through vast amounts of data from sources like social media, industry reports, and research papers. These AI tools allow entrepreneurs to anticipate emerging market trends.

The second dimension, *business models innovation*, shows how AI is reshaping the way businesses operate. For instance, AI is being used by entrepreneurs to improve platform-based models and apply dynamic pricing methods. Firms may improve their value propositions and achieve a competitive advantage by leveraging tools like real-time demand forecasts and recommendation systems.

The third dimension, *investments and financial decision-making*, explores how AI is transforming venture financing. AI-driven platforms and machine learning models improve risk assessment, credit scoring, and investment strategies, by helping entrepreneurs make more informed financial decisions.

The fourth dimension, *scaling and growing strategy*, highlights how AI supports key growth activities. Automated marketing systems, for example, customize consumer interactions to increase engagement and conversion rates, while AI-driven recruiting tools assist businesses in finding top talent. Additionally, AI optimizes supply chain operations, reducing costs and improving efficiency.

The fifth dimension, *ecosystems interaction and collaboration*, emphasizes how AI connects ecosystems. AI-driven platforms simplify networking and enable collaborative innovation to co-create stakeholders' value.

This framework provides a structured understanding of how AI transforms entrepreneurial decision-making, offering a roadmap for both researchers and practitioners.

6. Discussion and Implications

The bibliometric research demonstrates how quickly AI-driven entrepreneurship research is growing and developing strategically. The results indicate that, with expanding academic attention and multidisciplinary contributions, AI has moved from being a minor concern in entrepreneurship studies to a major study field. The significant increase in the number of publications over the past five years is indicative of interest from both academia and industry, suggesting that AI's contribution to market transformation, business model innovation, and entrepreneurial decision-making is now widely acknowledged. The examination of widely cited articles also shows that, especially in industries where automation and digitization are driving change, AI is not just supporting new venture development tactics but also improving conventional entrepreneurship models.

6.1 Theoretical Implications

The results of this bibliometric analysis add valuable insights to the ongoing debate about AI and entrepreneurship by mapping out the field's theoretical evolution. Over the last ten years, the surge in research publications reflects a growing acknowledgment of AI's transformative potential in shaping entrepreneurial practices. This trend mirrors the broader technological shift where AI-driven tools-like decision-making systems, automation, and predictive analytics-have become essential for innovating business models (Nambisan *et al.*, 2017).

From a theoretical perspective, our study reveals how different research areas-such as technological entrepreneurship, digital transformation, and innovation management-are coming together. The prominence of topics like "decision-making," "machine learning," and "business model innovation" indicates that AI is no longer seen just as a technical tool but as a core driver of entrepreneurial strategy. This aligns with Schumpeter's ideas about innovation fueling economic growth, where AI acts as a force for "creative destruction," opening new business possibilities while disrupting traditional industries (Diamond Jr, 2006).

Geographically, the analysis shows an interesting trend: while research hubs in the US, China, and Europe continue to lead in AI-driven entrepreneurship studies, the impact of research conducted by emerging economies is growing. In this scenario, future research should investigate how factors like institutional frameworks, cultural contexts, and regulatory environments shape the adoption of AI in entrepreneurial ecosystems across the globe.

6.2 Managerial and Entrepreneurial Implications

This research emphasizes how crucial it is for managers to include AI in entrepreneurial decision-making. The results show that AI plays an important role in developing strategies. In today's digital-first world, entrepreneurs and managers need to improve their capacity to apply AI to get a competitive advantage. The study also reveals the importance of global collaboration in AI and entrepreneurship research. To stay up to date with the latest technological advances, entrepreneurs and managers should engage in global networks, industry associations, and innovation hubs. Additionally, the findings indicate an increasing focus on preparing the next generation of entrepreneurs for an AI-driven world. The frequent mention of terms like "students" and "engineering education" in research highlights the need for educational programs to focus on AI literacy. Future managers should be prepared with the technical and analytical skills required for successfully applying AI through implementing AI training into the curricula of business schools and management courses.

6.3 Policy and Societal Implications

The findings also offer valuable insights for policymakers aiming to foster AI-driven entrepreneurship. Investments in digital literacy initiatives, AI infrastructure, and supporting regulatory frameworks should be given priority by governments. Based on the geographical concentration of research output, countries with large AI research ecosystems are better positioned to foster AI-driven business innovation. Policymakers in emerging economies should focus on creating synergic environments for AI-driven firms by providing access to funding, data resources, and AI expertise. Moreover, the bibliometric trends indicate an increasing focus on sustainability, with AI being examined as a tool for promoting responsible and impact-driven entrepreneurship. Policymakers should leverage AI to support social enterprises, sustainable business models, and inclusive innovation, ensuring that AI benefits extend beyond profit maximization to address broader societal challenges.

7. Insights from Bibliometric Analysis and Future Research Directions

Research on AI-driven entrepreneurship is expanding quickly, which presents both exciting new possibilities and issues that require further study. Building on the current state of art, future research should create empirically supported frameworks that reflect the nuanced link between AI and entrepreneurship. Future research directions could include:

1. *AI and Entrepreneurial Decision-Making*: So far, research has focused on AI's capacity to analyze large datasets and provide insights. However, experimental and long-term studies could shed light on how AI tools influence decision-making processes and biases in entrepreneurial settings.
2. *AI-Driven Business Model Innovation*: Research still don't entirely understand how AI-driven ventures create and capture value. Future research could explore how AI-driven automation interact with revenue generation, especially in industries at different stages of AI adoption.
3. *Ethical and Societal Implications*: As AI becomes more embedded in entrepreneurship, ethical concerns are becoming more pressing. Researchers should investigate how regulatory frameworks and governance strategies can help firms use AI responsibly while minimizing risks.
4. *AI in Entrepreneurial Finance*: AI's role in financial decision-making is still an emerging topic. Future studies could examine how AI-driven predictive models can change investment trends, access to funding, and financial inclusion for firms.
5. *Cross-Country and Sectoral Comparisons*: Comparative studies could explore how institutional, economic, and cultural factors shape the use of AI in entrepreneurial ecosystems worldwide.
6. *AI for Sustainable Entrepreneurship*: AI is increasingly being used to support sustainable business practices. Future research could investigate how AI enables circular economy models, reduces carbon footprints, and helps scale socially responsible ventures.
7. *AI and Entrepreneurial Networks*: AI is playing a bigger role in building entrepreneurial ecosystems by fostering collaboration and spreading knowledge. The effects of AI-driven networking platforms on industrial clusters and growth paths should be investigated in future research.

Researchers should employ a variety of techniques, including experiments, qualitative case studies, and large-scale data analysis, to get deeper insights and advance the field. Additionally, open-access data and AI-driven research tools can improve transparency and make it easier to replicate studies.

Research in this field must remain flexible as AI continues to advance. By addressing these gaps, scholars can deepen the understanding of the role of AI in entrepreneurship, smoothing the path for both theoretical advances and real-world implementations.

8. Conclusion

This paper has presented a detailed review of the intricate relationship between AI and entrepreneurship, highlighting key contributions and the evolution of theoretical perspectives in the field. The research indicates that AI has transitioned from a mere tool to a transformative force within entrepreneurial ecosystems. AI is significantly impacting how entrepreneurs identify opportunities, innovate business models, make financial decisions, develop their businesses, and collaborate within entrepreneurial ecosystems. The review's key findings highlight several transformative aspects of AI in entrepreneurship. Primarily, AI-driven tools are revolutionizing strategic decision-making by changing how entrepreneurs assess risks, analyze markets, segment customers, and forecast demand, which ultimately leads to more informed strategic decisions. Furthermore, AI's impact is evident both cognitively and operationally; cognitively, it enhances business decision-making through the processing of vast datasets and the provision of targeted insights. Operationally, AI optimizes resource allocation, enhances customer interaction, and streamlines supply chains, marking a significant shift in how businesses function. Another critical area is AI-driven business models and financing, where AI enables new business models and transforms access to financing by refining algorithms for investor-business matching and improving crowdfunding success rates. The integration of AI into business ecosystems also raises significant ethical and societal implications, particularly concerning algorithmic bias, privacy, transparency, and the potential impact on labor markets. Finally, AI plays a crucial role in facilitating connections within entrepreneurial ecosystems, benefiting the broader community by linking stakeholders such as investors, startups, incubators, accelerators, and legislators.

Despite the notable progress and the increasing number of publications demonstrating the growing interest in AI's role in entrepreneurship, several gaps remain. Future research should concentrate on several key areas to deepen the understanding of the intersection between AI and entrepreneurship. Firstly, it is essential to focus on empirical validation of current findings by supporting discoveries with concrete data to evaluate AI's impact across various industries. This approach will allow confirmation of the effectiveness of AI applications and identification of the areas in which AI offers the greatest benefits. Secondly, it is crucial to address the ethical concerns raised by the integration of AI in entrepreneurial ecosystems. This includes the development of strategies and regulatory frameworks that promote inclusive and sustainable business environments while minimizing the risks associated with AI utilization. Research should examine how firms can use AI responsibly, ensuring fairness, transparency, and data protection. Thirdly, it is necessary to encourage interdisciplinary approaches to deepen the understanding of AI's implications for entrepreneurship. Studies that integrate different disciplines, such as economics, ethics, computer science, and business management, can provide a more comprehensive view of the challenges and opportunities presented by AI. This holistic approach can lead to new perspectives and innovative solutions. Finally, future research should focus on developing empirically supported theoretical frameworks that reflect the nuanced link between AI and entrepreneurship. These frameworks should provide a solid foundation for understanding how AI transforms decision-making processes, business models, and interactions within entrepreneurial ecosystems. The creation of such frameworks can help entrepreneurs, researchers, and policymakers navigate the evolving landscape of AI and fully exploit its potential.

As AI technology continues to advance, its impact on entrepreneurship will accordingly increase, presenting both opportunities and challenges for managers. By responsibly adopting AI, managers, researchers, and policymakers can catalyze innovation, enhance competitiveness, and foster economic resilience.

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Oh my, AI! How to foster Artificial Intelligence maturity for third-party logistics service providers?

LORENZO PRATAVIERA[1] IVAN RUSSO[2]

Abstract

Frame of the research. *Artificial Intelligence (AI) is increasingly considered a transformative force within the logistics industry, including third-party logistics service providers (3PLs). However, the academic literature reveals a limited understanding of how 3PLs can develop their AI maturity to capture the emerging opportunities.*

Purpose of the paper. *The study aims to explore AI adoption within the 3PL industry by leveraging the dynamic capabilities theory.*

Methodology. *We collected empirical insights from a single case study that included ten qualitative interviews and two on-site visits at a leading British 3PL. Through abductive reasoning, we iteratively compared empirics with the available theoretical knowledge to understand how 3PLs can sense and seize AI opportunities, as well as reconfigure their processes when transformation occurs.*

Results. *Sensing AI opportunities critically depends on developing robust AI awareness but also openly involving customers to embed their perspective, while seizing concerns improving labour forecasting/scheduling and automatising back-office activities. Nevertheless, companies need to reconfigure their resources through fostering a cultural shift and developing a robust data infrastructure to support AI efforts. Building on these findings, a maturity model is developed to assess 3PLs' dynamic capabilities in their AI journey.*

Research limitations. *The reliance on a single case study design inherently limits external validity, restricting the applicability of the study's findings to a wider population of logistics and supply chain contexts.*

Managerial implications. *The study focuses on 3PLs to expose how they can navigate the complexities of AI adoption and develop their AI maturity, offering rich empirics about exploring the synergies between human workforce, technological tools, and physical assets.*

Originality of the paper. *Existing research has limitedly explored how 3PLs can approach AI adoption. The study elaborates and contextualises the dynamic capabilities theory with respect to AI-driven opportunities for 3PLs.*

Keywords: *3PL; Artificial Intelligence; AI; Dynamic capabilities*

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1. Introduction

Over the last decades, the increasing focus on core competences led many companies to outsource their logistics operations to third-party logistics service providers (3PLs), leveraging 3PLs' expertise to handle transport management, warehousing, and distribution on their behalf (Cozzolino, 2009; Sink and Langley, 1997). Nowadays, the logistics industry is on the brink of a revolutionary transformation driven by advancements in Artificial Intelligence (AI) technologies (Richey *et al.*, 2023). AI is a branch of computer science that attempts to understand the essence of intelligence and produce a new machine that mimics human intelligence (Bettiol *et al.*, 2021; Jackson *et al.*, 2024). AI is increasingly considered a transformative force within the logistics industry (Helo and Hao, 2022), showing great potential to ease repetitive tasks with minimal human inputs but also analyse raw data to identify solutions to problems which require significant human input/intervention (Durach and Gutierrez, 2024; Pournader *et al.*, 2021).

Although AI has emerged as a top technological priority for organisations in the last few years, with promising supply chain use cases (Guida *et al.*, 2023; Hendriksen, 2023), the available literature limitedly analysed the implications for 3PLs. AI tools can offer 3PLs the means to improve decision-making, optimise operations, and adapt to increasingly complex and volatile supply chain environments (Richey *et al.*, 2023; Pournader *et al.*, 2021). However, many 3PLs struggle with clearly understanding the opportunities that AI tools may be able to offer. Although they risk becoming obsolete or losing competitive advantage if they fail to adopt AI, 3PLs have not developed yet the necessary competencies to reconfigure their operational processes in response to AI innovations, displaying limited AI maturity (Kmiecik, 2023, Jackson *et al.*, 2024). Building on dynamic capabilities theory, which emphasises the importance of an organisation's ability to adapt to changing environments by integrating and reconfiguring resources (Teece *et al.*, 1997), this study aims to address the following research question:

How can 3PLs sense and seize AI opportunities and reconfigure their resources to capture such opportunities across supply chains?

Building on abductive reasoning, we developed a single case study in collaboration with a leading British 3PL provider which leveraged empirical insights collected through ten qualitative interviews with managerial-level stakeholders from different departments and two on-site visits. Findings highlight that sensing critically depends on AI awareness and understanding as well as customers' involvement, while seizing mainly relates to leveraging AI to improve labour forecasting/scheduling and automatising back-office activities. Nevertheless, companies also need to reconfigure their resources through fostering a cultural shift and developing a robust data infrastructure to support AI efforts. Building on these findings, a maturity model is developed to assess 3PLs' dynamic capabilities towards their AI journey. The study contributes to contextualising dynamic capabilities theory with respect to AI-driven opportunities for 3PLs, illustrating how 3PLs can systematically develop the AI-related dynamic capabilities needed to innovate, digitize, and respond to the complexities of modern supply chains. By specifically considering the perspective of 3PLs, it elucidates how this type of organisations can sense and seize AI-driven opportunities as well as reconfigure resources to navigate the complexities of AI adoption and develop their AI maturity.

The remainder of the paper is organised as follows. Section 2 offers an overview of the related academic literature, followed by Section 3 detailing our methodological approach. The study's findings are described in Section 4, before discussing their implications in Section 5 and summarising the contribution to knowledge and managerial practice in the concluding remarks.

2. Related literature

2.1 From transport and warehousing to Artificial Intelligence: the evolution of 3PLs

Logistics services are essential in the smooth flow of materials, information, and money within supply chains (Lieb *et al.*, 1993; Cozzolino, 2009). By ensuring an efficient flow of goods and services from point to point, businesses can meet customer demand and create a competitive advantage (Marchet *et al.*, 2017). However, conducting logistics operations efficiently and effectively can be expensive, further diverting businesses' focus from their core competences and the primary ways they create their competitive advantage (Selviaridis and Norrman, 2015). Therefore, companies increasingly outsource logistics operations to third-party logistics service providers (3PLs), i.e., companies executing logistics operations and adding more value to a shipper's business than the shipper can achieve alone (Marchet *et al.*, 2017). At first, logistics outsourcing was mainly motivated by the need to reduce cost and lead time and avoid heavy investment (Razzaque and Sheng, 1998). It started with services such as transport and warehousing (Sink and Langley, 1997) then evolved into integrating logistics into their client systems and providing tailored solutions to meet specific requirements (Selviaridis and Norrman, 2015). Today, many firms are outsourcing logistics activities to reduce overheads and supply chain complexity and increase capacity while retaining the benefits of operational efficiency, flexibility and increase in customer satisfaction (Prataviera *et al.*, 2021).

Although 3PLs emerged as essential players to streamline supply chain operations, the rising digitalisation has significantly impacted 3PLs' business and disclosed high potential to add further value to client services (Mathauer and Hofmann, 2019). Digitalisation refers to the process by which companies collect, store, analyse, and use customer and market data to capture value through digital technologies (Zhou *et al.*, 2023). As we venture deeper into the digital age, the emergence of large language models like ChatGPT suggests we are on the brink of a significant technological upheaval driven by AI, which can potentially revolutionise logistics and supply chain management (Richey *et al.*, 2023). AI refers to the ability of a machine to reason, solve problems, and adapt to the environment, like how a human being could do (Bettiol, 2021; Chen and Chen, 2022). It represents the ability of a machine (or computer system) to simulate and perform tasks that would typically require human intelligence, such as logical reasoning, learning, and problem-solving (Iansiti and Lakhani, 2020; Patrizi *et al.*, 2021). In the supply chain context, AI tools can process vast amounts of data generated across supply chains to provide actionable insights, helping managers make informed decisions regarding procurement, manufacturing, and distribution (Hendriksen, 2023).

2.2 AI tools: Predictive Analytics, Generative AI, and AI-driven Automation

AI tools can be classified into different types based on their cognitive ability, i.e., their capacity to learn, understand, and make decisions based on data and experiences. This classification discloses three overarching types of AI tools: predictive analytics, generative AI, and AI-driven automation.

Predictive analytics tools contribute to the prediction of future activities (Mediavilla *et al.*, 2022). AI predictive analytics models enable more accurate demand forecasting, optimising inventory and reducing stock out alongside providing predictive maintenance of equipment helping reduce downtime (Woschank *et al.*, 2020). They often rely on machine learning algorithms to analyse historical data and trends to predict future demand, helping companies better prepare for demand and supply fluctuations (Richey *et al.*, 2023). Such algorithms can help optimise transport routes and schedules, reduce fuel consumption, and improve delivery times (Jackson *et al.*, 2024).

Generative AI tools enable new content generation with limited predictive capabilities, focusing on generating original contents rather than acting on existing data (Hendriksen, 2023). For example, natural language processing models can handle customer inquiries and resolve issues autonomously through the implementation of chatbots powered by generative AI (Durach and Gutierrez, 2024). Chatbots can enhance operational efficiency by automating routine tasks, providing real-time updates

and assisting in decision-making processes (Pfaff, 2023). Generative AI opportunities also relate to conversational interface and knowledge discovery, supporting organisational and administrative tasks (Durth *et al.*, 2023).

Lastly, AI-driven Automation involves using AI to support the automation of various logistics processes (Richey *et al.*, 2023). Logistics automation usually entails adopting physical robots like Automated Guided Vehicles (AGVs) and Autonomous Mobile Robots (AMRs) (Benzidia *et al.*, 2019). AGVs and AMRs are self-guided vehicles equipped with sensors and cameras, providing efficient material transport within logistics facilities. They can navigate across the warehouse, retrieve products from their locations and deliver them to picking stations, helping improve picking efficiency. AI can reinforce logistics automation and improve warehousing operations, reducing errors and increasing throughput by enhancing precision and adaptability. Given the rising shortage of qualified supply chain personnel, including transport and warehousing operations (Klumpp, 2017; Phares and Baltrop, 2022), AI could help solve labour shortages. However, the broader impact of AI on labour demand is under discussion as it might lead to job displacement (Chen *et al.*, 2020).

2.3 Dynamic Capabilities Theory and AI development in logistics

Dynamic capabilities can be defined as the firm's ability to integrate, build, and reconfigure internal competences to address changes in the business environment (Teece *et al.*, 1997). For analytical purposes, dynamic capabilities can be disaggregated into the capacity to sense and shape opportunities and threats, to seize opportunities, and to reconfigure the business enterprise's intangible and tangible assets to maintain competitiveness (Teece, 2007).

In the logistics industry, this theory is increasingly relevant to explain and predict how firms confront rapid technological advancements and evolving customer demands (Li *et al.*, 2024). AI is emerging as a driving force of digital transformation, offering 3PLs significant potential to enhance their business operations by improving decision-making and automating processes (Richey *et al.*, 2023). However, the strategic integration of AI into logistics operations requires the development of specific capabilities and competences (Jackson *et al.*, 2024). Sensing in the AI context involves identifying how AI tools can unlock new opportunities, while seizing requires embedding these technologies into business operations. Reconfiguring, then, involves restructuring internal processes and systems to fully leverage AI's potential.

Previous scholars argue that companies can start from identifying potential business use cases or opportunities that AI might improve (Hendriksen, 2023, Herremans, 2021), then focus on the planning stage, highlighting critical steps like accessing available data sources and identifying their use within the company (Wagner, 2020). However, implementing AI not only concerns using the right technology, but equally considering the people working alongside it (Richey *et al.*, 2023). The continuous advancement in computing power and data availability facilitated the maturation of AI, allowing for efficient and robust human-AI collaboration (Jackson *et al.*, 2024). Human-AI collaboration is contingent on several critical factors, including the flexible integration of AI into workflows, the support of human sensemaking, and the maintenance of human control over AI systems (Hendriksen, 2023). Organisations must equip their workforce with the necessary skills to leverage AI tools effectively, though such an undertaking is not a one-time training but requires a cultural shift towards continuous learning and upskilling (Jaiswal *et al.*, 2022; Shrestha *et al.*, 2019). Overall, companies need to understand the implications of AI integration in operational settings along with the importance of data management and organisational culture to drive AI maturity (Dhamija and Bag, 2020). In this context, previous scholars formalised AI maturity as the level of development and sophistication in an organisation's utilisation of AI tools and capabilities (Chen *et al.*, 2021). Companies usually utilise maturity models to appreciate the capabilities of technologies and improve their ability to apply those technologies, often considering dimensions like culture/mindset, data maturity, ethics, organisation and processes, and technological development (Comuzzi and Patel, 2016; Sonntag *et al.*, 2024).

3. Methodology

3.1 Research design

This study aims to explore how 3PLs can build their AI maturity and AI opportunities' full potential. The dynamic capabilities theory is leveraged as it examines the foundation of enterprise-level competitive advantage in regimes of rapid (technological) change (Teece, 2007). As 3PLs experience a tumultuous development of the AI types around them, their ability to sense, seize, and reconfigure their internal processes becomes crucial to harness AI. Given the study's exploratory nature and the need to capture in-depth insights, a qualitative case study approach is employed to cope with contemporary practices and challenges (Ketokivi and Choi, 2014). As unit of analysis, we considered AI-related capabilities supporting AI adoption within 3PLs.

A single-case study research design was adopted because it was suitable to support exploratory research focused on better understanding nascent phenomena, focusing on a specific setting to gather rich and detailed data leading to generating deep insights into the investigated phenomenon (Voss *et al.*, 2002). Although a single-case approach can reduce transferability, it allowed to investigate an unexplored phenomenon (Flyvbjerg, 2006), as demonstrated by the scarcity of empirical studies that delve into the real-world implementation of AI by supply chain managers and enterprises (Moretto *et al.*, 2024). A leading British 3PL provider was considered being a rare example of organisation concretely involved in developing and implementing AI solutions, as shown by the creation of structured open innovation programme including an Innovation Centre to trial AI solutions (e.g., transport route optimisation and warehouse automation software). The case offered unique potential to explore the adoption of AI within 3PLs' logistics processes, allowing for examining the current business landscape and understanding how to create opportunities for customer value enhancement. Despite its initial commitment to AI, the company is still at the beginning of its AI journey, disclosing additional opportunities to explore the potential for future development of AI-related capabilities. Accordingly, the single case study offered the opportunity to collect rich insights into topical real-life challenges (Flyvbjerg, 2006), allowing for exploring unique elements about AI adoption by 3PLs.

The research approach is based on abductive reasoning (Kovacs and Spens, 2005). Abductive reasoning focuses on the search for suitable theories for an empirical observation through "theory matching" or "systematic combining" (Dubois and Gadde, 2002). By leveraging abductive reasoning, this research bridged empirical findings with previous knowledge and the dynamic capabilities theory. The abductive research process started with reviewing the available academic knowledge to develop a broader view of AI strategic opportunities and adoption within the 3PL industry (Kovács and Spens, 2005). Supply chain magazines and other secondary sources were also analysed to contextualise the academic insights within the practitioners' perspective, strengthening the study's practical relevance. Next, in-depth empirical insights were collected, analysed, and systematically combined with the existing literature and specifically against the dynamic capabilities' theory.

3.2 Data collection

Data was collected through semi-structured interviews with ten senior management stakeholders and two on-site visits at one of the company's primary distribution centres. Semi-structured interviews were conducted between April 2024 and June 2024 (either in person or online through Microsoft Teams), while on-site visits took place in May and July 2024. Each interviews lasted 45 to 60 minutes. Interviewees were provided with consent forms before the interview and were ensured that their information would be confidential and anonymous (Voss *et al.*, 2002). Each participant was asked to sign the consent form, and the forms were stored in a secure location. All the interviews were recorded and transcribed verbatim to ensure accuracy, and backup files of each transcript were maintained to safeguard against accidental deletions within the main files. Transcripts were condensed and returned to our interviewees for fact-checking and accuracy verification. All the

interviewees offered consistent availability to answer questions or provide further contextual elements needed for our analysis. Primary data collected through semi-structured interviews were then triangulated with academic literature and grey literature in the form of reports from Gartner and other global firms, which provided additional insights into the current state of AI applications in logistics and supply chain management. In addition to interviews, the research includes observations from two visits of the Innovation Centre and the primary distribution centre. These visits provided contextual understanding and first-hand insights into the company's technological landscape and operational processes. Notes from the visit were either taken down manually or recorded and later transcribed to capture details of the various stimuli; some photographs were taken of in-development technologies to document the near future of technological advancement. Lastly, the study's findings and implications were also returned to our interviewees for fact-checking and accuracy verification.

3.3 Data analysis

Data analysis included familiarising and preparing the data, generating initial codes, searching for themes and reviewing/defining themes (Braun and Clarke, 2006). Coding procedures followed the approach suggested by Gioia *et al.* (2013) to move from 1st order concepts (centred on the informants' perspectives) to 2nd order themes and then aggregate dimensions, which provide a comprehensive and cohesive narrative. To familiarise and clean the data collected from the semi-structured interviews and site visits, each transcript was read thoroughly, followed by familiarisation of the data to take notes and jot down early impressions from each interview (Voss *et al.*, 2002). Data analysis was characterised by a structured progression from empirically driven codes (1st order concepts) to more conceptual categories (2nd order themes). 2nd order themes were then further abstracted to overarching themes (aggregate dimensions) explicitly linked to the extant theory and its core capabilities (sensing, seizing, reconfiguring), enabling an iterative process where empirics and theory inform each other (Kovács and Spens, 2005).

In more detail, the process began by examining the interview transcripts to identify key phrases, codes, and ideas related to AI adoption and the emerging opportunities. Consistently with the adopted abductive reasoning, 1st order codes were first inductively determined by leveraging interviewees' perceptions and insights. Based on the semi-structured interviews and on-site tour, this initial set of codes was developed from interview quotes. 1st order concepts which reflected the interviewee's experiences and perspectives were then compared for pattern matching and grouped into broader 2nd order themes. The level of detail within the transcripts helped organise data into more conceptual categories. For example, various observations about AI initiatives from the Innovation Centre tour and interviews were grouped into the 2nd order theme of "Different AI Types." 2nd order themes were further consolidated into overarching aggregate dimensions to capture the essence of the company's AI dynamic capabilities. For example, "3PL Dynamics" emerged as an important 2nd order theme, reflecting the 3PLs' specific business environment and the importance to liaise effectively with customers. Careful consideration was given regarding which aggregate dimension could best fit the 2nd order theme, and "Sensing" was determined because it most accurately reflects how customers influence AI decisions as customer dynamics have a sizeable influence on identifying new business opportunities for 3PLs. Overall, three aggregate dimensions were formalised in accordance with the established literature about dynamic capabilities (e.g., Teece *et al.*, 1997) for theory matching (Dubois and Gadde, 2002).

4. Findings

4.1 Sensing

The importance of AI innovation is driven by the huge commitment at the Executive Board level, as noted by the Product Director - Technology: "*AI is a buzzword, our board's talking about it, our executive board is talking about*". With this commitment at the executive level, the company set out to understand and explore AI potential by creating an Innovation team which led discussions for AI awareness and understanding by focusing on defining what AI capabilities meant to the 3PL business. The company created an Innovation Centre to host events where presenting business use cases, also inviting startups to propose their solutions. In 2023, the Innovation Centre explored services from AI startups related to five clear use cases, namely, labour forecasting, labour scheduling, last-mile delivery vehicle selection, network optimisation, and upstream supply chain planning. As explained by the Head of Innovation: "*there were big use cases, and we invited around ten big and small companies to pitch. This was for us to explore and not invest money into something built from scratch*." Therefore, the company was able to embark on the learning phase regarding AI. Moreover, the company encourages home-grown talent through its AI solution enabler program. This internal initiative asks employees to showcase their innovative ideas, from home-built robotics hardware to AI-solution software, to help solve selected use cases.

However, interviews also revealed the critical importance of the business dynamics between 3PLs and their customers. The company owns only about 40% of its entire truck fleet and an even smaller percentage of its distribution warehouses, heavily relying on their customers' behaviour. Interviews revealed how deeply customers are integrated into the company's business, including their influence on AI adoption, and multiple stakeholders highlighted that customer interest is a critical driver in AI exploration. However, there is a gap between customer expectations and their understanding of AI applications. As reported by the Chief Innovation Officer "*our customers want us to use AI but don't know what they want us to do with it*." Therefore, major customers talk with senior executives to inform about the latest AI tools they may be implementing. This also involves customers having a say in the Innovation Centre selection criteria to test specific technologies.

4.2 Seizing

Any technological innovation, including AI developments, needs alignment with the broader business strategy. This leads first to use cases identification. Based on the use cases identified, business cases are developed as initiatives require a strong return on investment (ROI). Concerning predictive analytics, the company created business use cases to justify investment into AI initiatives or tools that may alleviate business challenges and improve predictive capabilities. For example, a top business challenge in the 3PL business is labour shortage. Accordingly, one of the most pressing opportunities concern labour scheduling, which are crucial for workforce optimisation to better cater to customer needs and address shift inefficiencies. Delivery and inventory management are also crucial to enhance delivery and stock accuracy. The company is currently analysing how machine learning algorithms could feed their daily delivery schedule and optimise delivery routes, saving fuel and ensuring on-time deliveries for both primary distribution and last-mile delivery.

Regarding Generative AI, the company recently arranged licenses for 30 Microsoft Copilot users to test its use across different departments. It assists workers in generating text, suggesting edits, analysing/searching for data and documents, creating presentations, and managing emails. Findings showed a wide range of cases, as specific departments have massively benefited from Copilot while others are unaware or haven't found personal use. This reflects the company's approach towards "finding the right hands" for the limited number of licenses they have. Beyond Copilot, the company is testing a chatbot assistant that helps generate meeting ideas, including strategies, standard operating procedures, and creative content. Moreover, the company is exploring Generative AI tools for

recruitment purposes, as their algorithms handle skill assessments, providing candidates with real-time warehouse scenarios to assess their readiness for the job. Furthermore, the company considered AI-enabled contract review tool for the procurement team. However, its limited scope and high licensing cost didn't justify the company-wide investment.

Lastly, the company has invested heavily in robotics for automation. While older distribution centres use non-AI robotics, newer facilities employ advanced AMRs for efficient, adaptable routing with minimal human intervention. To this extent, the Head of Robotics Solutions explained, "*we currently have more QR-based AMRs, but we're exploring collaborative mobile robots for greater flexibility and impact without zonal restrictions*." AMRs can map the area autonomously or be guided by a handler using RFID-based wearable. Then, AI software optimises the robot's route through machine learning algorithms to reach the pickers efficiently. However, investment in proprietary AI software to strengthen robotics is highly critical as AI offers significant opportunities for better optimisation and synchronisation. Nevertheless, AI-driven automation does not limit its potential to physical operations but extends it to back-office activities. The company already leverages AI to improve and quality for activities like work allocation to employees or subcontractors, payment processing, and invoice matching.

4.3 Reconfiguring

Developing AI capabilities and integrating them with the 3PL business comes with its own set of challenges. One primary concern is integration, mainly due to multiple contracts and different legacy systems. Backed by the commitment at the executive level, an open and inclusive culture towards AI is highly encouraged from training afterwards. One key aspect is the eagerness to change, supported by the Leadership buy-in. As emphasised by the Operational Excellence Director, "*there's real fear around technology. But motivation and investment from the higher up have encouraged positive direction to overcome this fear*." Skill development and continued learning are crucial aspects of the company's cultural approach, along with cross-functional exposure and the creation of mutual trust across different organisational level. Moreover, due to the many ethical concerns related to AI adoption, an Assurance Quality Service Cost and Innovation (AQSCI) checklist was developed to be used both internally and when assessing external AI suppliers. These ethical considerations are critical to ensure that vendors offering AI solutions have appropriate ethical policies.

Nevertheless, data readiness is critical and high-quality centralised data is crucial for AI implementation. Interviews revealed the company's strong focus on data availability and accessibility. Many interviewees stressed the importance of data integrity, highlighting the importance of a consistent and robust data infrastructure. Without it, AI (as well as other technologies) would have limited impact. Currently, the urgency of centralising data to foster AI is highly felt across the organisation, and efforts towards data centralisation are led by the executive level. To ensure data quality and integrity as AI adoption ramps up, the company arranges weekly data quality forum to iron out data issues. To maintain data security, data is provided to internal stakeholders and vendors purely on a role-basis. However, as data's importance for AI grows, stakeholders recognise challenges driven by decentralised operations. As acknowledged by the Strategy Manager, "*we've got lots of data across the business that sits isolated. Our best use case is convergence — combining these datasets to extract value from a holistic view*."

5. Discussion

The dynamic capabilities theory suggests that companies need to develop the ability to integrate, build, and reconfigure competences and resources to create, deploy, and protect the intangible assets that support superior long-run business performance (Teece, 2007). The theory also emphasises the importance of adapting to changing environments (Teece *et al.*, 1997). Today, AI represents an

impetuous source of transformation within the logistics industry (Durach and Gutierrez, 2024; Richey *et al.*, 2023). However, the existing literature offers limited insights into how 3PLs can understand and leverage the potential of AI across their business areas (Kmiecik, 2023; Jackson *et al.*, 2024). Our findings suggest that enhanced sensing of AI-driven opportunities is driven by increasing awareness and commitment at the executive level, which sets the strategic goals to extract the maximum value from AI initiatives through building customers' trust. The commitment to a customer-centric approach seems crucial as customers' involvement helps guide technological choices and strengthens customer relationships, potentially leading to extended contracts and allowing customers to understand solutions they may not be aware of.

Sensing AI opportunities directly influences seizing those opportunities related to different types of AI tools (i.e., predictive analytics, generative AI and AI-driven automation). Executive decisions inform the creation of a business use case, such usually driven by customers' needs like improving inefficient labour scheduling, which leads to identifying strategic opportunities for 3PLs. Our findings suggest that making a "buy" off-the-shelf procurement strategy for AI is currently more suitable than internal development, helping reduce cost and avoiding massive internal efforts to develop these solutions. After identifying strategic opportunities, 3PLs can shortlist and evaluate external suppliers offering AI tools, prioritising those suppliers who can offer proprietary software that enables effective integration with 3PLs' existing systems. Operationally, case findings illustrate the vast potential of predictive analytics to address labour shortages and enhance operational efficiency, in line with previous scholars (e.g., Richey *et al.*, 2023; Mediavilla *et al.*, 2022). Generative AI can be leveraged to enhance knowledge sharing and content creation (Durach and Gutierrez, 2024), while robotics reflects the growing importance of AI-driven automation. Beyond robotics, findings also illustrate the potential for AI to automate activities like matching numbers or data entry within back-office operations, reducing errors and improving efficiency.

However, our analysis highlights two critical areas for reconfiguration that underpin AI capabilities. First, AI impact on labour opens discussions and potentially creates huge frictions due to job displacement and job elimination (Chen *et al.*, 2020; Klumpp, 2017). Therefore, an open and inclusive culture is required to enable a cultural shift towards AI adoption. It becomes critical to engage with workers to discuss how technological adoption do not encompass work- and job-replacing consequences for humans. Instead of being a threat to people, AI becomes a contributor to enhanced job satisfaction, addressing labour shortages without reducing employment opportunities. Moreover, prioritising the completion of a centralised data infrastructure and establishing clear data governance policies are fundamental steps, as high-quality, well-managed data is critical (Zhou *et al.*, 2023).

5.1 Developing an AI Maturity Model for 3PLs

Based on the insights gathered from qualitative interviews and the literature review, an original AI maturity model for 3PLs is developed in Figure 1. The model comprises five maturity levels, beginning with Initial Explorer (L1), where 3PLs start to investigate AI opportunities without formal AI processes and with limited awareness. At this level, they sense new opportunities through scanning, learning, and interpreting activities. 3PLs can host AI pilots as they progress to Focused Piloter (L2), increasing their AI awareness while evaluating solutions offered by external AI suppliers. This corresponds to start seizing AI opportunities: once a new (technological or market) opportunity is sensed, it must be addressed through new products, processes, or services (Teece, 2018). The journey continues to Structured Implementer (L3), encompassing widespread AI awareness across various organisational departments and AI tools implementation within different business areas. At this level, reconfiguring capabilities are developed to incorporate the successful identification and calibration of technological and market opportunities, the judicious selection of technologies and product attributes, the design of business models, and the commitment of financial resources to investment opportunities. This is reflected in the case by the company's ongoing efforts

to centralise data and build a centre of excellence, which emerges as critical for future AI success. Advanced Integrator (L4) follows, marked by AI being deeply integrated into multiple business areas, deployment across various applications, and the emergence of an AI-driven culture with solid vendor relationships. This level corresponds to mature sensing and seizing capabilities, while the highest level of overall maturity is a Transformed Organisation (L5), where employees lead AI-based innovation, and the 3PL becomes an AI industry with robust reconfiguring capabilities that embrace a deep cultural shift. The distinction between L4 and L5 lies in how AI reshapes the organisational culture and identity, rather than in technological advancements (Jaiswal *et al.*, 2022).

Fig. 1: AI Maturity Model for 3PLs

Level	Organisational Processes	Culture and Competence	Data Maturity	Technological Adoption	Dynamic Capabilities Maturity
Initial Explorer (L1)	No formal AI processes, mostly exploratory scoping through programs	Limited AI awareness, primarily at the managerial level	Unstructured data across multiple systems or business units	Limited AI technology deployment such as in robotics and automation	Sensing ●○○ Seizing ○○○ Reconfiguring ○○○
Focused Piloter (L2)	Pilot projects underway through programs, evaluation of vendor performance	Increased AI awareness of applications; some departments using AI tools (e.g., Copilot)	Ongoing data centralisation efforts and investments in data quality checks	Implementation of off-the-shelf AI solutions and investment in robotics	Sensing ●○○ Seizing ●○○ Reconfiguring ○○○
Structured Implementer (L3)	Focus on procuring through established procurement norms and scalability of AI vendors	Widespread AI awareness, regular cross-functional exposure to AI initiatives	Standardised data model, defined norms for data quality checks and ownership	Facilitation of AI systems across multiple business functions; widespread use of generative AI	Sensing ●●○ Seizing ●○○ Reconfiguring ●○○
Advanced Integrator (L4)	Strong vendor relationships, built through trust in technology	Continuous AI learning programs for employees	Fully centralised data infrastructure (e.g., data centres) allowing advanced analytics	Widespread deployment of AI solutions across predictive, generative and automation applications	Sensing ●●● Seizing ●●○ Reconfiguring ●●○
Transformed Organisation (L5)	Fully integrated information for sharing AI processes between 3PLs, allowing for continuous optimisation	AI-driven culture, employees driving AI-based innovation or AI-first mindset	Real-time data-driven decision-making, allowing for industry-leading AI initiatives	Industry leaders in introducing built-from-scratch AI technologies, including advanced robotics and cognitive technologies	Sensing ●●● Seizing ●●● Reconfiguring ●●●

Source: our elaboration

6. Theoretical and managerial implications

3PLs find themselves amid an industry-wide digital transformation led by the adoption of AI tools, which can help improve process efficiency and extract valuable insights from data, adding tremendous value for their customers. This study leveraged the dynamic capabilities theory to explore how 3PLs can develop the sensing, seizing, and reconfiguring capabilities needed to innovate and respond to the complexities of modern supply chains. A single case study conducted within a leading British 3PL offered rich insights into how leveraging AI potential is a crucial capability for 3PLs, and an original maturity model is proposed to assess 3PLs' dynamic capabilities.

From an academic viewpoint, the study contextualises the dynamic capabilities theory within AI-driven opportunities for 3PLs. It emphasises the crucial influence of customer dynamics wherein any technological initiative for 3PLs, including AI tools, is heavily shaped by customers' expectations and involvement. The study provides original insights into adopting AI tools, offering a pathway to sense and seize AI-driven capabilities and reconfigure resources to address technological changes.

For managers, the study exposes how 3PLs can navigate the complexities of AI adoption and develop their AI maturity. The AI maturity model can guide organisations by identifying maturity levels and areas for improvement, offering rich empirics about exploring the synergies among human

workforce, technological tools, and physical assets. Findings suggest that 3PLs should cultivate strategic partnerships with AI vendors to maximise learning opportunities and increase effectiveness in operations, with particular interest towards labour forecasting and scheduling. Given the typical fragmented business structure of customer contracts within the 3PL industry, fostering an AI-positive culture from the top down is crucial, with leadership championing this change and encouraging implementation and trial across all levels. Similarly, prioritising the completion of a centralised data infrastructure and establishing clear data governance policies are fundamental steps for successful AI adoption.

7. Research limitations and future research directions

The reliance on a single case study design inherently limits external validity, restricting the applicability of the study's findings to a wider population of logistics and supply chain contexts. However, our analytical approach followed rigorous procedures to strengthen internal and construct validity, including the selection of respondents based on their potential to provide details about the investigated unit of analysis and returning all collected data to respondents for fact-checking and accuracy verification. Future work could investigate other contexts (e.g., involving 3PLs outside the UK) and elaborate single case findings to explore the transition across different levels of the proposed maturity model. Moreover, specific findings may become outdated quickly due to the speed of technological evolution in the field. However, this limitation highlights the opportunity for future research, including a periodic readiness assessment of dynamic AI capabilities for various potential applications in logistics (Durach and Gutierrez, 2024). Lastly, the study did not consider different AI types simultaneously, while future research could investigate the synergies and novel applications arising from such combinations within the context of 3PL businesses.

Data availability statement

Due to the sensitive nature of the research, supporting data is not publicly available. However, data that support the findings of this study are available from the corresponding author upon reasonable request.

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Track 2
Entrepreneurship

L'Etica imprenditoriale: verso un approccio armonico tra strategie, innovazione e inclusione

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Abstract

Frame of the research. *L'etica imprenditoriale sta acquisendo crescente attenzione nella ricerca accademica e nel dibattito manageriale, in risposta alle sfide poste dall'economia contemporanea. L'adozione di pratiche etiche è cruciale per garantire stabilità sociale, sviluppo economico sostenibile e fiducia degli stakeholder, in un contesto caratterizzato da incertezza e trasformazioni digitali.*

Purpose of the paper. *Il lavoro mira a esplorare lo stato dell'arte della ricerca sull'etica imprenditoriale attraverso un'analisi bibliometrica. L'obiettivo è identificare le tendenze emergenti, le principali collaborazioni accademiche e i temi più discussi, al fine di delineare un quadro sistematico dell'evoluzione del campo.*

Methodology. *Lo studio utilizza un approccio bibliometrico basato su una revisione sistematica della letteratura. L'analisi è condotta attraverso il database Web of Science, applicando specifici filtri tematici e temporali. Gli strumenti Bibliometrix e VOSviewer vengono impiegati per visualizzare le connessioni tra autori, citazioni e cluster tematici.*

Results. *L'analisi ha individuato tre principali cluster di ricerca: l'imprenditorialità sociale e i suoi dilemmi etici, il processo decisionale etico nelle imprese e il legame tra etica e inclusione. Inoltre, emerge una crescente attenzione verso il ruolo dell'inclusione in ambito finanziario, della digitalizzazione e nell'accesso equo alle risorse imprenditoriali.*

Research limitations. *I limiti dello studio riguardano l'approccio esclusivamente bibliometrico, che non permette un'analisi qualitativa approfondita e la selezione delle fonti limitata al Web of Science, escludendo altre banche dati.*

Managerial implications. *I risultati evidenziano la necessità per le aziende di integrare pratiche etiche nelle strategie di business per migliorare la reputazione, attrarre talenti e rafforzare la competitività. In particolare, l'etica può fungere da leva per favorire l'innovazione, la sostenibilità e l'inclusione nelle decisioni aziendali.*

Originality of the paper. *Il lavoro contribuisce alla letteratura offrendo un'analisi sistematica dell'evoluzione dell'etica imprenditoriale proponendo un modello armonico di etica imprenditoriale e individuando nuove direzioni di ricerca e fornendo spunti per future indagini interdisciplinari.*

Keywords: *Ethics; Entrepreneurship; Systematic Literature Review; Business Ethics; Bibliometric analysis.*

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1. Introduzione

Negli ultimi anni l'etica dell'imprenditorialità sta acquisendo una notevole rilevanza accademica e pratica, per via di una sensibilità che va maturando a livello sociale e scientifico (Vallaster *et al.*, 2019; Cordasco, 2024; Uriarte *et al.*, 2025). Pezzani (2013), già un decennio fa indicava come necessario ed urgente un ritorno ad una economia reale, ad una finanza governata da processi di trasparenza e di eticità, dunque bisognosa di essere sgonfiata e rallentata, per essere "asservita" ad un nuovo modo di fare impresa. Si comprenderà bene che pur in un contesto di crisi perdurante, oggi indicato con un apposito neologismo *permacrisis* (Brown *et al.*, 2023), il bisogno di eticità si staglia all'orizzonte non solo come garanzia di credibilità per l'impresa, l'economia, l'innovazione più in generale, ma anche come necessità di stabilità sociale, di promozione della dignità della persona, di autentico sviluppo economico e tecnologico (Michelini & Fiorentino, 2012). La società moderna, inoltre, pretende che le aziende implementino pratiche etiche e trasparenti soprattutto con riferimento alla loro governance, all'impatto che le loro azioni hanno sull'ambiente e ai diritti umani dei loro lavoratori. Di conseguenza, le aziende che non mettono in pratica comportamenti etici rischiano di perdere la fiducia degli stakeholder e dei consumatori e di diventare meno competitive sul mercato (Carroll, 2015). Ciò si riflette anche nell'attrazione e nella ritenzione dei talenti: le nuove generazioni di lavoratori sono più propense a lavorare in aziende che sposano i principi etici (Osibanjo *et al.*, 2015). Inoltre, mettere in pratica un comportamento etico riduce il rischio di generare danni alla reputazione dell'impresa che possono avere conseguenze economiche devastanti (Dembek *et al.*, 2016).

Partendo da tali riflessioni, il lavoro di ricerca è strutturato nel seguente modo: inizialmente propone l'analisi bibliometrica come uno strumento in grado fornire un'analisi quantitativa delle principali pubblicazioni scientifiche sul tema di ricerca e si percorrono le quattro fasi in cui è articolata. Successivamente vengono riportati i principali risultati descrittivi emersi dall'analisi. Quindi vengono affrontate le reti di collaborazione tra gli autori più influenti. Seguono l'analisi delle citazioni e l'analisi dell'accoppiamento bibliografico. Per concludere, viene presentata la mappa tematica seguita dalla discussione dei risultati ottenuti.

Framework teorico

L'imprenditorialità può essere considerata il motore della crescita sociale ed economica (Acs *et al.*, 2008). La cultura imprenditoriale sta assumendo oggi un'importanza crescente, tanto che molti ricercatori hanno cercato di spiegare i fattori che influenzano il suo sviluppo (Looi, 2019; Singh *et al.*, 2022). Le conquiste storiche di quella che viene comunemente definita "società postmoderna" hanno prodotto un culto della massimizzazione del profitto e della sua ricerca spregiudicata (Cater *et al.*, 2017), dando origine a una logica utilitaristica ormai diffusa, basata su un solipsismo sterile e autocentrato (Giovanola, 2009; Xu & Ma, 2016).

Dato questo contesto, nel mondo odierno dove la tecnologia è onnipresente e la società è frammentata, le imprese hanno la responsabilità di operare eticamente (Smith, 2018). Questo significa che l'etica svolge un ruolo cruciale nella costruzione di un mondo migliore, allineato a un insieme più ampio di valori sociali (Anderson, 1995; Harris *et al.*, 2009). Secondo Islam e Greenwood (2021) "*the world of business is "a work-in-progress, and ethics has a role in building that world within a broader horizon of social values*". Pertanto, è necessario ricordare l'importanza dei valori umani, ponendo l'"essere umano" al centro delle scelte sociali ed economiche (Pirson, 2019).

Diversi studi presenti in letteratura propongono analisi teoriche o revisioni della letteratura, evidenziando possibili direzioni per future ricerche sul tema. Nonostante l'importanza della "conversazione" tra etica e imprenditorialità (Bacq & Eddleston, 2018; Dey & Lehner, 2017), sono ancora necessari contributi scientifici per comprendere a fondo la tematica e per comprendere soprattutto le prospettive e i trend futuri. Partendo dalla letteratura preesistente, il presente lavoro ha

l'obiettivo di comprendere lo stato dell'arte della ricerca sull'etica nell'imprenditorialità e identificare i trend emergenti.

2. Metodologia: Analisi sistematica della letteratura

Si affronta una revisione sistematica della letteratura con lo scopo principale di indagare lo stato dell'arte dall'etica nel contesto imprenditoriale all'interno dei principali contributi accademici in merito all'argomento (Tranfield *et al.*, 2003). L'analisi sistematica della letteratura permette di superare l'ostacolo rappresentato dall'impossibilità di ottenere una visione complessiva su una determinata materia, spesso causata dalla crescente mole e frammentazione dei flussi di ricerca (Kraus *et al.*, 2022). Il rapido aumento del numero di pubblicazioni accademiche rende complesso individuare una base consolidata di conoscenze necessaria per capire quali siano i principali contributi esistenti, individuare le tendenze nel corso del tempo, rilevare i cambiamenti nei confini disciplinari e monitorare/avviare nuovi sviluppi sul tema. Per condurre questa revisione sistematica della letteratura viene utilizzata l'analisi bibliometrica (Aria & Cuccurullo, 2017). Questo strumento consente di effettuare un'analisi quantitativa delle principali pubblicazioni scientifiche su un tema di ricerca, metodo sempre più impiegato per mappare la struttura e l'evoluzione di ambiti e discipline scientifiche (Zupic & Čater, 2015).

La bibliografia si basa sull'analisi di dati bibliografici aggregati, ossia sull'aggregazione di dati prodotti dai ricercatori operanti nel settore, i quali manifestano le proprie idee tramite citazioni, collaborazioni e pubblicazioni. Difatti, da un punto di vista più concreto, la mappatura scientifica mira a rappresentare graficamente la struttura di un campo di ricerca organizzando gli elementi principali (documenti, autori, riviste, parole chiave, ecc.) in gruppi distinti. Attraverso l'utilizzo di strumenti di visualizzazione, queste classificazioni, vengono tradotte in immagini che mostrano chiaramente le relazioni e le connessioni tra i vari elementi.

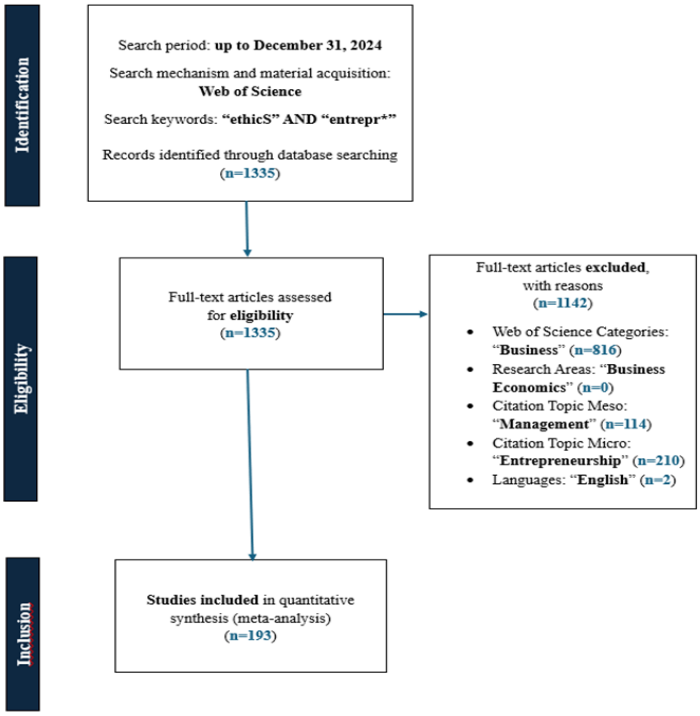
Come suggerito da Zupic e Čater (2015), un flusso di lavoro standard per la mappatura scientifica deve essere articolato in cinque fasi. La prima fase è rappresentata dalla *progettazione dello studio*; la bibliometria applicata alla mappatura scientifica consente di rispondere a tre principali tipi di domande di ricerca: (i) identificare la base di conoscenza e la struttura intellettuale di un argomento o di un campo di ricerca; (ii) analizzare il fronte di ricerca (o la struttura concettuale) di un tema o di un settore scientifico; e (iii) creare una rete sociale che rappresenti una specifica comunità scientifica (Aria & Cuccurullo, 2017). La scelta principale nella fase di progettazione dello studio riguarda l'intervallo di tempo. Alla progettazione dello studio segue la *raccolta dei dati*. In questa fase è necessario scegliere il database contenente il set di documenti rilevanti mediante l'impostazione di filtri appositamente individuati ed esportare i dati dal database scelto. In questo caso è stato utilizzato Clarivate Analytics Web of Science. La terza fase è costituita dall'*analisi dei dati*, che comprende l'analisi descrittiva e l'estrazione della rete. Come affermato da Vogel *et al.* (2012), i principali metodi bibliometrici utilizzati in questa fase sono l'*analisi di co-citazione (co-citation)* (Kessler, 1963) l'*accoppiamento bibliografico (bibliographic coupling)*(Small, 1973). La co-citation si riferisce al fenomeno per cui due documenti vengono citati insieme in altri documenti, mentre il bibliographic coupling è una misura della somiglianza tra due documenti basata sulle referenze che essi citano. All'analisi segue la fase della *visualizzazione dei dati* che permette di rappresentare graficamente le conoscenze emerse mediante rappresentazioni intuitive o mappe (Cobo *et al.*, 2011). L'ultima fase del flusso di lavoro da seguire per condurre una mappatura scientifica è costituita dall'*interpretazione*, in cui vengono descritti i risultati raggiunti. La query di ricerca che è stata formulata è la seguente "*ethics*" AND "*entrepr**".

Sono stati selezionati i documenti più rilevanti. Per inquadrare lo studio in un'ottica manageriale, sono stati impostati filtri relativi alla categoria (*Business*), all'area di ricerca (*Business Economics*), ad argomenti della citazione meso (*Management*) e micro (*Entrepreneurship*). Inoltre, sono stati selezionati soltanto i documenti realizzati in *lingua inglese*, al fine di assicurare rilievo internazionale.

Così, dai 1335 documenti iniziali, 1142 sono stati esclusi. In conclusione, la selezione ha prodotto 193 risultati, i quali sono stati pubblicati in un arco temporale che va dal 1987 al 2024.

La Fig. 1 illustra il diagramma di flusso PRISMA, ovvero una rappresentazione grafica del percorso seguito per selezionare e includere gli studi in una revisione sistematica o in una meta-analisi (Moher *et al.*, 2009). Per sviluppare l'analisi descrittiva e la visualizzazione dei dati è stato selezionato il Pacchetto R di Bibliometrix (Aria & Cuccurullo, 2017). Tuttavia, per l'analisi delle citazioni e quella dell'accoppiamento bibliografico è stato impiegato il software VOSviewer (Van Eck & Waltman, 2010).

Fig. 1: Diagramma PRISMA



Fonte: elaborazione degli autori

3. I risultati dell'analisi bibliometrica

In questa sezione vengono riportati i principali risultati emersi dall'analisi bibliometrica realizzata sui 193 articoli relativi all'etica e all'imprenditorialità e pubblicati nell'arco di tempo compreso tra il 1987 e il 2024.

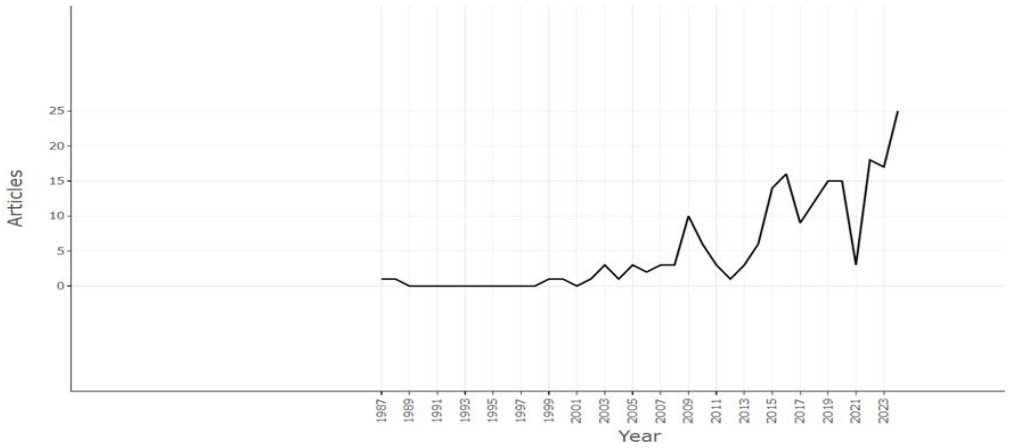
Nella prima parte vengono presentati i principali risultati descrittivi del quadro dei dati bibliografici, quali la tabella delle informazioni principali, in cui sono sintetizzate le caratteristiche rilevanti della collezione, la produzione scientifica annuale, gli articoli più rilevanti in materia di etica ed imprenditorialità, i principali Journal su cui sono stati pubblicati i documenti analizzati e i principali autori. Successivamente, sono state analizzate le reti di collaborazione tra gli autori più influenti, seguite dall'analisi delle citazioni e dall'analisi dell'accoppiamento bibliografico. Viene presentata, dunque, la mappa tematica. Infine, si procede con la discussione dei risultati ottenuti.

3.1 I principali risultati descrittivi

La prima sezione affronta i principali risultati descrittivi frutto dell'analisi. La *tabella delle informazioni principali* (Tab. 1) illustra le caratteristiche della collezione, includendo il numero di documenti, autori, fonti, parole chiave, la durata del periodo analizzato e la media delle citazioni per

documento. Più specificatamente, i 193 documenti, relativi al periodo compreso tra il 1987 e il 2024, sono stati pubblicati su 73 diversi Journal. Inoltre, emerge un tasso di crescita annuale pari al 9.09%, mentre sono 45.68 le citazioni medie per documento analizzato. I riferimenti sono 11474. Ai fini della descrizione dei risultati, un ulteriore aspetto rilevante è costituito dalla *produzione scientifica annuale* delle 193 pubblicazioni oggetto di analisi (Fig. 2). Nelle ascisse sono riportati gli anni di pubblicazione (dal 1987, anno in cui è stato pubblicato il primo articolo relativo all'argomento, sino al 2024), nelle ordinate è indicato il numero di pubblicazioni su una scala da 0 a 25 (numero massimo di pubblicazioni in un anno), infine la linea rappresenta il numero di pubblicazioni nel tempo.

Fig. 2: La Produzione scientifica annuale



Fonte: elaborazione degli autori

I primi studi significativi risalgono alla fine degli anni 90. Più specificatamente, dopo quella del 1987, la prima pubblicazione rilevante è quella proposta da Longenecker *et al.* (1988) la cui attenzione si è concentrata sulle inclinazioni individualiste ed egoistiche che possono spingere gli imprenditori a intraprendere differenti percorsi etici nel perseguimento del profitto. Tuttavia, a quest'ultima è seguita una fase di stallo in cui non è stato pubblicato alcun articolo sul tema oggetto di analisi (periodo 1989-1998). Nell'arco temporale compreso tra il 1999 e il 2012, nonostante alcune oscillazioni, il numero di pubblicazioni inizia a crescere in maniera significativa, raggiungendo un picco nel 2009, anno in cui sono stati pubblicati 10 articoli in materia di etica e imprenditorialità. Tra le ragioni si deve sottolineare l'edizione speciale che il *Journal of Business Venturing* ha dedicato all'argomento, su cui è stato pubblicato uno degli articoli maggiormente citato (Zahra *et al.*, 2009). Dopo il picco del 2009, si osserva una fase di declino, in cui il numero di articoli è calato nuovamente, raggiungendo 4 pubblicazioni nel 2012. Come evidenziato nel grafico, il periodo 2014-2024, è caratterizzato tendenzialmente da una crescita più sostenuta. Nonostante siano presenti alcune oscillazioni, si veda il periodo 2020-2021, il 2021 registra un incremento marcato. Il 2023 è l'anno in cui si registra il maggior numero di pubblicazioni realizzate dal 1987, con circa 25 articoli pubblicati in materia. Si riscontra, dunque, una tendenza crescente della produzione scientifica sull'argomento oggetto dello studio, la quale si è amplificata negli anni recenti, con un'accelerazione particolarmente visibile negli ultimi anni.

La Tab. 1 illustra le *riviste più frequenti*. Queste, sono classificate in maniera decrescente in base al numero di pubblicazioni in materia di etica ed imprenditorialità. In particolare, vengono rappresentate solo le prime dieci riviste più produttive. Le fonti comprendono varie riviste accademiche o specializzate che trattano temi relativi all'imprenditorialità e allo sviluppo regionale.

Tab. 1: Top 10 Riviste più frequenti

Riviste	Articoli
JOURNAL OF BUSINESS ETHICS	71
JOURNAL OF BUSINESS VENTURING	13
ENTREPRENEURSHIP AND REGIONAL DEVELOPMENT	6
ENTREPRENEURSHIP THEORY AND PRACTICE	5
JOURNAL OF SOCIAL ENTREPRENEURSHIP	5
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	5
INTERNATIONAL ENTREPRENEURSHIP AND MANAGEMENT JOURNAL	4
INTERNATIONAL SMALL BUSINESS JOURNAL-RESEARCHING ENTREPRENEURSHIP	3
SMALL BUSINESS ECONOMICS	3
SOCIAL ENTERPRISE JOURNAL	3

Fonte: elaborazione degli autori

Come si evince dalla Tab. 1, il "*Journal of Business Ethics*" è la fonte più prolifica sull'argomento oggetto della ricerca: 71 delle 193 pubblicazioni considerate nello studio sono state pubblicate su di essa. Segue il "*Journal of Business Venturing*" con 13 pubblicazioni; come anticipato precedentemente, questo Journal ha dedicato un numero speciale a tali argomentazioni nel 2009.

Le argomentazioni oggetto dello studio sono state affrontate anche in altre riviste, quali "Entrepreneurship and Regional Development", "Entrepreneurship Theory and Practice", "Journal of Social Entrepreneurship", "Technological Forecasting and Social Change", "International Entrepreneurship and Management Journal", "International Small Business Journal-Researching Entrepreneurship", "Small Business Economics" e "Social Enterprise Journal".

Per quanto concerne i riferimenti più citati, sono stati individuati i dieci migliori contributi forniti dagli autori in tema di etica ed imprenditorialità. La Tab. 2 riporta i documenti citati più frequentemente.

Più specificatamente, nel periodo di tempo considerato, 464 autori hanno focalizzato i loro lavori sull'argomento. Tra questi, il lavoro maggiormente citato, e di conseguenza quello che più ha influenzato i successivi contributi accademici, è sicuramente quello di Zahra *et al.* del 2009, il quale è stato citato in totale 1421 volte e che presenta una media di citazioni annuali pari a 88.81. Questo studio si focalizza sul contributo significativo e diversificato che gli imprenditori sociali apportano alla loro comunità: le loro attività consentono di migliorare la ricchezza sociale creando nuove imprese o gestendo in modo innovativo quelle esistenti. L'articolo propone la ricchezza sociale come misura del contributo dell'imprenditoria sociale, includendo sia il valore economico che sociale (Zahra, 2009).

Tra i documenti più citati rientrano anche lo studio di Saebi *et al.* del 2019 con 514 citazioni, il lavoro di Anokhin *et al.* del 2009, che è stato citato 457 volte, e la ricerca di Nga *et al.* del 2010 con 402 citazioni totali.

Tab. 2: Top 10 Riferimenti più citati

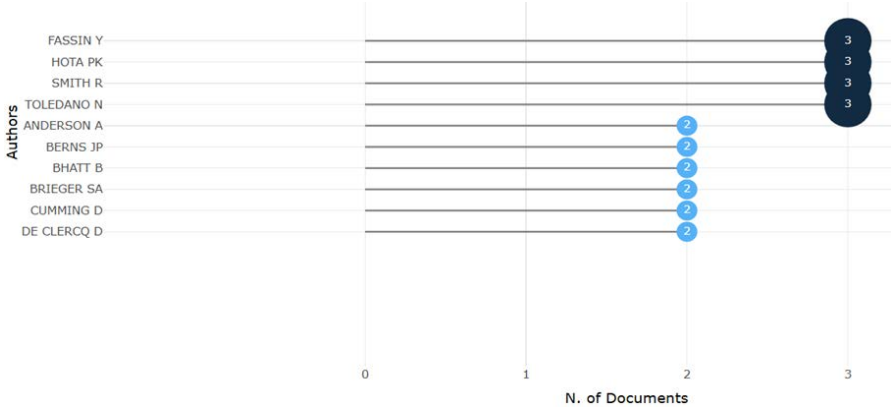
Documento	Citazioni	Citazioni per anno	Citazioni normalizzate
ZAHRA SA, 2009, J BUS VENTURING	1421	83,59	5,85
SAEBI T, 2019, J MANAGE	514	73,43	8,04
ANOKHIN S, 2009, J BUS VENTURING	457	26,88	1,88
NGA JKH, 2010, J BUS ETHICS	402	25,13	4,77
HOTA PK, 2020, J BUS ETHICS	233	38,83	6,24
GODFREY PC, 2011, ACAD MANAG ANN	229	15,27	2,83
MOSS TW, 2015, ENTREP THEORY PRACT	226	20,55	5,34
VALLASTER C, 2019, J BUS RES	191	27,29	2,99
HARRIS JD, 2009, J BUS VENTURING	168	9,88	0,69
ANDRÉ K, 2016, J BUS ETHICS	163	16,30	2,95

Source: our elaboration

Tuttavia, con riferimento ai dati su cui si sta effettuando l'analisi, si può affermare che il contributo di questi autori - Zahra, Saebi, Anokhin e Nga Jkm - si sia limitato ad una sola pubblicazione in materia. Vale a dire che, sulla base delle parole chiave inserite nel database, ogni autore ha prodotto

un solo articolo. Pertanto si riporta di seguito la Fig. 3, che comprende gli autori più produttivi in materia di etica ed imprenditorialità.

Fig. 3: Top 10-Autori più rilevanti.



Fonte: elaborazione degli autori

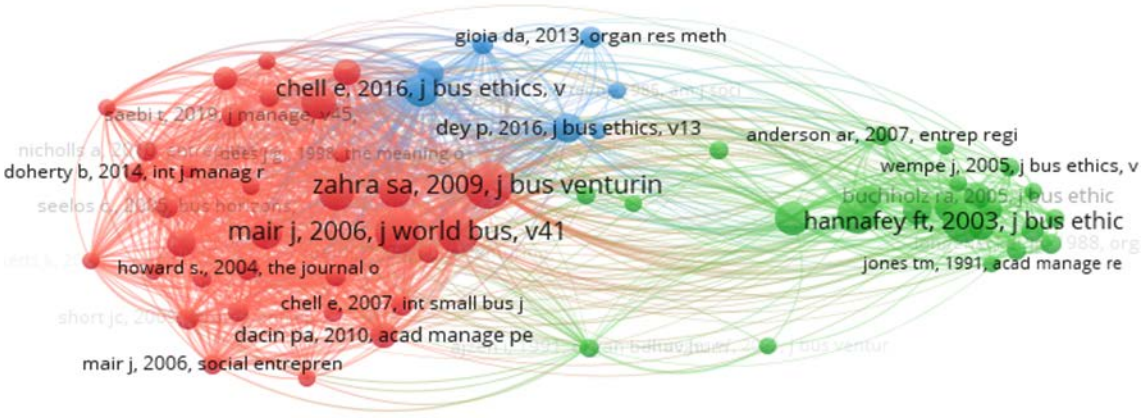
Come si evince dalla Fig. 3, se si considera la produttività, emergono altri autori rispetto a quelli precedentemente citati. In particolare, i maggiori contributi provengono da Fassin, Hota, Smith e Toledano, ciascuno dei quali ha affrontato le argomentazioni oggetto dello studio in tre pubblicazioni. Le pubblicazioni di Fassin in materia di etica ed imprenditorialità risalgono al 2013, al 2014 e al 2017. L'autore ha posto al centro dei suoi lavori il conflitto esistente tra imprenditori e investitori, ed in particolare ha approfondito l'impatto dei comportamenti percepiti come non etici da parte di entrambi gli attori coinvolti. Ad esempio, nell'articolo *Take the money or run? Investors' ethical reputation and entrepreneurs' willingness to partner* l'autore è giunto alla conclusione che "man mano che le conseguenze del rifiuto dei finanziamenti diventano più gravi (ad esempio, un possibile fallimento), gli imprenditori diventano sempre più disposti a collaborare con investitori non etici" (Drover *et al.*, 2014). Anche Hota ha contribuito in maniera rilevante alla ricerca. L'autore ha affrontato le tematiche oggetto dello studio nel 2020 e successivamente in due lavori pubblicati nel 2023. Più specificatamente, Hota ha concentrato i suoi studi sulla Social Entrepreneurship e sui dilemmi etici che gli imprenditori sociali incontrano nello svolgimento delle loro attività. Smith invece, nei suoi lavori pubblicati nel 2007 e nel 2015, approfondisce l'intensità morale nelle decisioni dell'imprenditoria sociale e il rapporto tra la violazione delle regole e la legittimità degli imprenditori. Infine, interessanti sono i lavori di Toledano. L'autrice ha affrontato le argomentazioni trattate in questo lavoro sotto molteplici punti di vista: nel 2018 ha indagato la promozione dell'imprenditorialità etica nel Terzo Mondo estendendo le implicazioni emerse anche ai Paesi sviluppati. I risultati lo hanno portato ad affermare che "il successo dei programmi di sostegno dipende dall'integrazione delle misure nelle aspettative della popolazione locale su ciò che significa etico nel contesto dell'imprenditorialità" (Karanda *et al.*, 2018). Gli altri studi pubblicati da Toledano nel 2020 e nel 2022, si concentrano rispettivamente sull'importanza della sfera religiosa ed ambientale nel contesto dell'etica imprenditoriale.

4. Co-citation

L'analisi delle co-citazioni ha l'obiettivo di analizzare lo sviluppo e l'interconnessione delle idee e dei temi all'interno di un field di ricerca. Per l'analisi, è stato fissato un limite di un numero minimo di citazioni pari a 10 documenti citati; Sulla base di questo processo sono emersi tre cluster, i quali sono stati analizzati in quattro fasi. In un primo momento, i documenti di ciascun cluster sono stati organizzati in base ad autore, titolo, anno di pubblicazione, abstract e numero di citazioni. Successivamente, per ogni articolo, sono state identificate le parole chiave di ciascun abstract con

l'obiettivo di classificarli. In un terzo passaggio, sulla base dei documenti principali di ciascun cluster sono state elaborate delle proposte di titolo. Infine, una volta identificati i contenuti principali, sono stati assegnati i nomi ai cluster. I risultati dell'analisi vengono presentati nella Fig. 4.

Fig. 4: I risultati dell'analisi delle co-citazioni.



Fonte: elaborazione degli autori

4.1 Cluster rosso: Social Entrepreneurship

Il primo cluster, indicato con il colore rosso e costituito da 33 items, racchiude gli studi nel campo della *Social Entrepreneurship*. Le imprese sociali cercano di equilibrare obiettivi economici e sociali: le loro decisioni sono orientate a favorire il benessere collettivo, piuttosto che puntare esclusivamente alla massimizzazione dei profitti. Questo scopo richiede l'integrazione di principi etici sia nelle decisioni strategiche che nelle attività operative quotidiane, pertanto, si può affermare che l'etica è il fondamento su cui si basa l'imprenditoria sociale. La discussione si concentra sul gap che viene a crearsi tra le missioni sociali e i principi della Social Entrepreneurship ma anche rispetto alle dinamiche di allocazione delle risorse, dell'efficienza e dell'innovazione delle imprese tradizionali (Smith *et al.*, 2013).

Zahra *et al.* (2009) arricchiscono la letteratura sull'etica aziendale offrendo un quadro per analizzare come gli imprenditori sociali incorporano le considerazioni etiche nelle loro attività. Vengono approfondite le sfide etiche che questi imprenditori devono affrontare, quali l'equità nella distribuzione dei profitti, il trattamento giusto dei dipendenti e l'uso sostenibile delle risorse. Inoltre, i dilemmi morali sorgono quando le imprese sociali devono scegliere tra opzioni che possono avere effetti differenti su vari gruppi di stakeholder, richiedendo un'attenta analisi delle implicazioni etiche. Peredo *et al.* (2006) esaminano il concetto di Social Entrepreneurship, in maniera analitica e critica, approfondendo sia gli elementi "sociali" che quelli legati all'"imprenditorialità". Mair *et al.* (2006), utilizzano la teoria della strutturazione di Giddens per analizzare l'interazione tra l'imprenditore sociale e il contesto. Tale teoria consente di "esaminare come il contesto consenta e limiti la comparsa dell'imprenditoria sociale e come si verifichi il cambiamento sociale" (Mair *et al.*, 2006). Miller *et al.* (2012), partendo dalla ricerca in merito alla compassione e alla motivazione prosociale, sviluppano un modello che propone tre meccanismi (pensiero integrativo, analisi dei costi e benefici prosociali, e l'impegno a ridurre la sofferenza altrui) in grado di convertire la compassione in imprenditoria sociale. Inoltre, gli autori individuano le condizioni istituzionali in cui questa trasformazione è più probabile.

4.2 Cluster verde: il processo decisionale etico nell'attività imprenditoriale

Il secondo cluster, contrassegnato dal colore verde, comprende gli autori che, nei loro studi, hanno adottato diverse teorie manageriali per esaminare il concetto di imprenditorialità etica, intesa come

l'avvio e la gestione di un'impresa secondo principi etici. I documenti appartenenti a questo gruppo si concentrano sull'analisi del processo decisionale etico nell'attività imprenditoriale.

Un contributo significativo è offerto da Buchholz *et al.* (2005), che approfondiscono la dimensione etica dell'imprenditorialità attraverso la teoria degli stakeholder. Gli autori criticano la visione tradizionale secondo cui imprese e individui operano in modo autonomo e orientato esclusivamente al proprio interesse, proponendo invece una prospettiva relazionale. In questa visione, l'impresa è parte integrante di una rete di relazioni con i suoi stakeholder e ha nei loro confronti obblighi morali, essenziali per il successo aziendale. Un altro aspetto interessante riguarda la tensione tra etica e business (Wempe, 2005). Secondo l'autore, tale tensione non deve essere vista come un ostacolo, bensì come un'opportunità per sviluppare soluzioni innovative. Risulta crescente la necessità di superare un approccio monistico e negativo all'etica, per abbracciare un pluralismo di valori che favorisca l'innovazione. Il contributo di Suchman (1995) si concentra sul concetto di legittimità organizzativa, distinguendone tre tipologie: pragmatica, morale e cognitiva. L'autore evidenzia che l'etica nell'imprenditorialità è strettamente legata alla legittimità morale, la quale si basa su principi e norme condivise dalla società. Ciò implica che le attività imprenditoriali non vengano valutate solo in base ai benefici offerti agli stakeholder, ma anche in funzione del loro allineamento con le aspettative etiche della comunità. Per garantire una fiducia duratura, è quindi fondamentale un impegno autentico verso il bene comune, evitando strategie opportunistiche che possano comprometterne la credibilità nel lungo termine.

4.3 Cluster azzurro: l'interazione tra etica aziendale e la Social Entrepreneurship

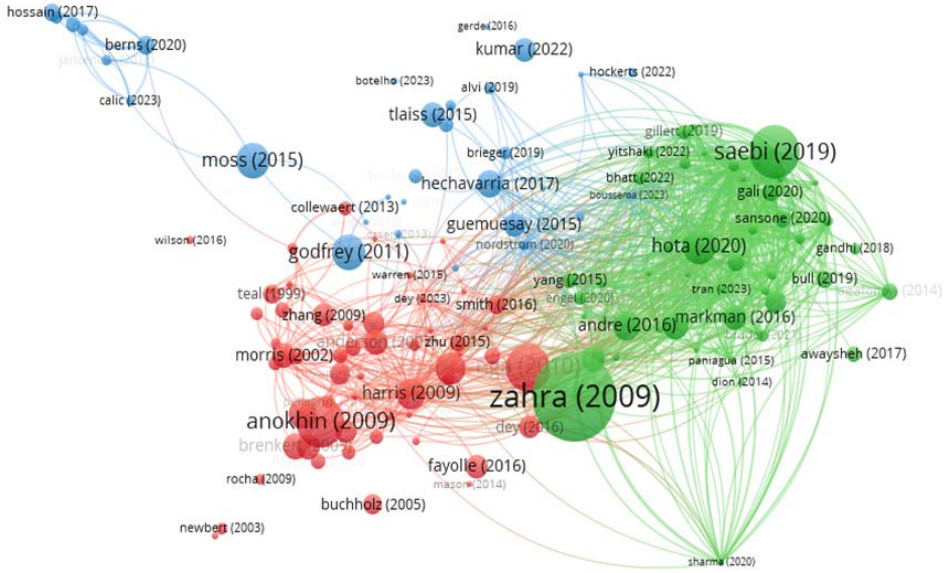
Il cluster azzurro racchiude tutti quegli studi che si concentrano sull'*interazione tra l'etica aziendale e la Social Entrepreneurship*, posta al centro dell'articolo *From Caring Entrepreneur to Caring Enterprise: Addressing the Ethical Challenges of Scaling up Social Enterprises* pubblicato da André *et al.* nel 2016. In particolare, gli autori esplorano la difficoltà di preservare la missione sociale durante l'espansione dell'attività. Viene proposto il concetto di "ethics of care", che si verifica quando l'imprenditore sociale non soltanto persegue una missione sociale ma lo fa implementando processi contraddistinti da attenzione, responsabilità ed empatia nei confronti dei destinatari. Tuttavia, man mano che l'impresa si espande, l'etica della cura tende ad affievolirsi in quanto vi è la tendenza a spostare l'attenzione sulla gestione delle risorse, sulla standardizzazione dei processi o sulla misurazione dell'impatto. Per ovviare ciò, gli autori, propongono il concetto di "cura organizzativa" che include attività quali la selezione e la formazione di persone con un orientamento alla cura, favorire relazioni di sostegno all'interno dell'organizzazione e garantire una continua attenzione ai bisogni dei beneficiari. Dey *et al.* (2016) analizzano il ruolo dell'etica all'interno dell'impresa sociale adottando una prospettiva foucaultiana. Gli studiosi contestano la concezione secondo cui l'etica nell'ambito dell'imprenditoria sociale sia un elemento innato della persona. Piuttosto, sostengono che essa si sviluppi attraverso azioni quotidiane e decisioni situate nel contesto. Presumere che gli imprenditori sociali siano sempre eticamente impeccabili è ingannevole, poiché questa concezione trascura le difficoltà etiche e le sfide concrete che devono affrontare. Propongono invece un approccio pragmatico, in cui l'etica si costruisce costantemente nel confronto con il potere e l'identità individuale.

Infine, risulta importante adottare un approccio empirico per affrontare la complessità etica dell'imprenditoria sociale (Bacq *et al.*, 2014). Nella visione tradizionale di business ethics prevalgono visioni regolative derivate dalla filosofia morale, mentre l'imprenditoria sociale viene frequentemente analizzata attraverso una prospettiva "priva di valori predefiniti". Questo implica l'assenza di criteri direttivi condivisi per stabilire quali scopi siano realmente vantaggiosi per la collettività, consentendo così un elevato margine di discrezione individuale.

5. Bibliographic coupling

Per individuare le tendenze attuali e le future priorità in materia di etica ed imprenditorialità, è stata condotta un'analisi dell'accoppiamento bibliografico sulla base dei dati oggetto di analisi. In particolare, per questa analisi è stata impostato un numero minimo di citazioni del documento pari a 3. Così, dei 193 documenti iniziali, ne sono stati selezionati 141, i quali soddisfano il requisito richiesto di un numero minimo di 3 citazioni di un documento. I documenti così ottenuti sono stati analizzati partendo da un'analisi dei tre cluster emersi dal software in quattro fasi. Inizialmente i file appartenenti a ciascun cluster sono stati organizzati in base ad autore, titolo, anno di pubblicazione, abstract e numero di citazioni. In seguito, per ciascun articolo, sono state individuate le parole chiave degli abstract con l'obiettivo di classificarli. In terzo luogo, al fine di elaborare dei titoli da assegnare a ciascun cluster, sono stati analizzati i documenti principali identificati per ognuno. Infine, una volta individuati i contenuti principali, sono stati attribuiti i nomi ai cluster. Nella Fig. 5 si riportano i risultati dell'analisi dell'accoppiamento bibliografico.

Fig. 5: I risultati dell'analisi dell'accoppiamento bibliografico



Fonte: elaborazione degli autori

5.1 Cluster verde: il ruolo della Social Entrepreneurship

Il cluster verde include studi sulla Social Entrepreneurship (SE), che rappresenta una tematica ormai consolidata in questo field. Le imprese sociali combinano l'attività imprenditoriale con uno scopo sociale: la priorità diventa quella di avere un impatto sociale positivo piuttosto che massimizzare il profitto per i proprietari o per gli azionisti. Tra i vari contributi, spicca quello di Hota *et al.* (2020) che sottolinea il ruolo centrale dell'etica nell'imprenditoria sociale, la cui essenza è intrinsecamente etica, distinguendola così dall'imprenditoria tradizionale orientata al profitto. Al contrario, secondo Saebi at al. (2019), l'etica pur essendo presente in maniera marginale nelle discussioni in materia di SE fin dall'inizio degli studi in merito, non può essere ancora considerata un aspetto centrale nella ricerca sulla SE. In questo contesto, Bhatt (2022) che propone due approcci all'etica, un approccio basato sui principi e uno basato sulla pratica, che le imprese sociali potrebbero adottare nel perseguimento del cambiamento sociale positivo che è al centro delle missioni di molte SE.

Quindi, una domanda rilevante riguarda la natura della SE "il sociale è intrinsecamente etico?", vige la "presunzione che, poiché qualcosa è orientato socialmente, è probabile che la motivazione sia eticamente sana; che sia di principio, moralmente giustificato ed eticamente legittimo" (Chell *et al.*, 2016). Seguendo questo filone Zahra *et al.* (2009) hanno individuato tre categorie di imprenditoria

sociale: *Social Bricoleur*, *Social Constructionist* e *Social Engineer*. La prima categoria sfrutta opportunità emergenti a livello locale, facendo leva sulle risorse disponibili nel contesto in cui operano. I costruzionisti sociali avviano e gestiscono imprese mirate a colmare bisogni sociali insoddisfatti dalle organizzazioni esistenti. Infine, gli ingegneri sociali si concentrano sull'analisi di problematiche strutturali nei sistemi sociali, proponendo soluzioni innovative che portano a cambiamenti trasformativi.

Quindi, risulta fondamentale contestualizzare il ruolo dell'etica all'interno della Social Entrepreneurship affrontando alcuni dilemmi etici e focalizzandosi sui percorsi di formazione e di vita, che intraprendono gli attori che operano nelle imprese sociali. Adottando un approccio pragmatico, Hota *et al.*, (2023) esplorano le diverse tipologie di dilemmi etici che gli imprenditori sociali devono affrontare quando devono prendere una decisione e propongono tre tipi di institutional work (recognition work, responsabilization work e reflective judgment work) che questi possono implementare per fronteggiarle. Un caso concreto è rappresentato dalla scelta relativa a come distribuire le proprie risorse: è più efficace concentrarsi su un gruppo ristretto di persone per offrire loro un aiuto più accurato, oppure è preferibile estendere il supporto a un numero maggiore di beneficiari, anche se con interventi meno mirati? Altre sfide considerate nello studio riguardano il bilanciamento dei diversi stakeholder (è più opportuno essere emotivamente distaccati o essere coinvolti?), la gestione degli effetti di ricaduta (è necessario dare priorità ai diritti dell'impresa o essere responsabili nei confronti delle comunità?) e gli sforzi di sovvenzione incrociata (utilitarismo o equità?).

5.2 Cluster rosso: il ruolo dell'etica nei processi decisionali

Il cluster rosso comprende documenti che affrontano tematiche legate alla funzione dell'etica nelle decisioni degli imprenditori. L'etica nell'imprenditorialità è un topic emergente che stabilisce i principi e le condotte che guidano gli imprenditori, influenzando sia i metodi sia gli obiettivi delle loro attività. Essa aiuta a conferire legittimità sociale all'impresa, assicurando che sia conforme alle norme e ai valori condivisi dalla società. Tra i vari lavori che caratterizzano il cluster, quello di Anderson e Smith (2007), evidenzia come l'imprenditorialità non debba essere considerata soltanto un'attività economica, ma come un processo socialmente costruito in cui domina una forte componente morale. "gli imprenditori, se autentici, gestiranno le loro imprese con un codice etico congruente con un comportamento socialmente approvato" (Anderson e Smith, 2007).

Anche Morris *et al.* (2002), enfatizzano come l'etica giochi un ruolo fondamentale nel contesto imprenditoriale, in quanto contribuisce a determinare il successo e la sostenibilità a lungo termine delle imprese. Gli autori pongono l'attenzione sulle strutture formali (codici etici, linee guida, programmi di formazione) ed informali (cultura aziendale, comunicazione etica) che contribuiscono a sviluppare un clima etico aziendale.

Infine, rilevanti in questo tema risultano le conseguenze della corruzione all'interno del contesto imprenditoriale; infatti un maggiore controllo della corruzione è in grado di determinare crescenti livelli di innovazione ed imprenditorialità (Anhokin *et al.*, 2009).

5.3 Cluster azzurro: l'etica per l'inclusione

Questo cluster può essere considerato quello più di frontiera, in quanto affronta il ruolo dell'etica come vettore di inclusione, non solo sociale ma anche economica. Diversi lavori evidenziano le strategie che mirano a valorizzare e integrare diverse prospettive ed esperienze nel contesto organizzativo, partendo dal presupposto che team diversificati possano prendere decisioni più efficaci. Si punta, infatti a cerare culture aziendali più inclusive in termini di gender, religione, spiritualità ma le considerazioni etiche riguardano anche l'accessibilità agli strumenti di finanziamento concessi alle imprese. La maggior parte degli articoli che costituiscono questo cluster sono stati pubblicati nell'ultimo decennio evidenziando una maggiore attenzione negli ultimi anni

verso questo sottocampo di ricerca. Uno dei principali contributi è quello fornito da Ali Aslan Gümüsay (2015), sul ruolo della religione nell'imprenditoria e nel management, sottolineando la scarsità della ricerca in questa direzione. In particolare, il focus si sposta sull'imprenditoria sotto una prospettiva islamica partendo da considerazioni in merito a tre pilastri interconnessi tra loro: quello imprenditoriale, quello socio-economico/etico e quello religioso-spirituale. La sfera religiosa/spirituale influenza l'etica e i principi degli attori che operano all'interno delle organizzazioni, di conseguenza le scienze sociali del management e della ricerca imprenditoriale devono tener conto di questi aspetti. Altri studi, si sono concentrati sulle differenze di genere nella propensione a perseguire o meno obiettivi di valore sociale nel contesto organizzativo: sulla base dei risultati ottenuti su un campione di 15.141 imprenditori in 48 Paesi, Hechavarría *et al.* (2017) sono giunti alla conclusione che le imprenditrici tendono, più degli imprenditori, a dare maggiore importanza agli obiettivi di impatto sociale rispetto a quelli di profitto economico. Inoltre, nello stesso studio gli autori hanno esaminato anche i fattori che influenzano la sostenibilità; è emerso che nelle società con una forte inclinazione postmaterialista, gli imprenditori tendono a perseguire maggiormente finalità legate al benessere sociale e ambientale, mentre mostrano un interesse minore per la generazione di valore economico. In altri casi, viene indagata la relazione tra genere e religione e le relative implicazioni etiche nel contesto imprenditoriale: Tlaiss (2015) ha analizzato l'integrazione dei valori islamici e dell'etica del lavoro nelle attività imprenditoriali delle donne arabe. Lo studio evidenzia come le imprenditrici musulmane puntino al benessere e all'eccellenza nella gestione delle loro imprese, seguendo principi come impegno, onestà, giustizia ed equità. Attraverso questi valori, le donne arabe musulmane orientano le proprie carriere in modi che si discostano dalle interpretazioni più tradizionali dell'Islam.

Inoltre, alcuni lavori sono incentrati sul rapporto esistente tra l'orientamento etico delle imprese e la microfinanza in termini di accessibilità agli strumenti di finanziamento ad esse concesse, promuovendo la Democratizzazione dell'accesso al credito. Berns *et al.* (2020), ad esempio, evidenza che i progetti che uniscono un forte valore finanziario e un rilevante impatto sociale ottengono i finanziamenti più elevati, offrendo opportunità di finanziamenti anche a coloro i quali, in altri contesti, non avrebbero avuto l'opportunità. Moss *et al.* (2015) estendono la "teoria dei segnali" alla microfinanza con l'obiettivo di evidenziare l'importanza di una comunicazione etica sulle piattaforme di crowdfinding (come Kiva); questi segnali, infatti, possono aumentare la fiducia dei microlenders, diminuendo l'incertezza sugli investimenti e favorendo sia la probabilità che la rapidità di ottenere prestiti.

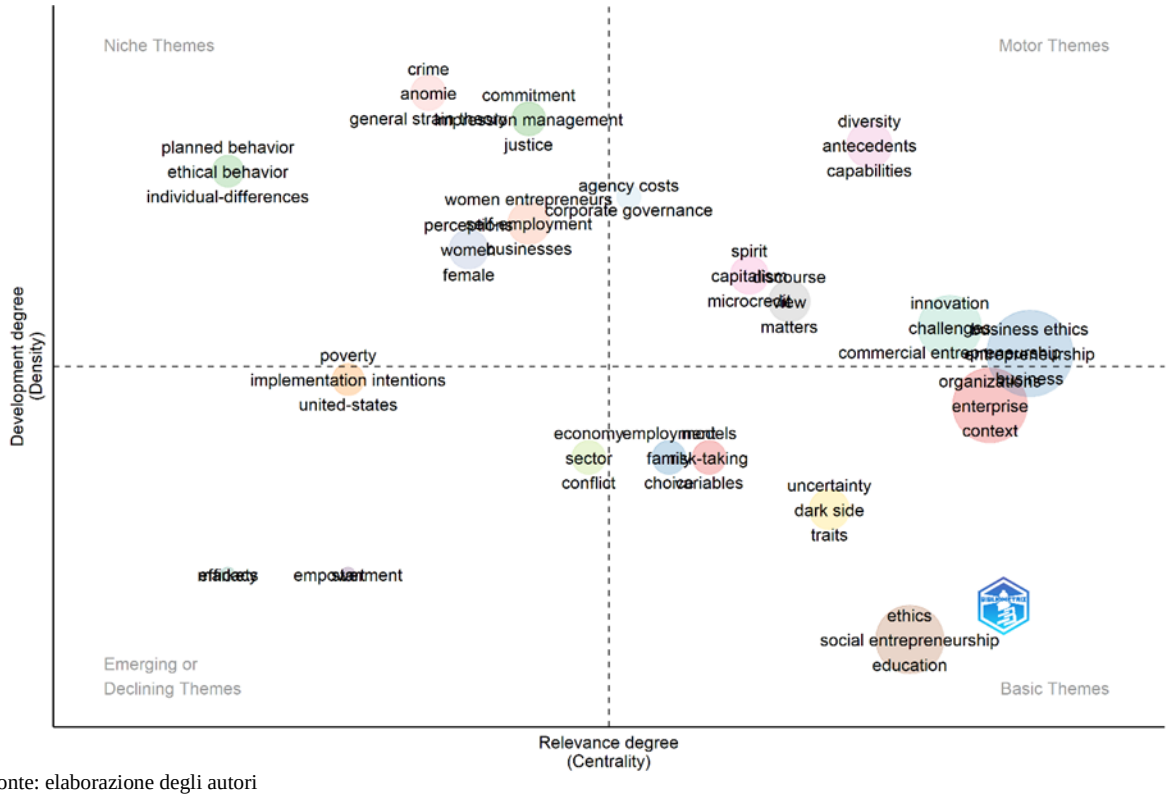
6. Mappa tematica

Dopo aver analizzato i dati, l'analisi bibliometrica procede con la fase della loro visualizzazione. La mappa tematica offre una rappresentazione visiva della struttura concettuale di un ambito di ricerca, facilitando l'individuazione dei temi più significativi, delle connessioni tra di essi e delle possibili direzioni per futuri sviluppi (Callon *et al.*, 1991).

Nella *Fig. 6* viene presentata la mappa tematica aggregata per l'intera durata del periodo analizzato; la mappa è stata creata impostando come campo "Keywords plus" ed escludendo dall'analisi parole generiche quali *entrepren, entrepreneurship, entrepreneur, entrepreneurs, enterprise, ethics, ethical, ethic, business, firm, management, organization, organizations*. Le parole sono state generate sulla base delle 250 parole più rilevanti ed impostando una frequenza minima del cluster (per mille documenti) pari a 5 e "trappola per passeggiate" come algoritmo di clustering. Infine, sono state impostate 3 etichette per ciascun cluster di parole chiave.

In generale, la grandezza di ciascun cluster riflette la rilevanza o il peso del tema all'interno del campo di ricerca esaminato: maggiori sono le dimensioni del cluster, più trattati saranno gli argomenti. Al contempo, la posizione del cluster rispecchia le relazioni tra gli stessi: più gli argomenti sono vicini, più strettamente sono correlati.

Fig. 6: Risultati della mappa tematica



Fonte: elaborazione degli autori

Entrando nel dettaglio, la mappa è divisa in quattro quadranti sulla base del grado di sviluppo (densità) posizionato sulle ascisse, e del grado di rilevanza (centralità), posizionato sull'asse delle ordinate. Ogni quadrante rappresenta una diversa categoria di temi.

Il quadrante in alto a destra racchiude i *Motor Themes*, ossia quelli caratterizzati da elevata densità e centralità. Sono considerati temi motori "diversity", "innovation", "business ethics", "spirit", "microcredit", "discourse", "agency costs" e "corporate governance". Come emerso dall'analisi, quando si parla di *diversity* si fa riferimento ad una serie di concetti quali le differenze di genere in termini di obiettivi di valori etici e sociali, che vengono perseguiti nel contesto imprenditoriale (Hechavarría *et al.* 2017), ma anche l'impatto della sfera religiosa e spirituale, soprattutto dell'Islam, sugli imprenditori e sulle imprenditrici nell'intraprendere scelte che incidono in maniera positiva sulla comunità (Gümüsay, 2015; Tlaiss 2015), oltre che considerazioni in termini di propensione a perseguire obiettivi di benessere ambientale (Hechavarría *et al.* 2017). Altro tema importante è quello legato al microcredito e al finanziamento prosociale, mettendo in luce la dimensione sociale e inclusiva di alcune piattaforme Peer to peer, spesso orientate a supportare piccole imprese o progetti etici. Tali strumenti, facilitano l'accesso al credito per start-up e imprese, specialmente in contesti con limitate opzioni di finanziamento. Un altro tema motore è la *business ethics*: molti autori indagano il ruolo dei valori etici che guidano gli imprenditori nell'influenzare i loro obiettivi, le loro strategie, i loro comportamenti. Ad esempio Morris *et al.* (2002) esaminano i tratti psicologici dell'imprenditore che influenzano la sua predisposizione ad adottare comportamenti etici, tra cui il locus of control e la tolleranza all'ambiguità. Questi argomenti sono fondamentali per la disciplina e continuano a essere un punto di riferimento importante.

I *Basic Themes*, contraddistinti da un basso livello di densità ed elevata centralità, sono raffigurati nel quadrante in basso a destra. Rientrano in questa categoria "social entrepreneurship" ed "education". Per quanto concerne la *Social Entrepreneurship*, ad esempio Hota *et al.* (2020), nel loro studio, indentificano la natura etica degli imprenditori sociali come l'elemento distintivo tra l'imprenditoria sociale e l'imprenditoria tradizionale orientata al profitto. Altri studi esplorano il modo in cui gli imprenditori sociali incorporano le considerazioni etiche nelle loro attività (Zahra *et al.* 2009). Anche *education* è considerato un tema base: alcuni studi pongono al centro delle proprie

ricerche l'impatto che la formazione all'imprenditoria sociale degli studenti ha nella propensione a lanciare imprese sociali partendo dal presupposto che quando gli studenti si impegnano in attività di apprendimento esperienziale si osservano maggiori effetti (Hockerts, 2018). I temi base rappresentano le basi concettuali del campo di ricerca, ma con margine per ulteriore esplorazione; tuttavia, richiedono ulteriori approfondimenti per diventare motori principali della ricerca.

Gli *Emerging or Declining Themes* sono rappresentati nel quadrante in basso a sinistra: questi temi sono meno sviluppati e meno centrali. In questo quadrante si trovano temi che possono indicare nuove aree di ricerca o nei confronti dei quali si sta perdendo interesse. Uno dei temi emergenti è sicuramente *empowerment*. Lo studio di Brieger *et al.* (2019) approfondisce il concetto di "empowerment umano" per comprendere in che modo i processi di modernizzazione possano massimizzare il potenziale delle iniziative delle imprese sociali per le comunità. Altri studi esplorano l'emancipazione delle donne nel contesto dell'imprenditoria femminile nell'ottica della responsabilità sociale d'impresa, la cosiddetta CSR (Bagheri *et al.* 2024).

Infine, l'ultimo quadrante, quello in alto a destra, contiene i *Niche Themes*, ossia quelli che hanno un elevato livello di densità ma un basso livello di centralità. Sono temi sviluppati in altri field, ma non centrali nel campo di ricerca, di nicchia appunto. Rientrano in questo quadrante I seguenti temi: *planned behaviour, individual-differences, gender-differences, women entrepreneurs*, ma sui quali si potrebbe investire.

7. Verso un modello armonico di etica imprenditoriale

L'analisi evidenzia la crescente attenzione della ricerca verso il rapporto tra etica e imprenditorialità, soprattutto negli ultimi anni. Un punto chiave riguarda la necessità di chiarire il significato dell'etica nell'impresa, poiché alcuni autori associano un comportamento etico all'accettazione sociale, mentre altri mettono in discussione questa equazione (Chell *et al.*, 2016). L'etica aziendale assume un ruolo cruciale nella promozione della dignità della persona e nel superamento di un modello basato esclusivamente sul profitto (Pezzani, 2013). Questa prospettiva richiama una visione antropologica dell'impresa, in cui l'imprenditore non è solo un attore economico, ma un soggetto responsabile, impegnato nel bene comune (Rotundo, 2010). Un'impresa etica deve coinvolgere ogni componente organizzativa, orientandosi verso un modello di sviluppo sostenibile e responsabile (Morris *et al.*, 2002). Tuttavia, le sfide come la corruzione nel contesto imprenditoriale evidenziano la necessità di un'educazione etica solida, basata su istituzioni formative che oggi risultano marginalizzate (Anhokin *et al.*, 2009). Modelli di imprenditorialità etica, come le Social Bricoleur, Social Constructionist e Social Engineer (Zahra *et al.*, 2009), richiedono un supporto educativo capillare che superi la semplice acquisizione di competenze tecniche. Anche nel caso dei dilemmi etici nelle imprese sociali, un approccio puramente pragmatico risulta insufficiente senza il supporto di principi superiori (Hota *et al.*, 2023; Bhatt, 2022). Filosofi come Possenti e Huizinga sottolineano l'importanza di un principio superiore nella guida delle scienze e dell'economia, evitando un progresso tecnico privo di una dimensione etica e umanistica. Senza etica, il mondo imprenditoriale rischia di essere dominato da dinamiche speculative, concentrazione di potere e mancanza di investimenti strutturali, minacciando la stabilità sociale e la qualità della convivenza civile. In conclusione, è necessario un rinnovamento del paradigma imprenditoriale, integrando etica, interdisciplinarità e visione umanistica per uno sviluppo sostenibile e inclusivo, in cui il progresso non sia solo economico, ma anche sociale e umano. L'etica imprenditoriale sta superando il concetto tradizionale di imprenditorialità sociale, per abbracciare nuovi ambiti di ricerca e applicazione. Oltre alla sostenibilità e alla responsabilità sociale d'impresa, stanno emergendo nuove aree di ricerca; la letteratura più recente, propone contributi che guardano all'etica come vettore di orientamento dei processi decisionali ma anche come strumento di inclusione non solo sociale ma anche economica, per promuovere modelli di business più equi e responsabili.

Le scelte imprenditoriali, infatti, non sono neutre; l'etica può quindi fungere da bussola decisionale, orientando i processi aziendali su tre livelli: a livello strategico, indirizzando scelte di investimento, governance aziendale, innovazione e digitalizzazione; a livello operativo implementando filiere produttive sostenibili, ma anche il rispetto delle normative ambientali e sociali; a livello relazionale, attraverso l'interazione con clienti, fornitori, stakeholder e comunità locali. Oltre a guidare le decisioni imprenditoriali, l'etica sta divenendo uno strumento di inclusione, capace di ridurre le disuguaglianze e favorire l'accesso alle opportunità economiche per un pubblico più ampio. Un esempio concreto, che emerge dalla letteratura, è rappresentato dalle piattaforme di lending finanziario (o crowdlending). Queste piattaforme, basate sulla tecnologia digitale, permettono di facilitare l'accesso al credito per individui e imprese, bypassando i tradizionali circuiti bancari, la marginalità geografica e sociale. A differenza delle forme speculative di finanza, il crowdlending etico si basa su principi di trasparenza, equità e responsabilità, consentendo a piccole imprese, startup e imprenditori sociali di ottenere finanziamenti senza le barriere imposte dai grandi istituti finanziari. Questo dimostra come la digitalizzazione e le nuove piattaforme finanziarie non solo garantiscono che i fondi vengano utilizzati per progetti a valore sociale ed economico positivo, ma anche che fungano da strumento di democratizzazione dell'accesso al credito.

In tale prospettiva, l'etica incoraggia un modello imprenditoriale "armonico", dove l'etica funge da "bussola" che orienta le decisioni verso la sostenibilità, la responsabilità sociale e il benessere collettivo, favorendo relazioni di fiducia tra stakeholder, dipendenti e clienti (Passarelli, 2024). Infatti, l'armonia imprenditoriale si realizza quando il profitto è compatibile con il bene comune, l'innovazione è guidata da principi di equità e sostenibilità, il lavoro è visto come uno strumento di dignità e sviluppo umano. L'armonia imprenditoriale si raggiunge anche attraverso la creazione di modelli economici inclusivi, che riducono le disuguaglianze e favoriscono opportunità per tutti. Un'impresa etica è un'impresa equilibrata, in cui il profitto non è fine a sé stesso, ma parte di un sistema più ampio che valorizza persone, ambiente e innovazione responsabile. Un'impresa senza un principio etico ben definito rischia di operare in modo disordinato, oscillando tra obiettivi di breve termine e compromessi morali. Dunque, l'etica nell'imprenditorialità funge da diapason creando sintonia e armonizzazione tra gli elementi chiave del fare impresa. Così come il diapason permette di accordare strumenti diversi per creare una melodia armoniosa, l'etica imprenditoriale permette di conciliare interessi diversi, garantendo inclusione sociale ed economica. Un sistema economico senza principi etici diventa dissonante, con squilibri che portano a conflitti e crisi. L'imprenditorialità, quando guidata dall'etica, non si riduce a un mero esercizio di calcolo finanziario, ma diventa un'arte di scelte consapevoli. Ogni decisione imprenditoriale ha un impatto non solo sui bilanci aziendali, ma anche sulla società e sull'ambiente. L'etica, assicura equità e armonia sociale, facendo sì che si crei un ecosistema in cui le imprese contribuiscono al bene comune. L'imprenditorialità, quando guidata dall'etica, non si riduce a un mero esercizio di calcolo finanziario, ma diventa un'arte di scelte consapevoli. Ogni decisione imprenditoriale ha un impatto non solo sui bilanci aziendali, ma anche sulla società e sull'ambiente. In tale prospettiva, il paradigma imprenditoriale si arricchisce di una visione interdisciplinare e più umanistica, che va incoraggiata anche attraverso la formazione imprenditoriale (Passarelli & Bongiorno, 2025). La formazione e l'imprenditorialità etica rappresentano, infatti, un connubio essenziale per la costruzione di un'economia sostenibile e responsabile. Educare alla gestione etica dell'impresa significa trasmettere non solo competenze tecniche e strategiche, ma anche valori che orientano le scelte verso il bene comune. Necessario anche un processo di riforma della preparazione universitaria, negli insegnamenti di management, ricalibrata in vista di una produzione meno legata ai vantaggi economici e più orientata alla qualità dei prodotti, dei servizi e dei reali benefici della persona impegnata nei processi di impresa e servita dai suoi prodotti.

Lo studio presenta alcune limitazioni, tra cui l'approccio esclusivamente bibliometrico, che non permette un'analisi qualitativa approfondita e la selezione delle fonti limitata al Web of Science, escludendo altre banche dati. Ricerche future potrebbero orientarsi sullo sviluppo di alcuni temi chiave in questo field: il ruolo delle neuroscienze come strumento per comprendere come gli

imprenditori bilanciano interessi economici e valori morali; il ruolo del *crowdlending* come veicolo di inclusione sociale e finanziaria per startup e PMI; come e se l'educazione imprenditoriale deve essere ripensata per formare leader consapevoli, capaci di integrare profitto e bene comune.

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Entrepreneurial attitude for social inclusion across AI-driven Phygital solutions

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Abstract

Frame of the research. *The Phygital approach, blending physical spaces with AI-enabled digital tools, is emerging as a promising model for inclusive education. From this perspective, the creation of an experimental Phygital space allows the integration of traditional and digital methodologies, reshaping learning processes and redefining the roles of both learners and teachers.*

Purpose of the paper. *This study explores the Phygital Center as a viable approach that combines digital platforms and physical spaces to deliver personalized entrepreneurial education. It aims to foster entrepreneurial attitudes among disadvantaged groups, helping to overcome socio-economic barriers and build sustainable, inclusive learning ecosystems.*

Methodology. *The paper adopts a theoretically informed, exploratory case study design. A narrative literature review supports the conceptual framing, while the case of a Phygital Centre located in Catania, Sicily (Italy), serves as a revelatory example to theorize how hybrid infrastructures can support inclusive, entrepreneurial learning experiences.*

Results. *Although still in progress, the Phygital Centre is expected to enhance learner motivation and engagement through personalized content, immersive simulations, and mentoring. Its hybrid structure is designed to strengthen employability skills and support the development of personal initiative and entrepreneurial orientation among NEETs, migrants, and other disadvantaged populations.*

Research limitations. *The study focus on a single territorial case study that is still under development, limiting generalizability. Further research, including longitudinal and comparative analysis, is needed to assess long-term impacts and broader applicability.*

Managerial implications. *Phygital models provide a strategic framework for scalable, inclusive learning environments. For policymakers and educators, they highlight the value of hybrid infrastructures, AI-based personalization, and cross-sector collaboration in enhancing vocational pathways.*

Originality of the paper. *This paper offers a conceptualization of the Phygital model as a generative framework for social inclusion. It contributes to inclusive education and service innovation literature*

Keywords: *Phygital; Social Inclusion; AI-Driven learning; Digital Transformation; Entrepreneurial Attitude*

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1. Introduction

This study explores the convergence between educational innovation and social inclusion, with a particular focus on the design of technology-supported learning environments tailored to the needs of marginalized populations. As inclusive education gains increasing prominence in both theoretical and policy agendas, growing attention is being directed toward hybrid models that strategically combine the efficiency of digital tools with the relational depth and transformative potential of human-centered engagement.

The term "phygital" refers to the seamless interlinking of the physical and digital environments. Initially limited to retail, this emerging model has now expanded to numerous sectors, including education, healthcare, and public services. The "phygital" experience gives rise to hybrid interactions that combine the best of both worlds, which enables increased personalization, accessibility, and scalability. From an educational and social inclusion perspective, phygital environments provide a feasible approach to engaging disadvantaged populations, such as NEETs (young adults not in employment, education, or training), migrants, and inmates, who are often excluded from traditional services (Del Vecchio *et al.*, 2023).

Theoretically, a phygital model is rooted in accessibility and inclusiveness principles underpinning service innovation and social policies. Providing a path to transcend socio-economic barriers, it offers an opportunity to re-think traditional models of service design and delivery. The integration of digital tools (for example, AI-based learning platforms) with physical support systems creates a holistic ecosystem capable of tackling the educational and social challenges faced by marginalized groups (Schneider, 2021). That ability to adapt and respond is especially critical in connecting with students without formal schooling or the means to engage fully in a digital-first world.

Digital platforms provide global access to learning assets and individualized support, while physical hubs facilitate meaningful interaction with mentors and peers. This dual-channel approach promotes deeper engagement and stronger learning results, validating the theoretical premise that hybrid settings can meet a wider range of learner needs more efficiently than either digital-only or physical-only models (Mele *et al.*, 2023). In doing so, the phygital model emerge as a key enabler for broad societal impact.

In this paper, we analyze the application of the Phygital model in the context of GRINS project, (Growing Resilient, Inclusive and Sustainable), an extended partnership, funded by the PNRR (Italy's National Recovery and Resilience Plan), Mission 4 (Education and research), Component 2 (From Research to Business), Investment 1.3 (Extended Partnerships), Theme 9 (Economic and financial sustainability of systems and territories), which generates frontier research in the field of economic-political-social sciences and data sciences to create scientific evidence that can help in the landscape of public policies, as well as citizen and company choices in complex decision-making scenarios.

The creation of the Phygital Center for GRINS Project is part of the ecosystemic strategy of entrepreneurial education inspired by the "third mission" of universities. It reflect the vision of an Entrepreneurial University as proposed by Audretsch (2014), which contributes to the generation of entrepreneurial capital also through educational initiatives. In this vision, entrepreneurial education must involve the entire university structure and extend beyond it, engaging with society at large.

In this perspective, entrepreneurial education encompasses a path that leads from knowledge, to skills, to entrepreneurial attitude through a wide range of activities, addressing not only students, researchers, and academic actors, but also external users in the broader ecosystem, particularly disadvantaged groups. These individuals are supported in developing their entrepreneurial mindset and recognizing untapped skills through personalized training experiences based on AI-driven technologies in the Phygital Centre (Nicotra *et al.*, 2021).

To optimize the re-skills and up-skills educational pathways within the Phygital Center, the project also includes the development of a Data dictionary for skill management designed to support the customization of learning experiences, solutions, and services offered to disadvantaged groups. This model is scalable at the national level, with implications for future policy and educational planning.

The structure of the paper is as follows: Section 2 describes the methodological approach adopted. Section 3 outlines the theoretical foundations of the Phygital model and its relation to social inclusion. Section 4 discusses the enabling technologies. Section 5 presents the GRINS Phygital Centre as a case study. Section 6 addresses managerial and policy implications, and Section 7 concludes the paper with final remarks and future research directions.

2. Methodology

Given the conceptual and exploratory nature of this study, the research adopts a qualitative approach grounded in a single-case study design (Yin, 2009; Eisenhardt, 1989). The aim is to investigate how Phygital models, conceived as hybrid infrastructures integrating digital and physical elements, can act as enablers of entrepreneurial education and social inclusion, especially for marginalized populations. Rather than testing hypotheses or producing generalizable results, the research focuses on generating theoretical insights by examining a relevant and innovative case.

In line with the interpretive tradition, the selected case is considered revelatory (Siggelkow, 2007), offering access to a context where a novel educational infrastructure is currently being designed and implemented. While the Centre is not yet operational, the documentation and planning processes offer rich material to analyze its conceptual architecture and intended impact.

The methodological approach combines two interrelated components. First, a narrative literature review was conducted to build the conceptual framework underpinning the study. The review focused on scholarly contributions in four thematic areas: digital transformation and agility; service innovation and hybridization; entrepreneurial education for inclusion; and AI-based personalization in learning environments. Sources were selected through targeted searches in academic databases such as Scopus and Web of Science, using keyword combinations reflecting the core concepts of the study. The review was interpretive in nature and aimed at synthesizing relevant knowledge to inform the theoretical positioning of the Phygital model.

Second, the paper presents a case study centered on the development of a Phygital Centre within the GRINS Project (Growing Resilient, Inclusive and Sustainable), a national research and innovation initiative funded by Italy's Recovery and Resilience Plan (PNRR). The Center is located in Catania (Sicily) and illustrates how a Phygital infrastructure is being conceptualized and designed to provide personalized, inclusive training pathways for disadvantaged groups such as NEETs, migrants, and inmates. Data were collected through document analysis, including project proposals, internal reports, technical documents and workshop materials produced during the design and prototyping phases.

Given the early stage of implementation, the analysis does not aim to evaluate results, but rather to conceptually explore how the Phygital approach can be operationalized as a model for social inclusion through entrepreneurial learning. The insights generated contribute to ongoing theory building and may serve as a foundation for future empirical investigations across a variety of socio-economic and institutional contexts.

3. Theoretical Background

Although digital transformation and new digital business models have significantly influenced various sectors, academic research has only lately commenced a systematic investigation of digitization, digitalization, and digital transformation (Venkatraman, 2017; Verhoef *et al.*, 2021). User behavior has undergone significant changes due to digital transformation, with online buying and digital touchpoints becoming essential components of each kind of experience (Kannan & Li, 2017). Digital transformation is especially crucial for established organizations, since they encounter difficulties in assimilating new digital business models due to legacy limitations (Markides, 2006; Christensen *et al.*, 2016). Some organizations are progressively undergoing digitization and

digitalization, while others face the threat of obsolescence if they do not adapt (Teece, 2010). This transformation allows organizations to utilize digital technologies for cross-border interactions (Singh & Hess, 2017), thereby fostering the achievement of a competitive advantage through the enhancement of existing core competencies or the creation of new ones (Liu *et al.*, 2011).

Recent search and social media tools have enabled users to be more interconnected and knowledgeable (Lamberton & Stephen, 2016; Verhoef *et al.*, 2017). Digital platforms currently enable co-creation, allowing consumers to build and customize items, engage in last-mile distribution activities, and share product feedback (Grönroos & Voima, 2013; Beckers, van Doorn, & Verhoef, 2018). The intersection between digital transformation and education has attracted increasing scholarly interest in recent years, as digitalization becomes a key enabler of inclusive learning practices. At the heart of this convergence, Phygital learning models propose hybrid solutions that integrate the personalization capabilities of digital tools with the human-centered value of in-person support, particularly in fostering re-skilling and up-skilling pathways for marginalized groups.

By incorporating these principles in aims of social inclusion, the Phygital Hub approach visualizes and edit the digital customization for socially disadvantaged populations of NEETs, migrants, prisoners, and people with disabilities. An arficial Intelligence (AI) -based data platform assess user data to tailor learning path, ensuring that academic content aligns with individual growth and needs. Augmented Reality (AR) technologies intensively enhance personalization, while community-oriented physical hubs provide essential face-to-face support (Silvia *et al.*, 2023). While augmented reality enhances immersion and personalization, its link to digital agility lies in enabling users to rapidly adapt to new interfaces and learning scenarios, thus fostering organizational responsiveness

Digital agility, which is the ability to detect and leverage opportunities offered by digital technology, is vital for survival in today's fast-paced markets (Lu & Ramamurthy, 2011; Tallon & Pinsonneault, 2011; Lee *et al.*, 2015). Organizations using this capability adapt to changing users demands and technological upheaval quickly (Chakravarty *et al.*, 2013). Managing the complexities of digital transformation requires organizations to constantly reconfigure their existing digital resources and capabilities (Lavie, 2006; Eggers & Park, 2018; Romano et al, 2021). Digital agility in Phygital Center drives integration between digital assets and organizational resources towards creating innovative business models and training programs (Sambamurthy *et al.*, 2003; Teece, 2010; Karimi & Walter, 2015). This approach can foster continuous improvement, ensuring that educational programs remain relevant, impactful, and accessible to underserved communities.

Digital networking capabilities enable learners to engage across geographical boundaries (Libert *et al.*, 2016; Koch & Windsperger, 2017). Phygital Centres strengthen their outreach through structured collaborations with schools, businesses, and public institutions, positioning themselves as strategic nodes within broader education and social inclusion policies. This transition is supported by big data analytics, which facilitate informed decision-making through systematic access to and interpretation of learning data (Loebbecke & Picot, 2015; Dremel *et al.*, 2017). Addressing the challenges of digital transformation (Eggers & Park, 2018; Sklyar *et al.*, 2019) requires an evolution of the Information Technology (IT) function toward active contribution in educational value creation (Leonhardt *et al.*, 2017). In this perspective, key performance indicators (KPIs) must go beyond traditional economic metrics, incorporating measures of engagement, inclusion, and learning effectiveness (Verhoef *et al.*, 2016). Within Phygital Centres, KPIs are redefined to reflect both individual-level outcomes-such as participation, completion, and employability-and system-level objectives aligned with scalable and inclusive policy frameworks (Verhoef *et al.*, 2015; Lemon & Verhoef, 2016).

Digital and physical components are intertwined not only to enrich user experience but also to optimize resource efficiency. Through ICT-enabled delivery and localized support, Phygital experience reduce educational costs while maintaining high-touch engagement that can make a critical difference in learner success (Mele *et al.*, 2023); technology-based platforms offer scale and flexibility, they often lack the personal engagement needed to ensure participation and retention. The phygital model overcomes this limitation by integrating both modalities within a unified system,

combining the benefits of digital content with the social presence provided by physical environments (Del Vecchio *et al.*, 2023).

In vocational training, for instance, the phygital model enables learners to complete online simulations and theoretical modules while participating in hands-on workshops. This is especially valuable for groups such as inmates, NEETs, and migrants, who benefit from digital inclusion but also require social interaction and practical skill-building (Gelsomini *et al.*, 2021). Educational phygital models are evolving alongside service systems, as both increasingly rely on personalization and hybridization.

These thematic trends have been identified through a Structural Topic Modeling (STM) analysis based on a systematic literature review by Virgillito *et al.* (2024). Seven key domains emerged where phygital applications are gaining relevance: (1) Metaverse; (2) Health Technology, Cultural Heritage, and Gaming; (3) Fashion & Luxury; (4) Customer Experience; (5) Education; (6) Tourism; and (7) Retail Experience. Among them, the education domain is particularly relevant to this study, representing a convergence of technological innovation and inclusive pedagogy.

Phygital education merges traditional classroom techniques with digital learning, surpassing the purely digital models adopted during the pandemic and reconfiguring both teaching and learning roles (Zaitseva *et al.*, 2023). It is particularly suitable for Generation Z, often referred to as the phygital generation. Researchers in the educational field are increasingly exploring how this approach enhances instructional effectiveness.

Existing studies demonstrate that phygital surroundings can enhance the teaching process in several ways (Fonseca & Mealha, 2022; Del Vecchio *et al.*, 2023; Zaitseva *et al.*, 2023). They support innovative methods, such as using smartphones for collaborative learning or phygital textbooks for immersive experiences that foster active participation.

This aligns with the broader goals of Entrepreneurial Education (EE), which aim to prepare learners to be adaptable and opportunity-oriented. EE is intended not only to build entrepreneurial competencies (Gibb, 2005; Nicotra *et al.*, 2021) but also to improve student engagement, motivation, and perceptions of educational relevance (Malsch & Guieu, 2019). As the nature of work continues to evolve, EE becomes crucial to building employability and resilience.

Within this framework, the Phygital Hub emerges as a practical model for integrating theoretical knowledge with experiential learning. Its digital dimension ensures accessibility and flexibility, while its physical spaces support mentoring, professional networking, and problem-solving. This is especially relevant for disadvantaged groups, enabling them to develop the cognitive and applied skills needed to enter entrepreneurial ecosystems.

Finally, the phygital perspective resonates with experiential learning theories, which emphasize the importance of action and reflection in educational processes (Mele *et al.*, 2021). By anchoring learning in both digital and real-world contexts, Phygital Hubs bridge the gap between education and employment, facilitating direct pathways into the labor market-particularly for those facing systemic exclusion.

4. Key Technologies Driving Phygital Experiences

The technological infrastructure of the Phygital Centre is built around three core components: artificial intelligence (AI), augmented reality (AR), and immersive environments. These technologies, integrated within a cloud-based and adaptive architecture, enable the delivery of personalized, scalable, and inclusive learning experiences for disadvantaged groups.

AI serves as the backbone of the personalization process. By analyzing behavioral data, performance indicators, and individual learner profiles, AI systems support the creation of customized educational pathways. This continuous adaptation helps maintain learner motivation, reduces the risk of dropout, and allows content to evolve in real time, in line with each learner’s progress (Pironti,

2022; Bini *et al.*, 2023). In the context of the Phygital Centre, AI is not just a digital tool, but a strategic enabler that aligns educational goals with personal and professional development needs.

Augmented reality further enhances the experience by layering digital information onto physical spaces, creating interactive, multisensory learning environments. AR has proven especially effective in vocational contexts, where learners can practice real-world tasks in virtual form before applying them in hands-on settings (Damala & Stojanovic, 2012; Mele & Russo-Spena, 2022). This lowers cognitive and emotional barriers, particularly for learners who may feel excluded from formal education. AR also fosters inclusivity through features such as real-time language translation and adaptive visual content.

In addition to its immersive capabilities, AR strengthens what is often called digital agility-the capacity to engage effectively with evolving technologies and digital platforms. This competency is crucial for groups who have had limited exposure to digital environments and need to build confidence and fluency in navigating digital learning systems (Lu & Ramamurthy, 2011; Lee *et al.*, 2015). In this sense, AR contributes not only to content delivery but also to broader digital empowerment.

Immersive technologies such as virtual reality (VR) and mixed reality (MR) add another dimension to the Phygital Centre's approach. These tools enable learners to simulate complex tasks and professional scenarios in safe, controlled environments. From healthcare to logistics, immersive learning supports both technical skills and soft competencies such as decision-making and emotional regulation (Jung *et al.*, 2015; Kandemir *et al.*, 2024). When combined with in-person mentoring and peer learning, these experiences reinforce the hybrid model that defines the Centre.

Supporting this entire technological system is a semantic and cloud-based infrastructure that ensures interoperability, scalability, and real-time responsiveness. Natural Language Processing (NLP) plays a central role in organizing and simplifying learning content, extracting key concepts, and adapting materials to different linguistic and cognitive needs (Roll & Wylie, 2016). This functionality is particularly important for learners with low literacy levels or language barriers, who often require content mediation to access training opportunities meaningfully.

Altogether, the technologies embedded in the Phygital Centre form a coherent and socially oriented infrastructure. Rather than being used as ends in themselves, they function as integrated resources that support learning personalization, inclusion, and empowerment. By aligning technological innovation with educational accessibility, the Centre redefines how digital transformation can serve social impact.

4.1 Technological Infrastructure for Phygital Customization: Augmented Reality and Immersive Reality

The Phygital Center uses Artificial Intelligence (AI) to provide a personalized learning experience. AI algorithms process a massive number of data points (such as user interactions, performance metrics, and demographic data) to formulate personalized learning tracks for each student (Pironti, 2022). This ensures that the Phygital Hub can continuously adapt its educational content according to the evolving needs of its user base.

For instance, AMELIA (Advanced Multidimensional Environment for Learning, Innovation and Acceleration) - the Data Knowledge Platform Ecosystem which support the collection and processing of data for the GRINS Project - leverages AI to enhance accessibility for a diverse user base with varying levels of technical expertise. Its interface facilitates data visualization through interactive charts, maps, and dashboards, ensuring that information is easily interpretable. By generating customized reports and insights tailored to stakeholders such as small and medium-sized enterprises (SMEs), local administrations, and academic researchers, AMELIA facilitates evidence-based decision-making. This functionality is particularly critical in addressing fragmented and inconsistent data sources through advanced geo-referenced analytics, thereby enabling local governments to optimize resource allocation and design targeted interventions to reduce socio-economic disparities.

This ongoing customization is particularly useful for disadvantaged learners who may struggle more than others in some areas, but may also accelerate faster than others in other areas. The Phygital Centre, providing a customized learning experience, increases the chances that learners will stay motivated and finish their programs (Silvia *et al.*, 2023).

The application of AI in education is based on the theories of adaptive learning, which posits that educational content should be customized to each individual learner's needs and learning style. Not only does this enhance learner outcomes, it also increases the overall efficiency of the educational system as fewer resources are being wasted (Bini *et al.*, 2023).

Immersive Reality expands the spectrum of fully immersive digital experiences such as Virtual Reality, which simulates a real-world environment, and Mixed Reality (MR), which combines both real-world and digital elements. In immersive reality, the "real world" could be a bit hidden, because of full immersion in a digital environment. In contrast, immersive reality can bring the magic and immersive experience while exploring new landscapes, but phygital experience can bring interaction to interact in real time with the physical world. It is imperative to understand the difference between augmented reality and immersive reality, especially in areas that could benefit from these technologies to enhance learning and connectedness, such as health care, education and community events. As tech continues to develop at a break-neck pace, it becomes critical to understand the difference between augmented reality and immersive reality. These two technological catalysts lay the foundations for a "phygital" experience that blends the digital and physical realms in a fluid, engaging manner. Augmented reality is the superimposition of computer-generated images or information, such as data, onto the physical world. Smartphones or smart glasses, devices that enable the perception of these digital elements, facilitate the deployment of this technology. Augmented reality has been discussed as a technology primarily aimed at enhancing the real world experience through the addition of novel elements or details without compromising on essential authenticity (Kandemir *et al.* 2024).

This demands for robust technological infrastructure that can derive insights from data to increase the personalization of educational services and the data-dictionary assumes this role. It takes a data-driven approach to analyze data across a spectrum of different sources to provide educators with a holistic view of their learners' progress, needs, and preferences, allowing for ongoing optimization of content and delivery. Such information is especially useful within phygital environments, where in-the-moment content customization is essential to learner success. This level of personalization is particularly beneficial for additionally disadvantaged groups of young people, especially given their low levels of success in formal education systems (Mele *et al.*, 2023).

As the sensitive nature of data gathered from disadvantaged learners, it is very important to maintain security and privacy. It should be aligned with stringent data protection structures, like GDPR, and have high-end security mechanisms preventing data leak, ensuring privacy. This guarantees the platform is safe and reliable by utilizing encryption technologies, secure data storage solutions, and conducting regular security audits. Besides technical-security protections, the Phygital Hub will need to ensure that learners are fully aware of their data usage and have the right of control over their personal data. Such transparency is crucial to building trust with learners, especially those who come from disadvantaged backgrounds and are thus more susceptible to data exploitation (Silvia *et al.*, 2023).

4.2 Impact on Social Inclusion

The Phygital Hub is outlined as a transformative social inclusion model, targeted at overcoming the structural obstacles that prevent access to education, vocational training and entrepreneurship for disadvantaged communities as NEETs, immigrants, or inmates. The model integrates digital learning platforms with physical community hubs, thus providing a hybrid solution to offer both technology immersion and human interest exploration. NEETs receive agile, skill-based education, matching market requirements and increasing employability. It also offers tailored language, legal and

vocational programs for migrants to help their integration into both labor and society (Buzek & Scheuplein, 2022). Eventually, prisoners are able to attend virtual simulations, classes, and mentorships, which increases their chances of becoming acquitted once released from prison. Based on community engagement and using artificial intelligence (AI) to tailor the learning process to the individual learner, the Phygital Hub encompasses a myriad of initiatives: in addition to providing technical and entrepreneurial skills, it builds a sense of community and empowerment and shows promise as a replicable, scalable intervention for marginalized populations (Jones *et al.*, 2023).

5. GRINS Case Study: Successful Customization for Disadvantaged Groups

In GRINS, the innovative implementation of the Phygital Centre aims to promote social and economic inclusion of disadvantaged groups by integrating digital solutions with face-to-face involvements for customized re-skilling and up-skilling educational pathways for economic independence and social inclusion.

We recognize a significant gap within the province of Catania that seeks to cover social and educational struggles of marginalized people, through an entrepreneurial educational intervention model that is scalable and offers strong empirical evidence of positive impact. Several case studies demonstrate the success of customized phygital learning environments for disadvantaged groups. The project focuses on blending of digital content with in-person supports to give learners the ability to engage with educational resources at their own pace through mentorship.

Another interesting use of phygital tools is the one for training inmates in vocational programs. These programs use digital replicas of real world tasks that traditional behavioral entrepreneurism can help with and combine it with in-person workshops to get inmates the skills to re-enter society and the workforce post-release. This balanced approach of theory and application, within a spacious and accommodating environment, guarantees preparedness to join the workforce, as well as to face the challenges of reintegration (Mele *et al.*, 2023).

This Phygital Centre is structured around two key components (a) digital learning platforms and (b) physical community hubs to deliver personalized educational content to target audiences based on their individual needs and progress, as disadvantaged groups, including NEETs, migrants, inmates. The physical hubs, meanwhile, provide spaces for in-person mentorship, practical training, and peer-to-peer interaction.

It should be noted that Phygital Centre offers a comprehensive digital data dictionary based on a carefully organized collection of data sets classified in different categories. Consequently, target audiences identified above are able to receive and utilize personalized contents.

The use of AI in the Phygital Centre aligns with the broader theoretical principles of adaptive learning, which suggest that educational content should be tailored to the individual learner's needs and learning style. By offering a personalized learning experience, the project increases the likelihood that disadvantaged learners will remain engaged and complete their courses (Silvia *et al.*, 2023). Furthermore, the strongly based on AI customization contributes to create a tailored learning experience inside the Phygital Centre in terms of re-skilling and up-skilling, which is one of the key elements of the model of action designed and implemented to support and encourage the development of an entrepreneurial attitude to enhance social inclusion. The focus on NEETs, inmates, and migrants reflects the project's commitment to addressing the needs of some of the most marginalized groups in society.

By focusing on practical, vocational training, the Project ensures that learners are prepared with the skills necessary to thrive in the workforce. This benefits their individual outcomes, while also supporting the broader goal of creating a more inclusive, equitable society (Mele *et al.*, 2023).

GRINS Phygital Centre in Catania was intentionally designed as a scalable, replicable model that can be applied to other territorial contexts, especially those in which it is necessary to improve the entrepreneurial approach to accelerate socio-economic development. The available modules make the

project highly adaptable to varied societal and economic settings, presenting a national strategy to tactics addressing social and educational issues. By partnering with local governments, NGOs, and private enterprises, this Phygital Centre aims to expand its reach and impact, creating a network of Phygital centres that serve disadvantaged groups across the country.

Going into more detail, to effectively structure personalized learning paths based on the needs of the target categories, that is disadvantaged groups as NEETs, migrants, inmates, the Phygital Centre will equip itself with a software platform that will fulfill the functions of Data Dictionary with structured data from relational databases, semi-structured data from web pages, social media feeds, raw feed directly from a sensor source, geospatial, e-mail, etc., or unstructured data from video, images, audio, clicks. Data dictionary, in fact, is defined as a centralized repository containing details about the data, including its meaning, links to other data, origin, usage, and format. Data dictionaries are vital for various data management activities, such as facilitating data conversion, testing data generation, validating data, and documenting data usage criteria (Rashid *et al.*, 2020).

The platform (deep tech knowledge management system) required to support the work of the Phygital Centre in Catania should be capable of acquiring, delivering and distributing knowledge in SaaS (Software as a Service) mode in the cloud, respecting the requirements of scalability, security and interoperability between multiple devices (PCs, smartphones and tablets, etc.) and using advanced natural language processing (NLP) technologies. It must be able to acquire text documents of various formats and from various sources for the construction of the “data dictionary”.

It also must use NLP algorithms to perform operations for: the automatic identification and structuring of key concepts, entities, relations and topics; the automatic grouping of documents based on their semantic affinity; the addition of metadata and semantic links to increase the information value of the contents; the automatic transformation of complex contents into more understandable versions, maintaining semantic integrity; the information extraction, thematic clustering, semantic enrichment, simplification and advanced indexing to facilitate rapid and relevant searches.

This platform will perform a generative synthesis capable of automatically generating summaries of the acquired documents, with the possibility of customizing the desired level of detail and producing personalized textual contents based on specific requests. It will also provide a multimedia layer for the presentation of the contents and a user-experience that allows the matching between the acquired knowledge contained in the “data dictionary” and the user profile to offer an active, immersive and collaborative learning experience.

In such way, this digital platform represents the core of the Phygital Centre for training and empowerment through the personalized delivery of information contained in the “data dictionary” with respect to the specificities of the target and consistent with the physical and digital context of use. It provides user analysis for the identification of objective targets and clustering consistent with the reference context to ensure the customization of the activity provided by the platform also in light of the recognition of work skills for the creation of occupational profiles and job orientation through specific training and work paths.

Besides this, it provides a frontend for administrative use (admin console) that allows convenient editorial management of platform content, for uploading and adding textual information (e.g. captions, alt text, labels) and for managing the multimedia content creation service (video, animated presentations, podcasts, webinars). Such content and information must also be able to be managed via API services, drawing from a storage cluster and ensuring content management from external consoles.

Additional services provided by the platform will be a simultaneous translation tool to overcome language barriers; secure digital identities for undocumented people (e.g. migrants, homeless); a data dictionary query tool via chatbot; a digital user experience through the use of Virtual Reality (VR) and Augmented Reality (AR) solutions for the provision of interactive and gamification content, as well as the simulation of technical-manual activities, the creation of virtual and metaverse experiences with the creation of virtual spaces, virtual tutoring activities, emotional support and verification of learning progress with interactive quizzes and certification of achieved results.

5.1 Social and Economic Impact of the GRINS Phygital Centre

The main social impact of the GRINS Phygital Centre is the enhancement of educational and training opportunities for target groups. Through flexible learning paths on the Centre, socio-economic and other barriers to learning are diminished and such possibilities further help learners in the pursuit of quality of life. This is especially true for groups like NEETs, inmates, and migrants who have been traditionally excluded from conventional teaching settings (Schneider, 2021).

Besides that, this Phygital Centre contributes to improving the educational results, as well and greater social inclusion. The Centre reduces the social gap and promotes workplace education by equipping learners with the skills that are required to have confidence for joining the workforce. This is consistent with more inclusive social theories that suggest it is crucial for marginalised people to have access to and be woven into dominant economic and social systems (Silvia *et al.*, 2023).

It is well documented that socio-economic empowerment occurs most effectively when provided through education in entrepreneurship, as this approach is most beneficial to those most disadvantaged in society. The Phygital Centre opens a direct path to economic participation by training learners to create and manage their own businesses. Such business acumen is especially useful to NEETs and prisoners who may find it more difficult to identify traditional routes into employment, and instead can craft their own by embarking into entrepreneurship.

Additionally, the Phygital Centre's emphasis on Entrepreneurship Education ties directly into wider theories of economic development, which posits that encouraging innovation and entrepreneurship is a crucial means of driving local economy and creating employment opportunities (Nozdreva *et al.*, 2023). The Centre is contributing to long-term economic growth and stability by preparing underprivileged learners for success in the digital economy. Phygital education is not only beneficial to learners but long-term it benefits also the society since it also stimulates local economies, particularly in underserved areas, by increasing educational attainment and fostering entrepreneurship. Because of this, employment, income levels and overall economic stability tend to rise (Schneider, 2021).

Moreover, the Phygital Centre's focus on customization guarantees that the educational services offered align directly with the requirements of the local economy. The link between education and economic development is essential for the sustainable existence of both the Centre and the communities (Mele *et al.*, 2023).

To assess the impact of these interventions, the GRINS evaluation framework integrates a set of both qualitative and quantitative key performance indicators (KPIs). These go beyond traditional metrics to capture multidimensional outcomes. The Digital Skill Uplift Score (DSUS), based on the DigComp framework (Vuorikari *et al.*, 2016), measures improvements in learners' digital competencies across key dimensions such as content creation, data literacy, and online collaboration. The Organizational Learning Capacity Index (OLCI) evaluates the Centre's ability to incorporate feedback and adapt its educational strategies dynamically (Jerez-Gómez *et al.*, 2005). Additionally, the Stakeholder Participation Rate (SPR) tracks the involvement of external actors-such as NGOs, SMEs, and local authorities-in co-designing educational paths and delivering support services (Liu *et al.*, 2019).

These indicators serve a dual purpose: they enable continuous monitoring of learner progress and engagement, while also assessing the strength of the broader educational ecosystem and the effectiveness of cross-sector partnerships. In doing so, the GRINS Phygital Centre positions itself not only as a space for individual empowerment but as a platform for structural inclusion and shared innovation.

5.2 Challenges in implementing the Phygital Centre

Equitable access to technology is one of the key challenges while implementing the Phygital Centre. Many marginalized and disadvantaged groups within the population, especially those living

in rural or impoverished regions, lack access to the digital infrastructure needed to engage meaningfully in online learning. The Centre must collaborate with government agencies, NGOs, and private sector partners to develop low-cost or subsidized technology solutions to address this challenge (Mele *et al.*, 2023).

The long-term success of the Phygital Centre depends on effective stakeholder engagement and alignment with national policies. Maintaining robust collaboration with government agencies, private sector actors, educational institutions, and NGOs is imperative to ensure both financial sustainability and operational effectiveness (Nozdreva *et al.*, 2023).

Furthermore, continuous innovation is essential for the Centre to retain its relevance in an evolving digital landscape. As technological advancements reshape educational paradigms, the Phygital Centre must remain agile and responsive, continuously adapting its educational methodologies and service offerings to meet emerging needs. By adopting an iterative and data-driven approach to program development, the Phygital Centre can reinforce its position as a leading model for digital education, social inclusion, and workforce integration (Mele *et al.*, 2023).

6. Propositions and expected results

The model utilizes customization enabled by AI and community-based learning spaces, providing a scalable and adaptable framework for empowering disadvantaged individuals. While Phygital Centre serves as an initial case study, its successful implementation may provide insights into the replication of the model in other regions.

Phygital Centre serves as a tangible example of how the theoretical principles discussed in this article can be applied in practice to foster social inclusion and educational equity. By combining digital accessibility with physical engagement, the project offers a pathway to reintegration for some of the most vulnerable members of society. This hybrid interaction model establishes the foundation for the dissolution of the numerous communication barriers that affect the project's target groups, including NEETs and other disadvantaged groups, to varying degrees and with distinct characteristics. In short, GRINS helps build a strong and sustainable knowledge ecosystem in Italy.

The platform plays an indispensable role in fostering resilience and inclusiveness, facilitating the development of quantitative, data-driven approaches in a field, namely the socio-economic field, which has heretofore been primarily governed by qualitative sources.

As it expands, Phygital Centre will demonstrate its scalability, offering a blueprint for other cities seeking to address similar social and educational challenges.

Moreover, the establishment of the Phygital Centre demonstrates GRINS's dedication to developing tangible instruments for inclusiveness by providing pathways for previously marginalized individuals to gain the competencies required for integration into the labor market, thus facilitating the process of cohesive and inclusive development within our country.

To perform these objectives, working on Entrepreneurial Education in the Phygital Centre, three propositions will be verified, arising from the previous discussion:

1. AI-driven customized learning paths, in Entrepreneurial Education, are more effective in increasing knowledge and skills of target audiences.
2. Customized Entrepreneurial Education in a Phygital Centre, supported by AI, Augmented Reality and Immersive Reality, increases entrepreneurship attitudes in target audiences.
3. The more the entrepreneurial attitudes of disadvantage groups, the more their economic independence and social inclusion.

Assessing such propositions, Phygital Centre could be identified as a significant contributor to the mitigation of disparities, faced by numerous marginalized individuals. The hybrid nature of the Phygital Centre can ensure that learners acquire not only theoretical knowledge but also develop practical skills, and above all, an entrepreneurial attitude, essential for successful entry into the job market.

The dual-channel approach enhances employability, particularly for those who may not thrive in conventional educational settings (Nguyen *et al.*, 2021). By facilitating collaborations with the Grins Project, the Centre also ensures that training aligns with labor market demands, creating clear pathways to employment and entrepreneurial opportunities. Beyond employment, the Phygital Centre fosters economic independence through "entrepreneurial attitude education". By integrating business training, it empowers learners to develop projects, manage finances, and navigate the complexities of the market. From a policy perspective, the Phygital Centre offers a scalable and adaptable model that can be tailored to various regional and socio-economic contexts. Its flexibility allows policymakers to implement targeted interventions that directly address local labor market conditions and educational needs.

7. Conclusions, limitations and managerial/policy implications

This study presents a conceptual and practice-oriented reflection on the Phygital Centre developed within the GRINS project, emphasizing its potential to foster social inclusion and economic empowerment among marginalized populations. While the Centre offers an innovative blueprint for hybrid, AI-enabled entrepreneurial education, it remains in its developmental phase, with full implementation expected by 2025. As such, this contribution draws from theoretical models and project documentation rather than empirical data. Future research should focus on longitudinal evaluations of the Centre's impact, including learner outcomes, labor market integration, and replicability across diverse socio-economic and cultural contexts.

The Phygital Centre goes beyond the scope of traditional educational initiatives, positioning itself as a strategic enabler of inclusive growth. By integrating AI-driven customization with community-based learning and multistakeholder partnerships, it introduces a dynamic and context-aware educational infrastructure. This infrastructure is designed to address structural inequalities while enhancing local capacity for innovation and entrepreneurship. Its success, however, relies on effective governance, continuous technological renewal, and policy frameworks that support flexible, hybrid learning systems.

From a managerial perspective, the implementation of the Centre requires a responsive approach to stakeholder engagement, service innovation, and infrastructure development. This includes the establishment of robust collaborations among governmental bodies, educational institutions, civil society organizations, and private sector actors. Operational agility is essential: the Centre must continuously adapt to emerging digital technologies and shifting labor market demands while ensuring accessibility for users with varied levels of digital proficiency.

Ensuring the sustainability of the Phygital Centre also entails maintaining a secure and interoperable digital infrastructure, compliant with data protection regulations such as the General Data Protection Regulation (GDPR). Attention must be given to the user experience, particularly in the design of inclusive and intuitive interfaces that enable meaningful participation. Accessibility via mobile devices and multilingual functionalities are further levers for reducing digital exclusion.

To sustain long-term growth, the Phygital Centre must adopt an agile and scalable operational model (Nguyen *et al.*, 2021). Achieving this will require a careful balance between online and offline learning, allowing learners to transition seamlessly between digital courses and physical mentorship sessions. It is imperative to evaluate success beyond traditional performance indicators. While completion rates and employment outcomes are valuable metrics, assessing the economic and social impact of entrepreneurial initiatives developed through the Centre is equally crucial.

The latter evaluation will also be fundamental with respect to the pursuit of the third mission strategic objectives in the perspective of the Entrepreneurial University and its impact on the entrepreneurial ecosystem to empirically analyze the effectiveness of such connections.

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The Role of Private Equity Sponsorship in Private Debt Financing: Evidence from Italian Firms

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Abstract

Frame of the research. *Private debt (PD) has emerged as a key financing alternative, yet determinants of PD investments remain underexplored. This study investigates the conditions at the target level for which PD investors seek private equity (PE) backing as a credibility signal for PD investors.*

Purpose of the paper. *The paper aims to analyze the determinants of PE sponsorship in PD transactions, examining whether PD investors look for PE-backed firms when target companies exhibit specific financial and performance characteristics.*

Methodology. *Using a proprietary dataset of 326 Italian PD deals from 2014 to 2024, we employ logistic regression models to assess the relationship between firm size, performance, indebtedness, liquidity, and the likelihood of PE sponsorship in PD transactions.*

Results. *PD investors are more likely to seek PE-backed firms when target companies are smaller, less profitable, and more leveraged, while liquidity does not significantly impact sponsorship probability.*

Research limitations. *The study is limited to Italian firms, restricting generalizability. Further research is needed to explore PD firms' investment selection process and post-investment performance with and without PE backing.*

Managerial implications. *Understanding the determinants of choosing PD target companies is relevant for policymakers, practitioners, and entrepreneurs.*

Originality of the paper. *This study contributes to the literature by providing empirical evidence on the determinants of PE sponsorship in PD investments, addressing a gap in research on non-bank financing dynamics.*

Key words: *Private Debt; Direct Lending; Private Equity; Italian firms*

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1. Introduction

In the wake of the recent global financial crisis, there has been a significant shift from bank lending to nonbank lending, driven by increasing regulatory constraints on traditional financial entities (Ivashina and Scharfstein, 2010; Martynova and Perotti, 2018). Consequently, nonbank financial intermediaries, especially private debt (PD) funds, have become prominent in corporate lending.

According to Preqin(1), PD has been one of the fastest-growing asset classes in recent years, reaching total assets under management (AUM) of $1.2tn in 2021. PD has emerged as an essential source of financing for private companies globally, offering an alternative to traditional bank lending, particularly for mid-market firms that often struggle to access credit from conventional financial institutions (Cumming *et al.*, 2019).

PD funds typically raise capital through closed-end funds (like private equity, PE) from institutional investors, including pension funds, insurance companies, and high-net-worth individuals, which they deploy through different strategies, such as direct lending, distressed debt lending, debt for LBOs, and venture debt lending (Böni and Manigart, 2022).

This work focuses only on direct lending, which involves a bilateral agreement between the lender and the borrower (Block *et al.*, 2024). Direct lending loans are typically cash-flow-based, focusing on firms with stable revenue streams but limited tangible collateral, in contrast to banks that predominantly engage in asset-backed lending (Buchner *et al.*, 2024; Block *et al.*, 2024).

Despite the growing importance of PD, several gaps remain in the academic literature.
Munday *et al.* (2018) study the performance of PD funds. They report that PD funds focusing on direct lending have outperformed the leveraged loan and high-yield bond markets on a risk-adjusted basis since 2004. Boni and Manigart (2022) report similar results on a larger, more recent sample. Cumming and Fleming (2013) use proprietary data provided by institutional investors and document the types and performance of PD securities. Block *et al.* (2024) surveyed both U.S. and European funds to deepen the knowledge about how PD investors source, evaluate, and monitor their financed companies, while Buchner *et al.* (2024) analysed the performance of PD investments and found that PD investments in companies without a PE sponsorship generate a premium, which compensates for higher risk and costs of risk mitigation as sponsorless lenders adopt a more hands-on approach emulating the role of PE.

A distinctive feature of PD markets is their close relationship with PE investors (Block *et al.*, 2024; Buchner *et al.*, 2024). Many PD transactions involve firms already backed by PE sponsors, as these firms benefit from more structured governance, financial discipline, and operational oversight. The presence of a PE sponsor can significantly enhance the structuring of loan agreements, facilitating stronger monitoring mechanisms and reducing the likelihood of default (Block *et al.*, 2024). Furthermore, PE-backed firms are often perceived as lower-risk borrowers due to the strategic guidance provided by their investors. Existing research has shown that PD funds often favour PE-backed firms due to the perceived governance advantages and financial discipline that PE investors impose (Block *et al.*, 2024) and practitioners claim that sponsorless lending generates higher returns arguably to compensate for the higher risk of investing without a VCPE sponsor (Nesbitt, 2019).

However, not all companies that receive PD financing are affiliated with PD. This raises questions about potential differences in the financial and performance pre-deal characteristics of firms that secure PD with or without PE involvement (Buchner *et al.*, 2024). To the best of our knowledge, no studies have examined the determinants of PE sponsorship in PD transactions.

This study analyses the characteristics of Italian firms receiving PD financing and investigates whether PD investors seek PE sponsorship as a signal of credibility. We assess how the probability of PE sponsorship in PD deals is shaped by the pre-deal characteristics of target companies, including size, performance, indebtedness, and liquidity. Italy represents a particularly compelling case study for private debt transactions due to its firms' structural reliance on bank credit, as national credit institutions represent the main source of external capital to local businesses, and the historical underdevelopment of alternative financing channels (Aristei & Gallo, 2016; Ricci *et al.*, 2023). Recent regulatory and market shifts have opened space for non-bank lenders, especially in support of SMEs (Gervasoni, 2014). This context offers a unique setting to analyze the growing role of private debt as a complement or substitute to traditional financing.

We find that PD investors look for PE sponsorship when target companies are smaller, less performing and more indebted. In contrast to our initial assumptions, results suggest that pre-deal target companies' liquidity levels do not reveal a significant relationship with the probability of PD investors looking for PE sponsorship.

Our research enhances the existing literature by offering new insights into how the involvement of PE sponsors in a firm's ownership structure may affect the investment decisions of PD funds. Specifically, this study builds on the limited body of work regarding PE-sponsored versus sponsor-less PD by examining whether PD investors are more inclined to finance companies with weaker financial and performance indicators when supported by a PE sponsor. The findings of this research will also deepen the understanding of the selection criteria of PD funds and provide valuable insights for policymakers, investors, corporate managers, and entrepreneurs navigating the evolving landscape of non-bank lending.

The remainder of this paper is structured as follows. In the next section, we outline the conceptual framework of our study and motivate our hypotheses. Section 3 describes the methodology and data sampling. Section 4 summarizes the results, and Section 5 concludes.

2. Hypothesis development

PD investors often seek mechanisms to mitigate risk, particularly in direct lending transactions where loans are primarily cash-flow-based rather than asset-backed (Buchner *et al.*, 2024; Block *et al.*, 2024). Unlike traditional banks, which rely on tangible collateral, direct lenders focus on firms with stable revenue streams but limited physical assets, making borrower quality and governance critical in lending decisions. Prior research highlights that PE sponsorship can enhance deal quality, reduce information asymmetries, and improve lender confidence (Gompers *et al.*, 2016; Block *et al.*, 2024). Through active governance and operational oversight, PE sponsors help alleviate concerns about mismanagement and financial distress. Empirical evidence further suggests that PD investors perceive PE-backed firms as more reliable borrowers, as demonstrated by the fact that almost 87% of U.S. investors are willing to lend a higher multiple of EBITDA when a PE sponsor is involved (Block *et al.*, 2024). This suggests that PE sponsorship is crucial in facilitating access to PD financing, particularly in riskier transactions.

Building on these insights, we examine whether PD investors actively seek PE sponsorship under specific pre-deal conditions that might otherwise heighten risk perception. We hypothesize that the likelihood of PE involvement increases when target firms exhibit financial and performance characteristics that make them riskier borrowers in a cash-flow-based lending environment.

First, we expect PE sponsorship to be more prevalent in smaller firms receiving PD investment (H1). Smaller companies typically have less established revenue streams, making their cash flows more volatile and unpredictable and increasing their failure risk and costs (Deis *et al.*, 1995). Lenders (including PD investors) prefer companies with stable cash flows that consistently meet debt obligations, and smaller firms might be more susceptible to external shocks or economic downturns. This increases the default risk, which makes lenders more cautious. Consequently, PD investors may view PE involvement as a signal of financial credibility and governance stability, compensating for the higher perceived risk.

H1: PD investors are more likely to seek PE sponsorship when target companies are smaller.

Second, we hypothesize that PE sponsorship is more likely when firms demonstrate weaker financial performance (H2). Firms with lower return on assets (ROA) may raise concerns regarding profitability and long-term sustainability (Beaver *et al.*, 2024). Since PE investors implement strategic and operational improvements, their presence can reassure PD lenders by signaling a commitment to value creation and financial oversight.

H2: PD investors are more likely to seek PE sponsorship when target companies are less performing.

Third, we anticipate that firms with higher pre-deal indebtedness are more likely to attract PE sponsorship (H3). High leverage increases financial fragility, potentially limiting a company's ability to take on additional debt due to a higher risk of failure. PD investors may seek PE-backed borrowers in such cases, as PE sponsors enhance financial discipline and restructuring capabilities, making further debt financing more viable.

H3: PD investors are more likely to seek PE sponsorship when target companies are more indebted.

Finally, we expect PE sponsorship to be sought in firms with lower liquidity levels (H4). Limited liquidity constrains a company's ability to manage short-term obligations, increasing the loan's risk profile. Since PE investors often provide financial and strategic support to improve cash flow management (Wilson *et al.*, 2022), their presence may alleviate lender concerns and facilitate access to PD financing.

H4: PD investors are more likely to seek PE sponsorship when target companies are less liquid.

Together, these hypotheses explore the conditions under which PD investors rely on PE sponsorship as a risk-mitigation mechanism in direct lending transactions, providing new insights into the interplay between borrower characteristics and investor preferences.

3. Methodology and data sampling

We study the antecedents of PE sponsorship in PD investments. We base our analyses on a unique dataset of PD deals undertaken in Italy between 2014 and 2024. The proprietary data in our sample are sourced by the Italian Association of Private Equity, Venture Capital, and Private Debt (AIFI), a key national player in the sector, delivering industry research services and bringing together financial institutions and professionals involved in alternative investments. AIFI granted us exclusive access to a dataset of 509 PD transactions representing almost the entire universe of Italian PD deals, with detailed transaction and investor-level information. From this initial sample, we filtered only first-time investments and manually added target-level economic, accounting, and financial data retrieved from AIDA, a widely used database with

comprehensive coverage of Italian businesses. This process left us with a final sample of 326 observations, each one representing a PD transaction.

We employ logistic regression analyses on our cross-sectional sample to test our hypotheses. Logit models are widely used in management and finance research to examine how the probability of a binary outcome is influenced by specific independent variables (Fuchs *et al.*, 2021; Singh and Hillemane, 2021; Wilson *et al.*, 2022; Estanol *et al.*, 2023). In our study, we estimate multiple logistic regressions where the dependent variable equals one if the PD transaction involved PE sponsorship and zero otherwise. More specifically, we investigate whether PD investors-who often perceive PE sponsorship as a signal of company quality-are more likely to invest in firms backed by PE under specific conditions. We assess how the probability of PE sponsorship in PD deals is shaped by pre-deal characteristics of target companies, namely size, performance, indebtedness and liquidity. Table 1 displays the list of variables and controls implemented in the model, while table 2 shows descriptive statistics.

In our probabilistic model, the odds represent the ratio of probability π to its complement 1- π, namely the probability of a PE sponsorship in the PD transaction compared to the likelihood of the opposite event. Our logit model consists of a logarithmic transformation of these odds, with the final regression as reported below:

$$ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta\, Target\ Size_{t-1} + \gamma\, Target\ Performance_{t-1} + \delta\, Target\ Indebtedness_{t-1} + \eta\, Target\ Liquidity_{t-1} + \varphi\, Control + \pi\, FE\ (Regional) + \lambda\, FE\ (Year) + \psi\, FE(Industry)$$

Tab. 1: Variables description

This table shows a detailed description for the variables used in the regression models.

Variable	**Description**
PE Sponsorship	Binary variable set to one if the PD transaction involved PE sponsorship and zero otherwise.
Target size: Total Assets$_{t-1}$	Numeric continuous variable equal to amount of Total Assets of the company subject to the PD transaction one year before the deal.
Target size: Number of employees$_{t-1}$	A numeric integer variable equal to a number of employees of the company subject to the PD transaction one year before the deal.
Target performance: ROA$_{t-1}$	Numeric continuous variable equal to the Return on Assets of the company subject to the PD transaction one year before the deal.
Target performance: EBITDA margin$_{t-1}$	Numeric continuous variable equal to the EBITDA Margin (EBITDA/Sales) of the company subject to the PD transaction one year before the deal.
Target indebtedness: Indebtedness index$_{t-1}$	Numeric continuous variable equal to the indebtedness index of the company subject to the PD transaction one year before the deal.
Target liquidity: Cash/TA$_{t-1}$	Numeric continuous variable equal to the ratio of Cash to Total Assets of the company subject to the PD transaction one year before the deal.
Control: Target age	Numeric integer variable equal to the difference between the year of the transaction and the year in which the target company was founded.
Fixed effect: Regional	Categorical variable representing the geographical location of the company subject to the PD transaction according to the Italian NUTS territorial units. 1 = Northwest; 2 = Northeast; 3 = Centre; 4 = South; 5 = Islands.
Fixed effects: Industry and Year	Fixed effects to account for the industry in which the target subject to the PD transaction operates and the year in which the deal is undertaken.

Source: authors' elaboration

Tab. 2: Variables descriptive statistics

This table shows descriptive statistics for the main variables used in the regression models.

Variable	**Mean**	**Median**	**St. Dev.**
Target size: Total Assets$_{t-1}$	91,753.11	15,611.52	222,812.30
Target size: Number of employees$_{t-1}$	423.77	74	1978.59
Target performance: ROA$_{t-1}$	4.09	3.79	13.49
Target performance: EBITDA margin$_{t-1}$	9.94	8.28	19.53
Target indebtedness: Indebtedness index$_{t-1}$	0.71	0.73	0.21

Source: authors' elaboration

4. Results

Table 3 displays the results of our logistic regressions. Models 1, 2, and 3 test our three main hypotheses by progressively adding regressors on target pre-deal size (Model 1), performance (Model 2), and indebtedness and liquidity (Model 3).

Tab. 3: Logistic regression models

This table shows the results of the regression models 1 (HP 1), 2 (HP 2), and 3 (HP 3 and HP 4).

	Dependent Variable: PE sponsorship		
	(1)	(2)	(3)
Target Size: Total Assets (log)$_{t-1}$	-0.281***	-0.200***	-0.255**
	(0.104)	(0.110)	(0.117)
Target Size: Number of employees (log) $_{t-1}$	-0.046	-0.012	-0.063
	(0.105)	(0.109)	(0.116)
Target Performance: ROA $_{t-1}$		-0.006***	-0.006***
		(0.002)	(0.002)
Target Performance: EBITDA Margin $_{t-1}$		-0.002	-0.002
		(0.002)	(0.002)
Target Indebtedness: Indebtedness Index $_{t-1}$			0.020**
			(0.009)
Target Liquidity: Cash/Total Assets $_{t-1}$			-0.000
			(0.000)
Target Age	-0.329*	-0.300	-0.260
	(0.181)	(0.185)	(0.009)
F.E. Regional	Yes	Yes	Yes
F.E Industry	Yes	Yes	Yes
F.E Year	Yes	Yes	Yes
Observations	326	326	326
Pseudo R^2	0.178	0.210	0.226

Note: * p < 0.10, ** p < 0.05, *** p < 0.01

Multiple diagnostic tests assessed the logistic regression models' goodness of fit, confirming that the predicted probabilities aligned well with the observed outcomes. Additionally, heteroskedasticity was tested and ruled out, making robust standard errors unnecessary.

5. Discussion

Results in Table 3 indicate that PD investors are more likely to seek PE sponsorship when target firms exhibit specific pre-deal characteristics.

More specifically, PE sponsorship is more likely to be observed when target companies are smaller. Indeed, the negative and significant coefficient for the Total Assets regressor across all models suggests that PD investors are more inclined to seek PE involvement as a signal of company quality for firms displaying fewer assets. This pattern is consistent with the notion that firm size is inversely related to bankruptcy risk (Dhawan, 2001). Consequently, when the target company size is smaller, the risk associated with the transaction increases, making PD investors more reliant on PE sponsors as an additional layer of credibility and financial oversight to mitigate uncertainty.

This same logic applies to the test of our second hypothesis, which confirms that PE sponsorship is also sought when target companies exhibit lower performance, as measured by their Return on Assets (ROA). A lower ROA indicates weaker profitability and potentially higher financial fragility, raising concerns about the company's ability to generate sufficient cash flows to meet its debt obligations. In such cases, PD investors may perceive PE backing as a mitigating factor, as PE sponsors typically implement strategic and operational improvements to enhance performance and ensure financial sustainability. Additionally, a PE investor may signal confidence in the firm's prospects, reassuring debt providers that corrective measures will be taken to restore profitability. Thus, in both cases-lower asset bases and weaker profitability-PD investors appear to rely on PE sponsorship as a form of implicit risk mitigation.

Similarly, the positive and significant coefficient for the indebtedness index of the target company further supports the notion that PD investors actively seek PE sponsorship in riskier financing conditions. Higher levels of pre-deal indebtedness indicate that a firm is already highly leveraged, which can raise concerns about its ability to take on additional debt and meet future repayment obligations. In such cases, the presence of a PE investor serves as a reassuring factor, signaling that the company has financial backing and that active governance mechanisms may be in place to support long-term stability. Moreover, PE sponsors often bring operational expertise and restructuring capabilities that can help optimize capital structure and improve financial discipline, reducing the likelihood of distress. As a result, PD investors may be more willing to finance highly leveraged firms when PE sponsorship is present, as it provides an additional layer of risk mitigation and confidence in the firm's ability to manage its debt burden effectively.

6. Conclusions

This study analyses the characteristics of Italian firms receiving PD financing and examines whether PD investors seek PE sponsorship as a signal of credibility under specific conditions. Using firm-level data from a unique and proprietary dataset, we conclude that PD investors tend to favour PE-backed companies when target firms are smaller,

less profitable, and more leveraged. This supports the notion that PE sponsorship serves as a stabilizing signal for PD investors, reducing perceived risk in financially vulnerable companies as reported by current literature (Butchner *et al.*, 2024).

While our results provide valuable insights into the role of PE sponsorship in PD investments, several limitations should be acknowledged. First, the findings are based on a dataset limited to Italian firms, which means the results may not be directly generalizable to other geographical markets. Countries and regions might have distinct financial environments, regulatory frameworks, and investor behaviours that could influence the relationship between PD investors and PE sponsorship. Thus, future research should consider cross-country comparisons to assess whether the observed patterns hold in different contexts.

Second, while our study sheds light on the general tendencies of PD investors to favour PE-backed firms, there is a need for a deeper understanding of the investment decision-making process. Specifically, future research could explore how PD firms evaluate a broader range of factors-such as industry-specific risks, managerial experience, and governance structures-when selecting investment targets. As Wilson *et al.* (2022) demonstrated in the PE context, a more granular analysis of the criteria used by investors could offer additional insights into how PD investors conduct the selection process.

Finally, a promising avenue for future studies is exploring post-investment performance. By comparing the financial and operational outcomes of firms experiencing PD involvement, with and without PE sponsorship, researchers could better understand the long-term impacts of PD investors on the performance of target companies and how proceeds are used to finance corporate strategic plans and projects.

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Author agreement statement
We declare that this manuscript is original, has not been published before, and is not currently being considered for publication elsewhere.
We confirm that the manuscript has been read and approved by all named authors and that there are no other people who satisfied the criteria for authorship but are not listed.
We further confirm that authors are listed alphabetically and not according to their research contribution.

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Stay, leave, or linger? A study on family power changes after Private Equity investment

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Abstract

Frame of the research. *Family firms are the most widespread business structure globally and PE investments are growing worldwide. This study explores how changes in family power-ownership, board representation, and leadership-affect firm growth after PE involvement.*

Purpose of the paper. *The paper aims to investigate how family involvement following PE investment enhances or hinders sales growth, considering both agency and stewardship perspectives.*

Methodology. *Using a unique cross-sectional dataset of 404 Italian family firms that received their first PE investment between 2013 and 2021, we employ OLS regression analysis to assess the impact of changes in family ownership, board presence, and leadership on post-investment sales growth.*

Results. *The results show that a reduction in family ownership negatively affects sales growth, while a reduction in family board involvement has a positive effect. The appointment of a new CEO by the PE investor does not significantly influence growth.*

Research limitations. *The study focuses solely on Italian family firms, limiting cross-country generalizability. Future research should explore variations in governance models and post-investment performance in different institutional contexts.*

Managerial implications. *The results provide insights for PE investors and family business owners, highlighting the trade-offs between retaining family control and achieving growth through external leadership.*

Originality of the paper. *This study contributes to the literature by integrating agency and stewardship theories to analyze how different dimensions of family power influence firm growth after PE investment.*

Key words: *family business, private equity, performance, growth*

1. Introduction

Family firms represent the most prevalent type of business organization worldwide (De Massis et al., 2018). As such, their survival and growth are vital for their success and the overall economy. However, their prosperity and continuity can be jeopardized by various factors. For example, many family businesses are encountering difficulties in transitioning to the next generation, influenced by demographic shifts such as the effects of COVID-19 and the ongoing retirement of the baby boomer generation (De Massis and Rondi, 2020). Additionally, numerous family firms lack the necessary resources and capabilities to thrive in today's competitive environment, which is marked by intense competition and uncertainty (Memili et al., 2015). To address these challenges, private equity

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investors are increasingly viewed as a worthwhile solution (Scholes, 2024). A growing body of evidence indicates that an increasing number of private firms, including family-owned businesses, are becoming targets for private equity investments (PEM, 2023; Cohn, 2022; Dawson and Barredy, 2018). Private equity (PE) investors play a distinct role in the business landscape and have gained prominence over the years, with assets under management rising from approximately 100 billion USD in the 1990s to 2.3 trillion USD by 2019 (Krysta & Kanbach, 2022).

The literature on private equity and family firms has increased over the last few years. Most studies primarily examine family firms' willingness to transfer control to outside investors, as well as the factors that drive or inhibit this decision (Neckebrouck et al., 2017). Recently, there has been significant attention on financial decision-making within family firms, particularly regarding the differences between family and non-family firms (Salerno, 2019). However, the literature has largely overlooked whether various combinations of changes in family involvement can enhance growth following private equity investment. This gap is noteworthy, considering that family ownership, board involvement, and leadership roles are key indicators of “family power” (Astrachan et al., 2002; Brunelli et al., 2024).

Thus, this paper wants to answer the following research question: Does family power change improve sales growth after private equity investment?

We built on previous literature on growth and firm performance, and we combined two theories that can be considered contrasting: agency and stewardship (De Massis et al., 2018; Schulze et al., 2001; Eddleston et al., 2012).

In outlining our methodology, we implemented a research design that utilizes a distinctive database centered on private equity transactions compiled by the Private Equity Market (PEM) in Italy from 2013 to 2021. Throughout this timeframe, a total of 1,432 transactions took place in Italy. Our focus was specifically on family-owned firms that received their initial private equity investment. After excluding missing values and outliers, we obtained a sample of 404 operations.

Findings show that an increase in DELTA FIO, i.e., a higher reduction of family involvement in ownership, negatively affects sales growth. In contrast, an increase in DELTA FIB, i.e., a higher reduction of family involvement in board, positively affects sales growth. Furthermore, the results indicate that appointing a CEO from the PE does not impact a firm’s growth.

Our study contributes to the family firm and PE literature by providing an empirical understanding of private family firms' optimal ownership and governance structures after the PE investment. Specifically, using the lens of agency and stewardship theories, we analyse how PE involvement can reshape the dynamic of control and decision-making in family firms. Additionally, we examine family business heterogeneity, examining how family power - resulting from PE investments, affects firm growth. Moreover, we also contribute to the corporate governance literature by exploring if and how family involvement at different governance levels can affect growth.

Our study offers valuable insights into the relationship between family involvement and firm growth within the Italian context. Recommendations include opening ownership to external stakeholders but maintaining family control while incorporating nonfamily members into the board.

The remainder of this paper is organized as follows. We begin by articulating our theoretical frameworks, specifically the agency and stewardship theories. Following that, we will describe the sample and methodology and discuss our primary findings. In the final sections, we will address contributions to the literature, practical implications, limitations, and potential avenues for future research.

2. Theoretical background

We will build upon two complementary theories, i.e., agency and stewardship theories.

On the one hand, the involvement of private equity funds in ownership, board, and leadership positions can give rise to agency problems or reduce the existing ones between family members (Schulze et al., 2001; 2003; Waldkirch, 2020). Specifically, PE investors may encounter owner-owner

agency issues when working with family firms, particularly when a family retains a majority stake while the PE fund acquires only a minority interest (Miller and Le-Breton-Miller, 2006). These challenges often stem from conflicts of interest and information asymmetries within family firms, which can negatively impact decision-making processes. Thus, we examine whether the reduction of family involvement at three levels-ownership, board, and leadership positions-due to PE investment effectively mitigates conflicts of interest or creates new challenges that could impact sales growth..

Focusing on the first dimension of family power-family involvement in ownership-literature suggests that family owners may prioritize the welfare of family members and act opportunistically, which is in line with agency theory. As noted by Schulze et al. (2001; 2003), family owners, compared to PE investors, often have the incentive to use company resources for their benefit, regardless of the firm's interests. This can manifest in practices such as extracting excessive resources through disproportionate remuneration, related party transactions, and special dividends (Chrisman et al., 2014; Le Breton-Miller et al., 2011; Chi, 2023), this can hinder growth. Therefore, the involvement of PE investors can play a key role in reducing and mitigating agency problems within family members and, therefore, positively impact sales growth.

Turning to the second component of family power, family members' involvement in the board of directors can have adverse effects, especially when family representation is high relative to external members appointed by the PE fund. An entirely family-composed board may lead to nepotism, diminish managerial talent (Anderson and Reeb, 2004; Schulze et al., 2001; Gomez-Mejía et al., 2001), and potentially stunt growth. Thus, reducing family involvement in the board can positively impact sales growth.

Moreover, in line with the agency theory, when family members are involved in leadership positions, they may engage in nepotistic practices by providing job security and responsibilities to the next generation (Waldkirch, 2020). This can result in a limited pool of non-family managers with greater experience and skills (Bertrand and Schoar, 2006; Dyer, 1989; Fang et al., 2022; Lien and Li, 2014), negatively influencing growth. Thus, appointing a new CEO from the PE investors (i.e., a reduction of family involvement in leadership positions) can positively impact sales growth.

Conversely, stewardship theory can explain a negative relationship between family involvement reduction following PE investment and sales growth.

Beginning with the first level of family influence-family participation in ownership-family owners tend to view the business not merely as a source of wealth but as a legacy to be preserved for future generations. It can be argued that this family involvement in ownership has a beneficial effect on innovation and growth, as family owners are generally more inclined to invest in new products and market development, both of which are essential for the growth of the firm (Eddleston and Kellermanns, 2007; Anderson and Reeb, 2003). Thus, a reduction in family involvement in ownership can have a negative impact on sales growth, as it may dilute family owners' ability to orientate decisions towards growth-oriented projects aimed at preserving the firm's legacy and identity.

Secondly, family involvement on the board of directors tends to foster a stronger identification with the organization, leading to pro-organizational behaviors that enhance longevity and a sense of familiness (Zellweger et al., 2010; Davis et al., 1997). Family directors take on the role of stewards, prioritizing business continuity, nurturing a community spirit among employees, and strengthening connections with stakeholders (Miller et al., 2008). Therefore, new directors appointed by the PE funds may lack these characteristics, which would negatively impact sales growth.

In a similar way, family CEOs show a greater commitment to the long-term wealth of the firm due to their exceptional loyalty, trustworthiness, strategic long-term planning, and generous investments. These attributes contribute enhancing the overall performance (Le Breton-Miller and Miller, 2009; Eddleston et al., 2012; Miller et al., 2013) and increase the likelihood of achieving growth. Family CEOs, compared to nonfamily members, possess unique and distinct advantages in the form of accumulated superior tacit knowledge and a deep familiarity with the business acquired over the years, making these valuable assets (Miller et al., 2013; LeCounte, 2022). Hence, the appointment of a new CEO from PE investors can generate a negative impact on sales growth.

Thus, we develop the following hypotheses:

H1a. Family involvement (in ownership, board, and leadership positions) reduction after private equity investment positively affects sales growth.

H1b. Family involvement (in ownership, board, and leadership positions) reduction after private equity investment negatively affects sales growth.

3. Methodology

From a methodological standpoint, we utilized a research design that takes advantage of a unique longitudinal database derived from the list of private equity transactions compiled by the Private Equity Monitor (PEM) in Italy between 2013 and 2021. During this period, a total of 1,432 operations were conducted in Italy. We focused only on family-owned firms that received their first private equity investment. Additionally, we excluded firms engaged in real estate, renewable energy, and financial services, as these sectors have distinctive business models and exhibit different accounting performances compared to companies in other industries (Jelic & Wright, 2011).

We manually searched governance (i.e. ownership, board, and CEO information) for each portfolio company using data from the Italian Chambers of Commerce and AIDA (the Italian chapter of Bureau van Dijk). We also required firm-level financial data for a minimum of two years following the investment to evaluate the economic performance of the portfolio companies during the holding period. Thus, due to the nature of our research design and the presence of missing values and outliers, our final sample comprises 404 firms.

We specified a linear model to investigate the relationship between shifts in family power and the growth of family firms receiving private equity investment for the first time.

To test our hypothesis, we estimated a cross-sectional OLS regression analysis.

Variable description

This section provides a detailed overview of the variables utilized in our analysis. Specifically, the dependent variable is defined as the growth in sales observed between two years after the investment and the date of the private equity investor's entry (Cirillo et al., 2020).

The primary independent variables are the three levels of family power (Brunelli et al., 2024): family involvement in ownership (FIO), family involvement in the board of directors (FIB), and the CEO. We measure FIO as the difference between the percentage of the firm’s equity held by the owning-family before the investment and after the PE investment (i.e., DELTA FIO). The second independent variable, used to test our hypothesis, is the percentage change in family board representation (i.e., DELTA FIB - family involvement in the board of directors), calculated as the difference between the percentage of board members belonging to the controlling families before the investment and after the PE investment. And lastly, we used a dummy variable “new CEO” indicating whether the PE investor appoints a new CEO (1 if a new CEO is hired; 0 otherwise).

Additionally, we incorporate several control variables at the firm level. In our focus on literature regarding firms' growth, we have included control variables that may influence a firm's growth. Literature reports that older companies grow more slowly compared to their younger counterparts (Miroshnychenko et al., 2021). Therefore, we control for age, measured as the logarithm of the number of years the firm has existed (Autio et al., 2000; Brunelli et al., 2024). We also control location and industry to check any differences in terms of performance outcomes. Additionally, because past performance can influence firms growth, we included three measures of company performance (i.e., Total assets, ROE, and liquidity) (Garcia-Martinez et al., 2023; Patel et al., 2018).

At the level of the PE investor, we account for Age and Size, which represent the age and total assets under management of the general partner (GP).

Finally, we also control for macroeconomic variables, including GDP growth. The time frame of our analysis covers one significant crisis caused by COVID-19.

4. Findings

Table 1 reports the correlation matrix and descriptive statistics. The dependent variable, "growth," is described in the first row of the table.

Table 2 summarizes the analysis results. For each regression, all variance inflation factor coefficients are below 5, and all condition indexes are below 10, confirming that multicollinearity is not a concern.

Our findings reveal several factors that influence the growth of family firms following the investment of a PE firm. As shown in model 2 of Table II, we find that an increase in DELTA FIO, i.e., a higher reduction of family involvement in ownership, negatively affects sales growth (β = -.1720, $p < 0.05$), thus confirming H1b. In contrast, Model 2 of Table II reveals that an increase in DELTA FIB, i.e., a higher reduction of family involvement in the board, positively affects sales growth ($\beta = 0.135$, $p < 0.05$), confirming H1a. Furthermore, the results indicate that the appointment of a CEO from the PE does not impact firm's growth.

The control variables also yielded interesting results. For example, the coefficient of PE investor age is positively related to sales growth ($\beta = .0953$; $p < 0.01$), and the same holds true for the size of the PE investor ($\beta = .0325$; $p < 0.01$). This means that the age and the size of the PE investor positively influence the sales growth of the firms, due to the greater experience, resources, and strategic support that PE can offer to the firm. Moreover, it seems that past performance influences sales, as indicated by the negative association between ROE and sales growth ($\beta = -.0020$; $p < 0.01$).

5. Discussion

The findings indicate that the family's ongoing involvement in the ownership structure contributes to stability and continuity, serving as a crucial catalyst for growth. Indeed, in line with Hypothesis 1, the family provides a long-term vision (Salerno, 2019) and safeguards the wealth of knowledge and expertise accumulated over time, aligning with stewardship perspectives. Indeed, the combination of network intelligence, cultural alignment, trustworthiness, and tacit knowledge positions family owners as indispensable stewards for family firms after a private equity investment. This effect aligns with the principles of stewardship theory, whereby family owners act not just as investors but also as "custodians" of the family and firm's legacy. Their engagement is particularly valuable in the post-investment phase of a private equity deal.

On the other hand, the agency's perspective prevails when it comes to FIB, where a higher reduction of family involvement in the board positively affects sales growth. This result, suggest that at the board level, a lower degree of family involvement may reduce agency problems such as entrenchment, risk aversion, or resistance to external influence. Thus, reducing FIB can increase the objectivity of decision making, the level of professionalization, and facilitate the implementation of growth-oriented strategies promoted by PE investors. The findings support the view that while ownership continuity may foster long-term orientation and stability, a high level of family influence may hinder sales growth.

Interestingly, the appointment of a new CEO has no impact on sales growth. On the one hand, this result can be explained by the relatively short-term window used to measure changes in sales performance. A newly appointed CEO may need a substantial period to implement their vision and influence operations. Therefore, short-term metrics may fail to capture the impact of leadership transitions. On the other hand, this result can also be viewed through the lens of contrasting theoretical perspectives that may have an effect. According to stewardship theory, a family CEO might positively impact the organization by acting as a steward, fostering the family legacy. Thus, according to this perspective, appointing a new CEO can hinder a firm's sales growth. Conversely, agency theory suggests that a family CEO can generate unique risks, such as the potential entrenchment, the

prioritization of family interests over firm performance and therefore the appointment of a new CEO from the PE could be considered as a source of advantage.

These opposing theories may counterbalance each other, leading to a net-zero observable effect on short-term sales growth.

Conclusions and contributions

This study demonstrates how family members' ongoing involvement in the shareholding structure acts as a catalyst for growth. Family owners are instrumental in the decision-making process, maintain a long-term perspective on financial and strategic initiatives, and possess strong interpersonal skills. Conversely, to achieve higher growth, private equity investors generally need to appoint new directors.

Our study contributes to the family firm and PE literature by providing an empirical understanding of private family firms' optimal ownership and governance structures after the PE investment. Specifically, using the lens of agency and stewardship theories, we analyse how PE involvement can reshape the dynamic of control and decision-making in family firms. Additionally, we delve into family business heterogeneity, examining the extent to which family power - resulting from PE investments, affects firm growth. We combine agency and stewardship theories to provide a more holistic view of governance dynamics in family businesses (see Brunelli et al., 2024).

On the one hand, we contribute to the literature on family firms by investigating the intersection with private equity investors. Family firms increasingly seek to open up their capital, yet they are often concerned about the potential impacts such operations may have on their corporate culture and performance. This study sheds light on the key levers that family firms should activate to enhance their growth rate when they decide to open up to private equity investors.

On the other hand, this study allows the private equity literature to further investigate the heterogeneity of family firms - an aspect that remains largely unexplored in the current body of research on private equity.

Moreover, we also contribute to the corporate governance literature by exploring if and how family involvement at different governance levels (i.e., ownership, board representation and CEO) can affect growth. By distinguishing between the three family power levels, our study provides a more nuanced understanding of how the presence and degree of family control and involvement can influence growth when a private equity investor is involved. This perspective can fill a gap in the literature, which often treats family involvement as a uniform concept, overlooking its complexity and heterogeneity.

Our study offers valuable insights into the relationship between family involvement and firm growth within the Italian context. Recommendations include opening ownership to external stakeholders while maintaining family control and incorporating non-family members into the board.

As this study is only limited to the Italian context, its applicability to other countries may be limited due to cultural, economic, and institutional differences.

Our study utilized secondary data; however, we recommend conducting further research through surveys that examine the effects of management transitions within the organization. Additionally, focusing on case studies would help to better understand the actual changes implemented following such transitions.

Author agreement statement

We confirm that the manuscript has been read and approved by all named authors and that there are no other people who satisfied the criteria for authorship but are not listed.

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Table I. Descriptive statistics and correlations

	Mean	St dev	Growth	DELTAFIO	DELTAFIB	CEOPE	Log Age	Log Total Asset	ROE	Liquidity	Log GPAge	SizePE	GDP	Region
Growth	.2703	.3764	1											
DELTAFIO	.7662	.2436	(.0367)	1										
DELTAFIB	(.4968)	.3634	(.1057)**	(.3575)**	1									
CEOPE	.485	.5004	(.0586)	.2384***	(.2258)***	1								
Log Age	3.067	.775	(.0418)	.0062	.0997**	(.0709)	1							
Log Total Asset	10.165	1.392	(.044)	(.1961)***	.3182***	(.0605)	.3122***	1						
ROE	12.613	27.50	(.1193)**	.0462	.0258	(.0599)	.0071	(.1630)***	1					
Liquidity	1.652	1.063	(.0190)	.0221	(.0924)*	(.0448)	(.0947)*	(.2232)***	.2433***	1				
Log GPAge	3.026	.5639	.1717**	.1099**	(.0389)	(.0092)	.0053	(.0372)	.0517	.0617	1			
SizePE	3.438	1.535	.1361***	.0562	(.0772)	.0973*	.0541	.0520	.0782	.0224	0.0841*	1		
GDP	.0102	.0582	(.1494)***	(.0192)	(.0538)	.0761	(.0807)	(.0329)	.0239	(.0140)	(.0891)*	(.0793)	1	
Region	1.821	.9065	.0519	.0071	.0855*	(.1207)**	(.0445)	.0453	(.0051)	(.0133)	.0312	.0259	(.0618)	1

Notes: * *p* < .10; ** *p* < .05; ***p* < .01.

The correlations were calculated after applying the log transformation, while maintaining the original values for Age, Total Assets and GP Age to provide a clearer information.

Table II. Regression analysis

Variables	**Model 1**	**Sign**	**Model 2**	**Sign**
Log Company Age	(.0239)		(.0199)	
Log Total Assets	(.0147)		(.0119)	
ROE	(.0020)	***	(.0020)	***
Liquidity	(.0050)		(.0089)	
Log GPAge	.0899	***	.0953	***
Size GP	.0318	***	.0325	***
Region	.0133		.0144	
GDP (macro)	(.8580)	**	(.8657)	**
Industry fixed effects	yes		yes	
FIO change			(.1720)	**
FIB change			.135	**
CEO change			(.046)	
N	404		404	
Rsquared	12.44%		14.47%	

Notes: * *p* < .10; ** *p* < .05; ***p* < .01.

Track 3
Innovation & Technology Management

Entrepreneurship and Innovation Ecosystem: The Contamination Lab Experience [1]

MICHELE MODINA[2] ARI GINSBERG[3] SARA KULLAFI[4]

Abstract

Frame of the research. *In recent years, entrepreneurship and innovative ecosystems have emerged as critical to addressing economic, social and environmental challenges and have attracted the attention of academics, policymaker, firms and institutional investors.*

Purpose of the paper. *The aim is to explore whether the Contamination Lab experience-an innovative approach to entrepreneurship introduced in Italy in 2014-can be theoretically grounded through the lens of entrepreneurship and innovation ecosystems.*

Methodology. *Starting with bibliometric analysis, which identified 208 articles of interest, performance analysis was then conducted to identify key trends in the intersection of entrepreneurship and innovation ecosystem. The search then proceeds with an examination of the contamination lab identifying how this experience produces results in line with academic research.*

Results. *The paper lays the groundwork for a solid theoretical framework that emerges from the analysis and is embodied in the CLab experience; the theoretical concepts identified through the study find representation within the CLab, which thus serves as a concrete expression of these contributions. If further developed, this framework has the potential to become a key reference for future student entrepreneurship programs.*

Research limitations. *Limitations of the research include the exclusive use of indexed databases and the selection of only English-language contributions.*

Managerial implications. *This study provides insights for researchers and practitioners to replicate models similar to the contamination lab experience in building constructive collaboration between entrepreneurship and innovatio*n.

Originality of the paper. *The paper helps to cover a notable gap in understanding how theoretical models and frameworks can be designed to maximize the role of entrepreneurship in fostering innovation ecosystems.*

Key words: *Entrepreneurship, Innovation, Innovative ecosystem, Startup, Contamination lab*

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[1] **Introduction:** Michele Modina conceived and wrote the introduction section, defining the context, study objectives, and main research questions.
Literature Review: Sara Kullafi wrote the literature review, with each author contributing to the research and synthesis of the most relevant sources. Ari Ginsberg integrated theoretical concepts with the research design.
Contamination Lab Case Study: Sara Kullafi conducted the analysis of the "Contamination Lab" case study, gathering the relevant information for the paper's objective. Ari Ginsberg supervised the application of the methodology to the case, while Michele Modina developed the practical implications of the results.
Methodology: Sara Kullafi developed the methodology. Michele Modina supervised the practical application of the methodology.
Performance Analysis: Sara Kullafi analyzed the performance analysis. Michele Modina supervised the analysis, helping to ensure that the techniques used were appropriate for the context.
Results: All three authors collaborated to discuss the results obtained and formulate the conclusions of the study. Ari Ginsberg and Michele Modina led the discussion of the theoretical and practical implications, while Sara Kullafi contributed to integrating the results with the existing literature.
Manuscript Writing: Michele Modina and Sara Kullafi drafted the initial manuscript, with significant contributions from Ari Ginsberg in the methodological and analytical sections.
Re-writing and Editing: After revising the reviewers' comments, all three authors collaborated on the re-writing of the manuscript, revising and improving the content based on the feedback received

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1. Introduction

Innovative ecosystems serve as a cornerstone for economic and social progress, driving value creation through the collaborative interplay of diverse actors-ranging from businesses and institutions to universities and local communities.

In today's fast-paced and competitive global landscape, entrepreneurship has emerged as a critical force in strengthening these ecosystems, enabling the spread of innovation, the generation of new opportunities, and the translation of ideas into tangible solutions (Dias Sant´ Ana, T., 2020, Dedehayir, O. *et al.*, 2018, Zahra and Nambisan, 2011). Despite increasing academic and practical interest in this field, there remains a notable gap in understanding how theoretical models and frameworks can be designed to maximize the role of entrepreneurship-intended here as the growing centrality and relevance of its various forms, such as student entrepreneurship and entrepreneurial networks-in fostering innovation ecosystems. This is particularly relevant from a managerial perspective, as a deeper understanding of how to strategically exploit these forms of entrepreneurship can influence, for example, the decision-making processes of different ecosystem actors or the allocation of resources, with the aim of improving overall innovativeness.

In an interconnected world, innovation is no longer the product of isolated efforts but arises from intricate networks of collaboration among various stakeholders, including private enterprises, public entities, and social organizations (Adner, 2016). This shift has led to the conceptualization of innovation ecosystems, which provide a holistic perspective on the mechanisms driving change and the conditions necessary for sustainable development (Ritaala and Gustaffson, 2018). By framing innovation within an ecosystem, researchers and practitioners gain deeper insights into the dynamics that enable transformative evolution. Recent studies have shown that the evolution of innovation ecosystems can be driven by leveraging entrepreneurship as a key mechanism for change and development (Lucarelli *et al.*, 2025). This rise in attention is sustained over times by several factors, including the exponential growth of data, information, and knowledge, which has created new demands for collaboration and coordination among diverse organizations and individuals (Pustovrh, A. *et al.*, 2020). Additionally, advancements in technology have facilitated unprecedented levels of interaction and cooperation among stakeholders (Ritaala and Gustaffson, 2018). However, despite this progress, the definition of solid theoretical frameworks that can explain the evolution of innovation ecosystems through entrepreneurship remains a subject of ongoing debate (Ritaala and Gustaffson, 2018).

However, despite this progress, the definition of solid theoretical frameworks that can explain the evolution of innovation ecosystems through entrepreneurship remains a subject of ongoing debate. This paper seeks to contribute to this line of research by conducting a performance analysis aimed at identifying the most relevant research streams and developing a robust, integrated theoretical framework. In doing so, it explores how experiences like the Contamination Lab can be theoretically grounded. Once the guiding principles of this framework are defined, they may serve as a foundation for designing replicable and theoretically sound models capable of generating even more effective outcomes. CLab (Contamination Labs), a new approach to entrepreneurship introduced in 2014 in Italy, prove to be a concrete realization of this framework, embodying non only the principles of collaboration, openness, and co-creation that form its foundation, but also the theorical results of academic research. The start-up program that represents the core aspect of this new approach to entrepreneurship that takes place in these hybrid spaces, where students, entrepreneurs, researchers, and professionals come together and collaborate, represent a tangible example of how Student entrepreneurship programs can play a key role in strengthening entrepreneurial ecosystems.

The following analysis aims to explore how initiatives like the CLab-originally designed by policymakers with primarily economic and social goals-can be anchored in a solid theoretical framework. This perspective is particularly valuable, as it may help define, over time, the theoretical foundations of activities that have already proven effective in practice. Through activities such

hackathons, workshops, and multidisciplinary projects, CLabs facilitate the exchange of knowledge and skills, accelerating learning and adaptation processes.

Moreover, they foster an entrepreneurial culture that not only generates new ideas but also transforms them into concrete solutions, thereby strengthening the socio-economic fabric of the contexts in which they operate. In this sense, CLabs expand its potential, demonstrating how models based on open and collaborative innovation principles can effectively improve innovation ecosystems through entrepreneurship. Such models have proven effective in enhancing innovation ecosystems by accelerating processes of learning, adaptation, and growth.

Through a critical examination of existing practices and empirical evidence, the paper aims to establish a solid conceptual foundation that not only elucidates theorical results of academic research. and provides actionable insights for policymakers, entrepreneurs, and other stakeholders committed to advancing transformative entrepreneurship. In summary, this work contributes to the existing body of literature by proposing a systemic approach that links entrepreneurship and innovation ecosystems, offering a foundation for future research and practical applications across diverse contexts. Starting with bibliometric analysis, which identified 208 articles of interest, performance analysis was then conducted to identify key trends in the intersection of entrepreneurship and innovation ecosystem. The search then proceeds with an examination of the contamination lab, identifying how this experience produces results in line with academic research.

Compared to significant studies of the theme, such as Schiuma and Carlucci (2018), this contribution not only analyses the role of partnerships with universities in the innovation ecosystem but also provides a concrete demonstration of how an actor, when implementing structured and systematic entrepreneurial programmes, can significantly boost the entire innovation ecosystem. Compared to other works, such as that of Schmitz *et al.* (2026), this study not only proposes an analysis of the literature through a bibliometric first step, but also offers a practical demonstration of how a model identified at a political level and introduced in the Italian context has solid theoretical foundations, anchored to a scientific framework. This makes it possible not only to assess the applicability of the model in other contexts, but also to imagine, if not, which theoretical aspects might not have been respected or adapted in the new environment.

The remaining sections of the paper are explained below. Section 2 reviews the literature review, while the next section describes the experience of contamination labs as an actor in innovative ecosystems. Section 4 outlines the methodological approach and explains the dataset creation process. Section 5 explores the results of the performance analysis focusing on areas of research in entrepreneurship and innovative ecosystems. Section 6 shares the main findings and highlights key directions for managers and policymakers. The last section presents conclusions and future research directions.

2. Literature review

The concept of the innovation ecosystem has gained increasing prominence in the fields of strategy, innovation, and entrepreneurship (Gomes *et al.*, 2018). Scholars have proposed various definitions and frameworks across different contexts, often using distinct labels and emphasizing diverse objectives. Foundational research on ecosystems has consistently highlighted the central role of innovation (Silva *et al.*, 2024). Building on the distinctions between innovation ecosystem concepts proposed by Adner (2006) and Carayannis and Campbell (2009), numerous scholars have introduced different classifications of innovation ecosystems. Nambisan and Baron (2013) identified several types of innovation ecosystems, including hub-based ecosystems, open-source communities, R&D consortia, and crowdsourcing ecosystems. They specifically described hub-based ecosystems as those in which a single firm assumes leadership, setting goals, defining the innovation platform, and exerting significant influence over the strategies and outcomes of other participants. These ecosystems are typically associated with well-established companies. Ecosystems in which models

like the Contamination Lab take root-primarily thanks to the role of the university as the guiding actor-can be considered hub-based ecosystems, where the university acts as the central node, orchestrating innovation and facilitating collaboration among students, local businesses, and public institutions. This model aligns with the principles of entrepreneurial universities (Guerrero *et al.*, 2016), where academic institutions play a pivotal role in fostering innovation and entrepreneurship. The Contamination Labs' experience focuses on interdisciplinary collaboration and real-world problem-solving reflects the dynamics of innovation ecosystems, enabling participants to develop innovative solutions that address local challenges.

In the field of entrepreneurship, the innovation ecosystem framework has been used to examine venture creation. Zahra and Nambisan (2012), building on earlier work by Nambisan and Sawhney (2007), identified four distinct types of innovation ecosystems, connecting strategic thinking with entrepreneurship: Jam Central, Orchestra, Creative Bazaar and MOD Station. The Jam Central Model pertains to networks of independent organizations, including research institutions, that join forces to conceptualize and develop innovations in cutting-edge or emerging fields.

The Orchestra Model describes a scenario where multiple companies collaborate to seize a market opportunity through a shared innovation framework or platform. This framework is clearly defined and governed by a leading entity, often referred to as the "keystone player". Creative Bazaar Model revolves around an ecosystem in which a prominent company seeks out innovations-such as new ideas, products, or technologies-on a global scale, akin to shopping in a marketplace. The company then integrates these innovations within its proprietary systems to refine and commercialize them. MOD Station Model refers to an approach that empowers users to actively participate in innovation. In this type of ecosystems customers are enabled by companies to create and share modifications or enhancements to their products.

The innovation ecosystem concept is particularly useful for analyzing entrepreneurial efforts to establish new businesses. Entrepreneurial action, in this context, extends beyond managing uncertainty at the firm level to addressing collective uncertainties that impact multiple actors within the ecosystem (Salerno *et al.*, 2015). Establishing and managing an innovation ecosystem, therefore, becomes a strategic approach for entrepreneurs, aligning closely with the entrepreneurial model of innovation ecosystems.

Numerous studies highlight that innovation ecosystems, defined by interactions among diverse actors such as universities, businesses, and public institutions, are essential for generating and disseminating innovation (Tagliazucchi *et al.*, 2024). Innovation often emerges from collaboration among companies, public entities, and local communities, as these partnerships enable the effective utilization of available resources and knowledge, creating synergies that drive technological and organizational progress. In particular, the collaborative approach has proven effective in the public sector as well, helping to address complex challenges and enhance institutional innovation capacity (Sacchetti and Ianes, 2024).

In this context, the crucial role of public-private partnerships and innovation-supporting policies is widely recognized. Measures that encourage cooperation between the public and private sectors, combined with targeted fiscal and financial policies, can significantly enhance companies' innovation capacity. For example, tax incentives for acquiring advanced technologies have accelerated the adoption of digital tools among Italian firms, improving their competitiveness and innovation potential (Pagano *et al.*, 2021). At the same time, the establishment of publicly funded research centres has demonstrated a positive impact on regional innovation capacity and the development of highly skilled human capital. Moreover, numerous studies have documented the phenomenon of knowledge spillovers resulting from the presence of research centres in host regions, further strengthening local innovation ecosystems (Robbiano, 2022).

Innovation ecosystems have become a crucial environment for fostering entrepreneurship. However, entrepreneurs operating within these ecosystems encounter distinctive challenges, particularly in navigating the delicate balance between aligning with the objectives and priorities

established by the ecosystem leader and pursuing the goals of their own venture (Nambisan and Baron, 2013).

Characterized by the presence of multiple actors and the growing importance of public-private partnerships, universities play a pivotal role in managing innovation ecosystems, leveraging their capacity to orchestrate learning and innovation processes to become entrepreneurial institutions essential to the development of such ecosystems (Amitrano and Bifulco, 2024). Innovation ecosystems are widely acknowledged as key drivers of local and regional socioeconomic development, as they foster job creation, income generation, and social well-being through innovation. While often analysed at the city level, universities are also playing a transformative role within their environments. Acting as catalysts for an entrepreneurial mindset, universities bring together a diverse network of actors and resources, facilitating the conversion of knowledge into innovation (Bittencourt *et al.,* 2019) However, the interaction among ecosystem actors does not always yield the desired outcomes, as evidenced by studies conducted in Italy. For instance, research has shown that businesses not affiliated with universities tend to achieve stronger sales growth than those linked to academia. This raises questions about the effectiveness of universities in supporting the development of innovative businesses during their early growth stages (Modina *et al.,* 2024).

Closely tied to the concept of collaboration is the idea of open innovation, which involves organizations leveraging external sources of knowledge to accelerate their innovation processes (Del Sarto *et al.*, 2024). The core principle of open innovation (OI) is to make the innovation process more accessible and collaborative (Cheng & Huizingh, 2014). A widely accepted definition of open innovation emphasizes the exchange of information-both inbound and outbound-to evaluate innovations internally while expanding the market for external applications of inventions (Chesbrough, 2003). It also suggests that businesses aiming to enhance their technological capabilities should leverage both internal and external ideas (Arvaniti *et al.*, 2023). Consequently, the successful implementation of open innovation requires not only executive commitment but also the allocation of human resources. The current study highlights that many businesses in developing countries are hesitant to embrace open innovation due to leadership reluctance (Haylemariam *et al.*, 2024). Widely discussed in the literature, this approach has proven particularly effective in enhancing the organizational and innovative performance of companies (Haylemariam *et al.*, 2024), especially small and medium-sized enterprises (SMEs) that often lack sufficient internal resources to drive innovation (Battistella *et al.*, 2023). The literature highlights two key strategies adopted by large companies practicing open innovation: sourcing external knowledge by expanding networks to explore new markets and technologies; supporting innovative start-ups through mentorship programs.

These efforts can foster the development of an open innovation ecosystem, enabling collaborative innovation among diverse actors (Marozzo *et al.*, 2023). In joint open innovation initiatives involving large companies and SMEs, shared leadership, dynamic decision-making, and effective prioritization emerge as fundamental elements of successful collaboration (Giardino *et al.*, 2022).

Business acceleration programs and collaborations with other companies, universities, or research centres have enabled many firms to acquire the knowledge and skills needed to innovate more effectively. Some authors identify three key external sources of knowledge -coopetitors, educators, and investors - that influence start-up innovation in distinct ways. Coopetitors enhance incremental innovation by facilitating the exchange of tacit knowledge among similar start-ups, though they have little impact on radical innovation. Educators contribute to incremental innovation by strengthening professional skills through the development of social and human capital. Investors, such as venture capitalists and business angels, drive radical innovation by offering not only financial resources but also specialized knowledge and access to strategic networks. Additionally, these actors, often operating within coworking spaces, support the creation of networks and the acquisition of new knowledge. A key element of innovation is the ability to develop new mechanisms and processes that enhance efficiency and competitiveness (Del Sarto *et al.*, 2024).

Innovation often arises as a response to challenging market conditions, such as those triggered by economic crises. Companies that adopt a proactive stance tend to continue investing in innovation

during times of crisis, using it as a tool for survival and future growth (Brzozowski and Cucculelli, 2016). However, innovation is not merely a reaction to crises; it is a continuous process that empowers organizations to fundamentally reshape their business models, fostering adaptability and long-term success in a dynamic marketplace. "Business model innovation" refers to a fundamental shift in how a company creates and delivers value (Scuotto *et al.*, 2023). The literature emphasizes the significance of innovation in business models, with technologies from Industry 4.0 and 5.0, such as the Internet of Things (IoT), artificial intelligence, and data analytics, reshaping traditional business models and enabling companies to discover new ways to create and capture value (Visvizi *et al.*, 2022). The integration of digital technologies has allowed businesses to manage products and services more effectively, enhancing their ability to meet customer demands and respond to market changes. Key enablers of business model innovation include stakeholder and customer engagement, a collaborative environment, knowledge management, and sustainability (Botti and Baldi, 2024).

This literature review aims to clarify how, in experiences such as the CLab, concepts like ecosystems, entrepreneurship, and innovation are fundamental starting points for identifying the key research streams that inform the subsequent analysis and support the development of an initial theoretical framework.

3. Contamination Labs: a university tool in innovative ecosystems

Numerous studies show that innovation ecosystems, defined by interactions between different actors such as universities, companies and public institutions, are essential to generate and disseminate innovation (Tagliazucchi, *et al.*, 2024). The role of universities in the development of innovation ecosystems, has attracted wide interest in the business and management literature. Innovation ecosystems play a key role in enhancing innovative entrepreneurship by facilitating the creation of new knowledge, the novel combination of existing knowledge or its reworking in innovative ways (Romano *et al.*, 2014). This process enables not only the emergence of new entrepreneurial ventures, but also the strengthening of the innovative capacity of existing organisations, fostering the development of new products, processes, markets and organisational models. This dynamic represents a crucial step for the economic progress and competitiveness of regions and countries (Malerba, 2010). In this context, universities play a key role in the growth of innovation ecosystems, as producers and catalysts of knowledge.

Contamination Labs (CLabs), operating under the aegis of universities as central ecosystem actors, serve as pivotal instruments through which universities advance their mission of fostering innovation within the ecosystem via entrepreneurship. By facilitating interdisciplinary collaboration, promoting knowledge exchange, and engaging with diverse stakeholders, CLabs effectively bridge academic research with practical entrepreneurial initiatives, thereby reinforcing the university's role in driving ecosystem-wide innovation. Through the generation, transfer, mediation, codification and dissemination of specialised knowledge, they actively contribute to the processes of knowledge creation and absorption. This support is essential for entrepreneurial and innovative development, as it provides both new and existing companies with the necessary tools to compete and innovate in a changing environment. This article adopts a combined research approach to examine the experience of the Contamination Lab, an innovative program in entrepreneurship education aimed at fostering entrepreneurial skills among university students (Secundo *et al.*, 2021).

The Clab offers a collaborative environment where students, researchers, and aspiring entrepreneurs can develop innovative ideas, create startups, and design business models. This Italian concept has become a key component of open innovation initiatives serving as collaborative spaces where universities, students, businesses, and workers connect, bridging academic knowledge with the practical world of production. In these settings, universities not only promote entrepreneurial learning but actively engage in creating innovative work models, addressing social and environmental challenges while reinforcing their transformative role in society. In lagging regions - areas

characterized by economic and technological underdevelopment - CLabs provide spaces for social experimentation and innovation, fostering new work practices, learning models, and collaboration.

Universities are particularly well-positioned to offer creative, interdisciplinary solutions to complex societal problems, encouraging teamwork and innovation across disciplines. The decision to analyze the CLab model is driven by their potential to play a significant role in local innovation ecosystems. They foster the transition to 'strategic ecosystem partnerships' from what can be called an 'ad hoc approach', in which university collaborations are first established by individual researchers with a focus on specific university-firm collaboration projects (Schiuma and Carlucci, 2018).

4. Methodology

In recent years, scientific output through journals, conferences, and other platforms has experienced substantial growth, exploring a wide range of contexts and characteristics using various methodologies. Consequently, it has become increasingly important to establish the current state of research on a specific topic by organizing existing knowledge and identifying gaps that require further exploration through a comprehensive literature review (Linnenluecke *et al.*, 2020; Ozturk, 2021; Öztürk *et al.*, 2024). Different methods can be employed to conduct a literature review (Singh *et al.*, 2024; Zupic and Čater, 2015), such as bibliometric analysis, meta-analysis, systematic literature reviews, and framework-based reviews.

The methodology used in this study follows a hybrid approach, combining part of bibliometric analysis, the performance analysis, and applying the results of the performance analysis to a case study. The case study of the Contamination Lab was selected because it is an initiative in which the authors have been directly involved since 2021 through various roles, including research, program design, teaching, and communication. This involvement will continue until July 2026, providing the authors with in-depth, first-hand insight into the initiative's development and impact. The research question is built around the case itself, as the objective is to identify theoretical guidelines and propose a framework for a program originally designed by policymakers with economic and social goals. The Contamination Lab, with its distinctive features and practical outcomes, offers a fertile ground for this investigation, serving as a concrete example through which theory can be extracted, structured, and eventually generalized.

Bibliometric analysis is a method growing in importance due to the increasing number of scientific publication and utilizes techniques to quantify written communication. It is particularly useful for citation analysis, which helps identify key scientific papers and understand their interconnections (Chai and Xiao, 2012). As defined by Öztürk *et al.* (2024), bibliometric analysis provides a broad overview of a field by examining its scientific outputs. This method explores the evolution of publications over time, their citation impact, and identifies the most active and frequently cited authors, journals publishing the most articles, leading institutions and countries, and the top 10 most cited papers, along with the key topics they cover (Cobo *et al.*, 2011; Merigó *et al.*, 2016; Baier-Fuentes *et al.*, 2019). The lens of performance analysis, which is part of bibliometric analysis, were identified trends in the literature, highlight frequently discussed topics, and uncover gaps within the field. This performance analysis led to the development of a theoretical framework, which was subsequently applied to a case study. The choice of analysing CLabs is motivated by the fact that these centres can play an important role in local innovation ecosystems (Schiuma and Carlucci, 2018).

To conduct a thorough analysis of the existing literature, we selected Scopus as the search engine due to its reliability and comprehensive coverage in scientific research (Caviggioli and Ughetto, 2019). The search was carried out using the following string: TITLE-ABS-KEY ("entrepreneur*" AND "innovation ecosystem*"). The results were limited to articles within the "Business, Management, and Accounting" category to ensure relevance to the focus of the study. In this contribution, the performance analysis concentrates on identifying the topics related to the 10 most cited articles, aiming to highlight points of overlap or divergence. Subsequently, the research streams

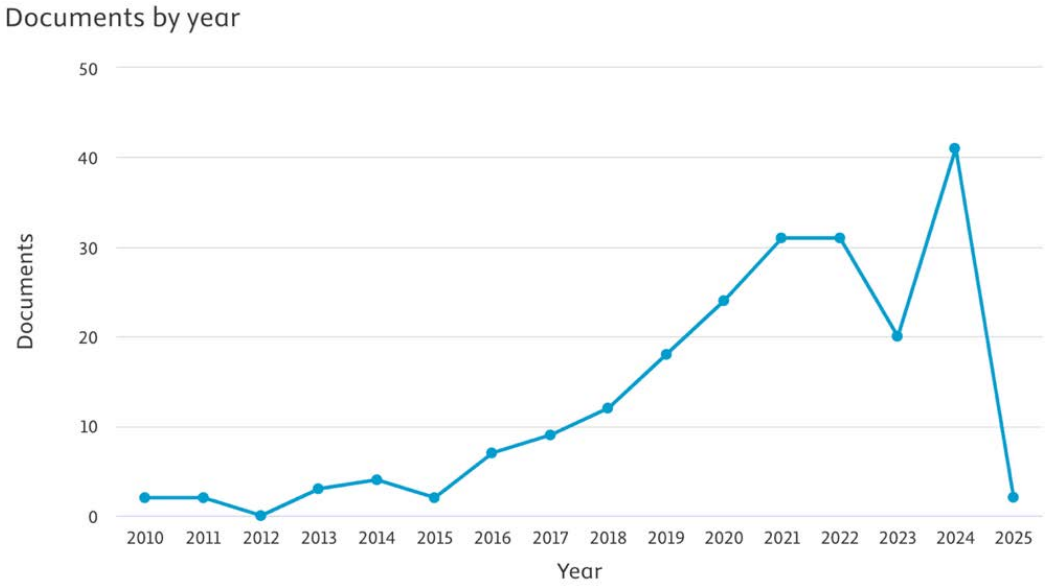
that emerged from this analysis was applied to the case of the contamination lab. The decision to use a limited number of keywords, particularly two well-selected terms, meets the need for greater precision in the bibliographic analysis.

This approach makes it possible to focus on a clear and consistent thematic core, reducing the risk of including irrelevant articles and improving the overall quality of the results. Moreover, a more focused search facilitates the management and analysis of the returned corpus, avoiding the excessive dispersion of information that would result from an overly broad set of keywords. This choice also limits terminological ambiguities, ensuring that the concepts analysed are indeed central to the research objective. In this way, the data obtained are more reliable and functional for the construction of valid and meaningful conclusions.

5. Performance analysis

To study the evolution of the topic under investigation, a performance analysis was carried out in which was identified the trend over time of the theme and was carried out an analysis of the 10 most cited articles. The scientific output examined in this study covers a span of 15 years, with the first publication dating back to 2010. As shown in Figure 1, interest in the link between innovation ecosystems and entrepreneurship has progressively increased over time, albeit with some discontinuities. In particular, the period was characterised by sporadic and discontinuous production. Between 2015 and 2020, a steady increase in production was observed, which then reached a stabilisation phase in the period 2021-2022. However, this remains the period in which the most solid and continuous growth was recorded. This trend peaked in 2021, with 31 papers published, a figure that also remained constant in 2022. However, 2023 saw a decline compared to 2020, with around 20 papers published. In contrast, 2024, as shown in Figure 1, stands out as a particularly productive year, with a peak of 41 documents. Finally, the year 2025, having just begun, was not included in the analysis.

Fig.1: Evolution of the topic (2010-2025)



Source: our elaboration

In order to better understand the development of the theme of this work over the years, it is necessary to analyze the ten most cited articles (Tab. 1).

Tab. 1: Top 10 cited article

Authors	Year	Title	Cited by
Gomes L.A.D.V.; Facin A.L.F.; Salerno M.S.; Ikenami R.K.	2018	Unpacking the innovation ecosystem construct: Evolution, gaps and trends	469
Nambisan S., Baron R.A.	2013	Entrepreneurship in innovation ecosystems: Entrepreneurs' self-regulatory processes and their implications for new venture success	419
Audretsch D.B.; Cunningham J.A.; Kuratko D.F.; Lehmann E.E.; Menter M.	2019	Entrepreneurial ecosystems: economic, technological, and societal impacts	319
Guerrero M.; Urbano D.; Fayolle A.; Klofsten M.; Mian S.	2016	Entrepreneurial universities: emerging models in the new social and economic landscape	302
Palmiè M.; Wincent J.; Parida V.; Calgar U.	2020	The evolution of the financial technology ecosystem: An introduction and agenda for future research on distruptive innovation in ecosystems	207
Hayter C.S.	2016	A trajectory of early-stage spinoff success: the role of knowledge intermediaries within an entrepreneurial university ecosystem	202
Huggings R.; Williams, N	2011	Entrepreneurship and regional competitiveness: The role and progression of policy	154
Usman M.; Vanhaverbeke W.	2017	How start-ups successfully organize and manage open innovation with large companies	150
Chesbrough H.; Kim S.; Agogino A.	2014	Chez panisse: Building an open innovation ecosystem	149
Surie G.	2017	Creating the innovation ecosystem for renewable energy via social entrepreneurship: Insights from India	138

Source: our elaboration

The first article of Gomes *et al.* (2018) is a review that highlights the key papers on innovation ecosystems and traces a shift in the literature from business ecosystems (focused on value capture) to innovation ecosystems (focused on value creation). Gomes's study identifies six main research streams within innovation ecosystems: industry platform vs. innovation ecosystem, innovation ecosystem strategy and business model, innovation management, managing partners, the lifecycle of innovation ecosystems, and innovation ecosystems in new venture creation.

The second most cited article is that of Nambisan and Baron (2013) who analyse the importance of innovation ecosystems for entrepreneurship, focusing on the challenges faced by entrepreneurs in balancing the goals of their businesses with those set by ecosystem leaders. To effectively manage these dynamics, the role of entrepreneurs' self-regulation processes as a tool is explored.

Audretsch *et al.* (2019) critically analyse the concept of 'ecosystem', highlighting the lack of clear and consistent definitions in the academic, industry and policy literature. The paper explores the economic, technological and social dimensions of entrepreneurial ecosystems, focusing on the key elements that characterise them and the conditions under which firms influence their development and thinking within such ecosystems.

Guerrero *et al.* (2016) examines the role of entrepreneurial universities as drivers of innovation and entrepreneurial activities in the new socioeconomic environment. The authors propose a theoretical framework to analyse the role of these institutions.

Palmiè *et al.* (2020) defines disruptive innovation ecosystems and illustrates the impact that the financial technology (FinTech) ecosystem has had on disrupting the financial services industry, while the central focus of Hayter's (2016) contribution is to conceptualize and explore the structure and function of an entrepreneurial university ecosystem, specifically examining the role of social networks among faculty and graduate student entrepreneurs and the knowledge intermediaries that support them.

Hugging and Williams (2011) explore the multidimensional nature of regional entrepreneurship policy, which spans both economic and social drivers. The paper highlights a shift from cluster-focused policies to those fostering regional innovation ecosystems, noting that policymakers face pressure to prioritize short-term results over long-term development. Additionally, it discusses the tension between using enterprise policy to enhance regional competitiveness or address economic and social challenges.

Uman and Vanhaverbeke (2017) explore how start-ups engage in and manage open innovation with large companies to address challenges related to their early-stage size and inexperience. It

underscores the unique strategies start-ups adopt, differing from those of larger firms, and examines the opportunities and obstacles of both inbound and outbound open innovation. The study highlights the critical role of experienced start-up managers, particularly those with prior exposure to large firms, in effectively fostering and sustaining this collaborative innovation effort.

Chesbrough et al (2014) in the Chez Panisse case study applies an open innovation framework to examine the restaurant's growth and success. It illustrates how a small firm flourished by cultivating a thriving business ecosystem centered on knowledge sharing, fostering individual development, and building trust among participants. This case study offers valuable insights for students into the factors behind Chez Panisse's business achievements.

Surie (2017) explores the role of social entrepreneurship, both at the organizational and institutional levels, in driving innovation and economic development. By integrating perspectives from national innovation systems (NIS), complexity theory, ecosystem dynamics, and social entrepreneurship studies, it proposes a framework for building innovation ecosystems through the lens of social entrepreneurship.

We selected the 10 most cited articles on the topic, as they represent the most significant scientific contributions, widely recognized as foundational by the academic community. This choice enables us to identify the key research trends and the most established theoretical references, offering a robust foundation for framing the subject. The purpose of this selection was to explore whether experiences such as the Contamination Lab can be grounded in a well-structured, scientifically validated theoretical framework. These articles form the research streams that underpin the emerging framework, illustrating how the Contamination Lab is seamlessly integrated within them.

6. Results and main findings

The evolution of the relationship between entrepreneurship and innovation ecosystems reveals a progressive deepening and diversification of research on the topic that describe a theorical framework. Initially, the focus was on business ecosystems and their role in value capture, but the literature has gradually shifted towards innovation ecosystems, emphasizing value creation. This transition is evident in studies that have defined key research streams, such as platform strategies, innovation management, lifecycle dynamics, and the role of ecosystems in new venture creation (Gomes *et al.*, 2018).

Entrepreneurship is increasingly viewed as a critical component within innovation ecosystems. Research by Nambisan and Baron (2013) highlights the interplay between entrepreneurs and ecosystem leaders, emphasizing the need for entrepreneurs to balance their business objectives with broader ecosystem goals. Similarly, studies on entrepreneurial universities (Guerrero *et al.*, 2016; Hayter, 2016) underscore the importance of these institutions in fostering innovation, entrepreneurial activities, and social networks that support knowledge exchange. The multidimensional nature of ecosystems is another recurring theme.

Audretsch *et al.* (2019) critique the inconsistent definitions of ecosystems and explore their economic, social, and technological dimensions, while Hugging and Williams (2011) highlight the policy evolution from cluster-focused strategies to fostering regional innovation ecosystems. Specific cases and sectors also provide rich insights. Palmiè *et al.* (2020) explore disruptive innovation ecosystems, particularly in FinTech, while Uman and Vanhaverbeke (2017) examine how start-ups navigate open innovation with large firms to overcome early-stage challenges. Similarly, Chesbrough *et al.* (2014) showcase the success of the Chez Panisse business ecosystem, highlighting the role of trust, knowledge sharing, and individual growth.

Finally, Surie (2017) expands the discussion by integrating social entrepreneurship and innovation ecosystems, proposing a framework for leveraging entrepreneurial activities to drive economic and social development through ecosystem-building. In conclusion, the evolution of the entrepreneurship-innovation ecosystem discourse reflects a shift towards more holistic, interdisciplinary approaches,

recognizing the complex dynamics of value creation, collaboration, and policy interplay across different contexts and scales. The literature has shifted toward viewing innovation ecosystems as dynamic, multi-actor systems where universities play an increasingly central orchestrating role. The Contamination Lab (CLab) initiative in Italy exemplifies how these theoretical insights can materialize in practice. As a university-led programme, the CLab integrates key aspects discussed in the literature-such as entrepreneurial orchestration, knowledge exchange, stakeholder engagement, and open innovation-demonstrating how the abstract principles of ecosystem research can translate into actionable, context-specific interventions. In this sense, the CLab can be seen as a practical manifestation of the diverse theoretical contributions reviewed, offering a structured implementation of ecosystem thinking within real-world entrepreneurial environments.

The Contamination Lab (CLab) could represent a practical embodiment of these theoretical advancements, illustrating how these programmes can play a pivotal role in fostering innovation ecosystems. By blending interdisciplinary collaboration, open innovation principles, and ecosystem thinking, the CLab demonstrates how universities can act as hubs that connect students, researchers, businesses, and public institutions to address regional developmental challenges. As part of Italy's national initiative to cultivate entrepreneurial mindsets, the CLab model provides a structured, replicable framework for leveraging academic knowledge and entrepreneurial activities to drive socioeconomic growth.

Applying the results of the performance analysis to the CLab underscores its alignment with the multidimensional nature of innovation ecosystems (Adner, 2016). Operating in an economically and technologically disadvantaged region, the CLab leverages interdisciplinary collaboration to bridge gaps in innovation and stimulate regional development. The program facilitates interactions between diverse stakeholders, embodying the principles of open innovation, where external knowledge and resources accelerate the creation of startups and innovative business models. This reflects the findings of Uman and Vanhaverbeke (2017), who highlight the role of start-ups in navigating open innovation to overcome early-stage barriers.

The progression of the number of CLabs illustrates and demonstrate its increasing influence on the local entrepreneurial ecosystem, aligning with Surie's (2017) framework for leveraging entrepreneurial activities to drive economic and social development. By orchestrating a collaborative environment where academic research, industry expertise, and entrepreneurial action converge, the CLab exemplifies the hub-based ecosystem model (Chesbrough *et al.*, 2014). Moreover, the CLab fosters business model innovation, enabling participants to develop solutions that integrate emerging technologies and address market needs. Its approach highlights the critical role of universities as ecosystem orchestrators, bridging public and private sectors while facilitating knowledge spillovers and startup acceleration. The CLab thus serves as a compelling case of how innovation ecosystems, grounded in systematic entrepreneurship and interdisciplinary collaboration, can promote sustainable and impactful regional development, even in underdeveloped areas.

7. Conclusions and further research

Models such Contamination Labs (CLabs) have been shown to embody a scientifically rigorous and replicable theoretical framework aligned with the most relevant research in innovation and entrepreneurship. This means that this programme, conceived by policymakers with economic and social objectives, has a solid scientific basis that allows it to represent a theoretical framework that can be adapted and replicated in other contexts, with due modifications. This new approach highlights the potential of structured innovation ecosystems to foster entrepreneurship and drive economic renewal, emphasizing the importance of strong public-private partnerships, investment in startup support mechanisms, and the continuous evolution of entrepreneurial education.

By creating a collaborative environment where students, researchers, businesses, and institutions interact, it demonstrates how interdisciplinary learning and open innovation can transform ideas into

viable business opportunities. Moreover, is illustrated how a key ecosystem actor, through a systematic and methodical approach to entrepreneurship, can significantly enhance the broader innovation ecosystem. Such initiatives serve as catalysts for technological advancement, entrepreneurship, and regional economic development, reinforcing their role in shaping the future of innovation-driven growth.

Future research should continue with the analysis of further C-Lab cases, evaluating how this experience produces multiple results in line with academic research.

Future research trajectories based on this contribution should also focus on identifying which specific aspects of the theoretical streams, as revealed through performance analysis, are embodied by models such as the Contamination Lab, and how these elements can be applied in different contexts. It is important to explore whether such models, when implemented in comparable environments, produce consistent and replicable results or whether variations in results indicate that this hypothesis may not be universally applicable. In case of discrepancies, it will be crucial to further explore the underlying factors, such as institutional settings, cultural dynamics, availability of resources or levels of stakeholder involvement.

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A Modular and Stakeholder-oriented Theory for Ecosystem Leadership and Governance

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Abstract

Framework of the research. *In contemporary times, businesses and societies must navigate new, complex challenges that no single entity can resolve. These challenges stimulate modular contributions between a set of heterogeneous stakeholders that influence to the emergence of different forms of ecosystems characterised by various leadership models.*

Aim of the paper. *This work discusses governance and leadership models that may emerge from different ecosystem forms.*

Methodology. *To tackle this challenge, the authors conducted a theoretical study recognising the ecosystem as an intersection of modular and stakeholder theories.*

Results of the paper. *This manuscript focuses on ecosystems' creation and dynamics, emphasising that they are not always constructed through a top-down process. Instead, they grow spontaneously from deliberate, collaborative social, economic, public, and cultural activities driven by individual and contextual social, environmental, and economic needs.*

Originality of the paper. *This work presents various governance and leadership models as representations of the application of theories and the key elements that stimulate and manage the ecosystem through a conceptual approach.*

Research limitations. *This work represents a theoretical effort supported solely by case studies conducted through desk research.*

Managerial implications. *This study aims to adapt the theoretical effort to identify diverse forms of ecosystem governance that integrate scientific knowledge and offer suggestions for policymakers.*

Keywords: *Ecosystem; Governance; Stakeholder Engagement Theory; Modular Theory; Collaborative and Collective Intelligence*

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1. Introduction

Societies face several pressing and wide-ranging issues, such as local and global poverty, healthcare challenges, and environmental sustainability concerns, including climate change, biodiversity loss, and air and water pollution. To remain relevant, these issues require radical and urgent changes (Steffen *et al.*, 2018; Tittensor *et al.*, 2014).

On a different, albeit more complex, level, they must navigate increasingly rapid technological advancements, as evidenced by the swift development and spread of the Internet of Things, the Metaverse, and, in the past year, the renewed push for developing AI. These innovations are expanding collaborative forms by supporting modular engagement between interconnected, not rigorously co-localised actors, not just producers and users, but considering even the other stakeholders, as they will influence or be influenced by these issues.

These interconnection dynamics help emerge an approach characterised by actors (such as business, scientists, NGOs, social movements, and several others) who act both as problem-solvers and solution-seekers, driving resource allocation by creating a collective and collaborative effort (Blok and Lemmens, 2015).

Adopting this collaborative approach helps mobilise knowledge assets and needs from various stakeholders at a global scale, accelerates learning and knowledge combination processes, and fosters advancement towards addressing a specific issue (Chesbrough and Di Minin, 2014). This establishes a global resource-sharing framework that can be analysed through the lens of open innovation, which is characterised by different knowledge exchange flows (both outside in and/or inside out) (Chesbrough, 2003).

This context benefits from a broad approach to stakeholder engagement to manifest, combine and share their capabilities, needs and interests. Thus, it helps create a mutual understanding between the heterogeneous and co-responsible innovation actors, favouring win-win solutions and creating a more promising scenario for all the actors committed to these “eco” innovation processes (Sciarelli and Tani, 2015).

Accordingly, a metaphor emerges about relationships between heterogeneous agents who, while committed to attaining their individual goals, modularly contribute with their capabilities and assets to finding and delivering an answer to social, economic, and environmental needs (Russell and Smorodinskaya, 2018).

Recent worldwide socio-economic dynamics, such as sanitary emergence or the application of ESG pillars, have helped identify various forms of not necessarily co-localised ecosystem emergence that Ansell and others (2022) defined as *theme-focused*. These include *community-based* ecosystems (Reina-Rozo, 2021), exemplified by crowdsourcing frameworks that link problem-solvers with solution-seekers, or *focal-firm-based* ecosystems, created by the interaction between developers, producers and end-users (Autio and Thomas, 2020).

Direct or indirect interactions among diverse institutions and actors participating in the ecosystems present challenges to the governance, including resource distribution and conflicts over resource and benefit allocation (Cunningham *et al.*, 2019).

This leads to hyper-connectivity, further eased through technological innovations, which is contributing to ecosystem emergence processes with extreme boundary openness, and it highlights several governance/leadership models on which management studies have less focused their efforts.

Therefore, in the last decades, researchers have focused on localised ecosystem forms, such as business ecosystems (Moore, 1993), entrepreneurial ecosystems (Stam and Spigel, 2006), and innovation ecosystems (Adner, 2006), ecosystem service (Matthies *et al.*, 2016), highlighting the fundamental role of the geographical variable, or on the participant nature or their characteristic access such as in the Digital Business Ecosystem (DBE) that considers economic actors as ecosystem’s components (Senyo *et al.*, 2019).

In the current scenario, social and environmental issues are globally diffused and require combined ad interconnected heterogeneous capabilities coming from bottom-up or top-down flows to be solved.

These phenomena characterise hierarchical or etherarchical ecosystem forms that show different leadership.

This work aims to analyse different forms of governance/leadership in theme-based ecosystems. To reach this objective, the authors conducted a theoretical study recognising the ecosystem dynamics resulting from the intersection of modular and stakeholder theories. This study sought to adapt the theoretical effort to identify, using case studies carried out on the desk, diverse forms of ecosystem governance that integrate scientific knowledge and provide suggestions for practitioners and policymakers (Jaakkola, 2020). It addresses the research question:

1. Does engaging a diverse set of loosely coupled stakeholders increase the ecosystem's modularity?
2. What principles define the role and the relationships between the ecosystem's components?
3. How do these phenomena influence the ecosystems' governance models?

To achieve our goal, the work will be articulated as follows: In the following section, we present a literature review on the ecosystem. Next (in section 3), we present a study of modular and stakeholder theories. In the fourth section, we present ecosystem governance models. The paper closes with section 5, which gives space to conclusions and suggests avenues for future research.

2. Literature review

Drawing on biological studies, researchers assert that an ecosystem can be broadly defined as a complex, interactive, and adaptive system in which components engage by establishing open, non-linear relationships to sustain both people and the planet under changing conditions (Ferraro *et al.*, 2015). A lot of management researchers (Moore, 1993; Stam and Spigel, 2006; Adner, 2006; Matthies et al, 2016; Senyo *et al.*, 2019) have adopted this concept to understand and explain how the activities of various heterogeneous co-located agents, along with their active relationships, could support innovation-based ventures.

This perspective is rooted in the institutional phenomenon (Wessner, 2007; Adner, 2006) and focuses on understanding the roles of companies, universities, investors, and governments in their closely interconnected local interactions. As a result, authors such as Spigel (2017) contend that the ecosystem comprises "the combinations of social, political, economic, and cultural elements within a region".

With the rise of new technologies, these relationships are no longer focused on capturing value and are no longer confined to specific geographical areas when creating the ecosystem, but they may be focused on mutual value creation. Consequently, based on this understanding, an ecosystem can be perceived as an interconnected network of individuals, organisations, resources, and institutions that collectively contribute to the development, adoption, and diffusion of new ideas, technologies, and processes, generating solutions to economic, social, and environmental needs. The significance of these ecosystems lies in their ability to foster creativity, collaboration, and the overall advancement of society (Ritala and Almpanopoulou, 2017).

Furthermore, in the traditional studies on innovation ecosystems, several researchers, such as Autio and Thomas, 2014; Jacobides *et al.*, 2018; Chu and Chan, 2009, have looked into value co-creation as a result of diverse and loosely connected actors, typically organised around a focal organisation (Moore, 1993). Currently, this focal role is increasingly filled by platforms, or just an innovative and diffused idea, considered as new "places" that help the other actors to engage in 'co-creating' mutual, contextual benefits (Panetti *et al.*, 2020).

Several authors (Fuller *et al.*, 2004; Chesbrough and Appleyard,2007; Namin *et al.*,2024) see ecosystems as the result of heterogeneous agents who work together. These agents share a common knowledge of specific social, environmental, or economic needs resulting from market failures, state failures, and/or those related to civil society; they are able to commit to searching for a solution and provide innovative products, services, or approaches to *unmet needs*.

In this paper, the authors synthesized the literature on ecosystem creation into two macro-streams: the first considers the ecosystem's emergence as the result of the actions of a community, and the second is based on the actions of a focal actor (be it firm, institution, social agent, and so on).

The first macro-stream, the one on *community-based ecosystems*, is characterised by bottom-up emergence, adaptive behaviour, and a diffuse governance model that may address social, environmental, and economic needs (Gunderson *et al.*, 2002; Crona and Bodin, 2006; Ciasullo *et al.*, 2020).

An example of this process can be found in the 2014 Ebola outbreak. At that time, local communities supported by economic and institutional actors faced a critical issue. Still, they were able to focus their efforts on leveraging each stakeholder's specific capacity to undertake the social and economic tasks assigned to them by the core of the ecosystem while collaborating with both internal and external partners. (Powell *et al.*, 2018).

In the community-based ecosystem, producers and decision-makers collaborate to explore approaches for advancing shared goals within informal connections that make the boundaries of ecosystems less visible (Gunderson *et al.*, 2002). As a result, cooperation and engagement form the foundational assumptions of this ecosystem model for creating adaptive, collaborative, diffuse, and open governance (Primmer and Furman, 2012; Hauck *et al.*, 2013; Moggi and Dameri, 2021).

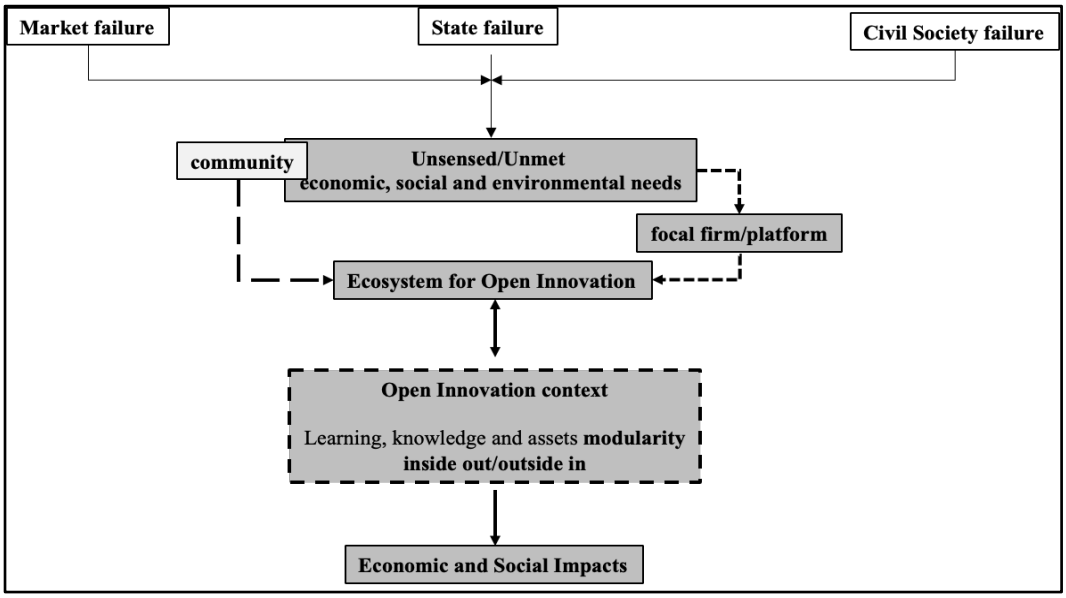
Looking at the second macro-stream, these are studies looking into ecosystems centred around a specific agent (Autio and Thomas, 2014; Iansiti and Levien, 2004; Moore, 1996; Teece, 2007; Cassia *et al.*, 2020); they view the ecosystem as a network of interconnected organisations individuated and led by a *focal firm*, or a focal platform, to answer to social and economic needs. This network focuses on creating new economic, social and environmental value through innovation processes coordinated by an ecosystem builder or, at most, a backbone team (Hoffecker *et al.*, 2023).

An example is the Samsung open source initiative, created to address the plagiarism cases associated with Samsung Developer, with a second motivation to align developer capabilities and user needs around the globe (https://opensource.samsung.com/). On a specific platform created by Samsung, developers and users of Samsung products converge to generate new value and experiences for customers alongside respective partners, individual developers, and communities characterised by limited technological innovation in social fields such as health, education, and natural resources safeguards.

The ecosystem actors' interconnectedness and the social and economic impacts of their relationships facilitate interactions that address the gaps left by ineffective public sector policies.

This collaborative and co-creative trend characterises *open innovation* approaches, representing the purposive knowledge inflow and outflow to accelerate innovation in both production and usage (Chesbrough, 2003; Costa *et al.*, 2023; Cozzolino *et al.*, 2021). This phenomenon facilitates creating a more embedded network to support the emergence and development of modular learning processes, to share knowledge and assets in both *community-based* and *focal-firm-based* ecosystems. In these ecosystems, the less and less limited exchange processes between heterogeneous ecosystem components help produce *eco" impacts* following both inside-out or outside-in exchange trajectories (see Figure 1, which we adapted from the models presented in Gupta *et al.*, 2017: 19).

Figure 1: Focal firm or community empowerment within economic and social solutions



Source: Our adaptation of Gupta *et al.* (2017: 19)

Cortez and Johnson (2020) argued that crisis events stimulate the application of the four foundational premises of social exchange theory within B2B relationships (Lambe *et al.*, 2001). According to their approach, these interactions contribute to developing a more embedded ecosystem, as the related processes yield economic and social outcomes. These outcomes support policymaker activities and characterise the exchange relationship between economic agents; consequently, they foster trust and commitment between the agents.

3. Modularity characteristic and the conceptual framework

The cooperative condition arising from a single actor's contribution to achieve a shared purpose underpins the modular characteristics of an ecosystem.

Baldwin and Clark (2006, p. 84) assert that modularity involves "constructing a complex product or process from smaller subsystems/modules that can be designed independently yet still function collectively as a whole". In this context, modularity theory, developed as a counterpart to transaction cost theory, emphasises that the primary unit of analysis is neither a "stage" in a sequential production process nor "knowledge" contributing to a routine, competency, or capability. Instead, the fundamental units of analysis consist of decisions, components, or tasks, and their interdependencies between engaged parties will help to produce, combine and share learning, knowledge and assets as a consequence of adopting inside-out or outside-in processes in an open innovation condition (Chesbrough, 2014; Mason *et al.*, 2024). Decisions, components, and tasks are more granular than stages yet more concrete and directly observable than knowledge (Baldwin, 2008).

Consequently, its role in the ecosystem relates to the *encapsulation boundaries* (Tiwana *et al.*, 2010), which pertain to the absence of a triggering effect - i.e., changes in specific subsystems/modules could do not have a ripple effect on the behaviour of other components within the ecosystem. Consequently, modularity aims enabling diverse suppliers to create interdependent, non-standard, and adaptive system components, necessitating only minimal coordination within the supply chain or, more broadly, help suppliers, producers, and users as well, to become a coherent whole without incurring the costs of needing to manage the interaction enforcement processes (Cennamo, 2021; Scorrano *et al.*, 2025).

As a result, organisations within an ecosystem acquire considerable autonomy in designing, pricing, and operating their respective modules, provided they connect with others in mutually agreed ways, which sometimes may be predefined (Baldwin, 2008).

In this context, modularity helps to foster innovations by integrating various subsystems (Bitner *et al.*, 2008; Kohtamäki *et al.*, 2019). These innovations have the potential to produce economic, social, and environmental outcomes. This creates a dynamic context with diverse agents representing relatively autonomous production modules that can be readily reconfigured to support and improve various initiatives.

Consequently, the more questions the context generates, the greater the modularity potential for reducing the operational burden on the individual agent and promoting a mix of varied capabilities and knowledge.

From a scientific perspective, modularity theory is central to characterising the differences between ecosystems and networks. It emphasises that, in ecosystems, collaborative value creation helps achieve specific goals without relying on standardised processes. It also facilitates engagement with agents operating across various industries through interfaces, coordination rules, and trust. In turn, this enables economic, social, and institutional agents to develop complementary and synergistic "modules" that embody the make-or-collaborate-or-buy decision or the problem-solver or solution-seeker condition, thereby blurring the traditional distinction between producers and customers (Pilinkienė and Mačiulis, 2014; Kuan and West, 2023; Bianchi and Grippi, 2025). The presence of modularity is also the condition that allows a hub to forego at least some degree of explicit coordination. Furthermore, within ecosystems, end-users are expected to join a group or platform to utilise its specific complements (Hagiu and Wright, 2015), as exemplified, for instance, by web apps (Jacobides *et al.*, 2018).

From this modular perspective, ecosystems differ from market-based arrangements. End customers can choose from various producers or developers connected through various relationships (Ancillai *et al.*, 2023).

Regarding this approach, Malone *et al.* (2010) argued that collaborative or collective efforts could characterise the modular production of ecosystems. This *collective* condition occurs when ecosystem members develop items independently, whereas the *collaborative* one occurs when members collaborate to create something with interdependent contributions. In either condition, the sustainability of such solutions depends upon the degree of reciprocity among the provider, consumer and facilitator of the delivery systems and on the openness of the learning and exchange platform (Gupta *et al.*, 2017). This *collective and collaborative* effort among independent technological agents promotes the development of ecosystems characterised by complementary digital servitization, where all components can function as either sellers or buyers, aligning with the question, "who sells to whom?" (Kohtamäki *et al.*, 2019; Boudreau and Lakhani, 2009).

An example of these ecosystems can be found in the Voron project, an innovative ecosystem established in 2015 to develop an open-source, high-performance 3D printer involving end- users and companies. Several stakeholders co-created an initial "Bill of Materials" (BOM), first utilised by pioneering end users to construct the initial functioning prototypes. Subsequently, it has been adopted by various participants worldwide to produce specific parts based on the white papers from which the BOM was derived, enabling them to profit from selling "part kits." Eventually, these "producers" and "end users" began to collaborate closely, co-creating new and improved parts referenced in the original "part list" as "variants" or, when they significantly impact the entire project, as "revisions." Due to this intricate self-reinforcing process, the Voron project has developed, since 2015, five main Voron designs, each produced by thousands of different users and then evolved into hundreds of variants.

Therefore, while modularity, the nature of complementarities, and fungibility may all be partly designed, the process is not always driven by foresight, and some actors may unwittingly form ecosystems.

4. Stakeholder engagement within the modular approach

The modular approach highlights the relevance of the stakeholder network perspective (Rowley, 2017), which overcomes the business-centric vision from the original stakeholder theory. This approach does go beyond the dyadic approach in stakeholder management theory (Rowley, 1997) to understand that when the company and other social actors are in a stakeholder relationship (see Freeman, 1984 for the definition of stakeholders), they are in a reciprocal condition (Wagner Mainardes *et al.*, 2012). Consequently, stakeholder engagement processes are necessarily bi-directional ones.

In the ecosystem dynamics of recent decades, driven by social, geopolitical, and economic events, the "crowd" has evolved into a relational context utilised by diverse stakeholders to interact. Within the crowd, different stakeholders can take on the roles of both problem-solver and solution-seeker, thereby enhancing the mutuality of their relationships with each other.

Using a different approach as the context for a stakeholder network, the crowd may be read as an ecosystem as loosely-coupled heterogeneous actors populate it. They, often supported by new technologies available through crowdsourcing processes, interact to *combine* knowledge and know-how as a way to reach a mutual objective. This is coherent with the vision by Adner (2017) that considered the ecosystem as "defined by the alignment structure of the multilateral set of partners that need to interact for a focal value proposition" (2017, p. 42).

Therefore, modularity's primary action is to enable heterogeneous inputs introduced by heterogeneous stakeholders to be recombined into a variety of heterogeneous configurations/demands.

Hence, all the actors within this network of relationships can mutually influence each other. Furthermore, considering that each stakeholder's participation may be considered dynamic, the various actors must balance and align their multiple interests according to the needs manifested by the other actors to be considered legitimate agents in the ecosystem, i.e., they have to follow the third principle of Stakeholder Capitalism (Freeman *et al.*, 2007).

According to several authors (e.g., Devin et Lane., 2014; Payne and Calton, 2017; Hristov and Apolloni, 2022), the continuous interactions supporting stakeholder engagement processes will help create a boundary-spanning condition characterised by goodwill, competence and contractual trust and a shared view of the needs and the way to attain the broader goals of the ecosystem as a whole (Malhotra and Lumineau, 2011).

In line with the ecosystem perspective, De Colle (2005) argues that the stakeholder engagement process can create self-reinforcing positive feedback to help the various actors attain better social, environmental, and economic performance. On the same page, Jonas *et al.* (2018) hold that these processes are driven by micro-level factors, such as common experiences, trust and sharing a common goal, that may help every single stakeholder to participate as part of these innovation ecosystems. This is even truer, as highlighted by Sciarelli and Tani (2013), arguing that the company is not necessarily the focal stakeholder in the network and that the dynamics in the relationship networks may make the focal stakeholder change over time according to the legitimacy the other actors give to the specific agent.

Furthermore, a well-developed set of stakeholder engagement practices helps the ecosystem attain the fourth principle of stakeholder capitalism-i.e., acknowledging that human beings are complex psychological creatures that may act using different values and points of view-and the fifth principle, which is Continuous Creation (Freeman *et al.*, 2007).

On the same page, Roloff (2008) holds that stakeholder theory should move to an issue-focused approach to acknowledge that companies operate in multi-stakeholder networks with numerous and, at times, contradictory stakeholder demands and enhance the legitimacy of corporate activities. Accordingly, the stakeholder network could be seen as a "virtual" community where several committed actors interact to satisfy their interests and needs, even if they need a network orchestrator

(Reypens *et al.*, 2021) to effectively align their values and activities toward reaching a common goal or a set of shared goals connected with their social context.

5. The governance/leadership in the ecosystem

From an ecosystem perspective, modularity represents the mode of operation of an emergent organisation, typically non-formalised and characterised by loosely coupled stakeholders that combine their assets to reach a mutual purpose. These stakeholders produce economic, social, and environmental impacts by themselves or by leveraging their network (von Hippel, 2006; Daft and Lewin, 1993). Stakeholder management theory holds that stakeholders should adopt engagement processes to define shared objectives that will survive in the long run only when the goals of individual actors align with the more general ecosystem's ones (Zahra and Nambisan, 2012).

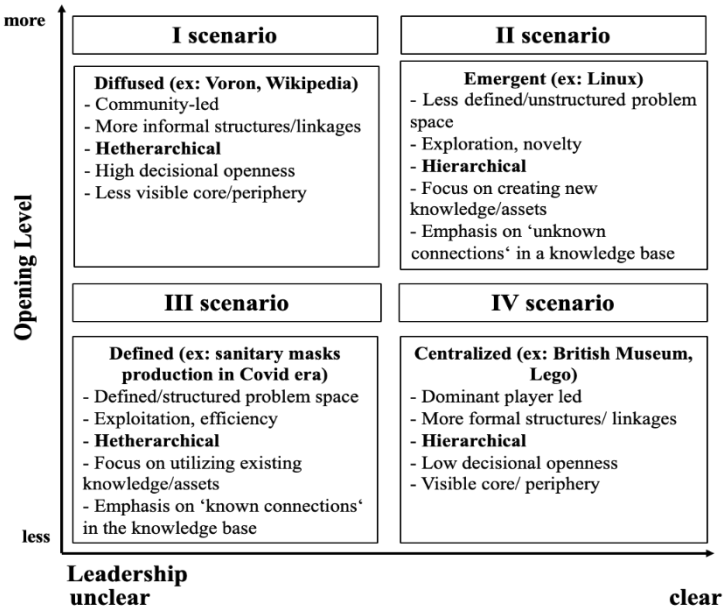
The shared interest (Iansiti and Levien, 2004) fosters engagement and foundational interdependence among ecosystem agents influenced by joint co-evolution (Majava *et al.*, 2016). It underscores collaboration between heterogeneous actors, not necessarily co-localised in developing new products or innovations and adhering to formal and informal exchange rules.

All the activities aimed to involve the processes of recognising goals, mobilising actors, defining roles and rules in the co-production of assets, knowledge, capacities, and products/services that benefit humanity, and monitoring the achievement of objectives sign the ecosystem governance (Ojasalo, 2001; Primmer *et al.*, 2015; Rampersad, 2016; Winkler *et al.*, 2021).

Regarding governance, Reypens *et al.* (2019) highlight that leadership in the ecosystem could be relevant in mobilising a heterogeneous set of diverse stakeholders. In this vein, Schmidt and Foss (2025) argue that the increasing modularity, supported by loosely-coupled relations (separation and recombination level), does not influence only the final objective, but it concerns the whole organisation in terms of flexibility and functioning.

Therefore, Nambisan and Sawhney (2007) propose four ecosystem scenarios, which are presented here with related examples. These scenarios arise from the interdependence of the level of innovation openness, their specific rules, and the “clear or unclear” identification of the ecosystem's focal point-its leadership (see Fig. n.2). Regarding ecosystem functioning rules, Sturgeon (2002) holds that they may use a traditional vertical and hierarchical model or a horizontal or heterarchical one.

Figure 2: Ecosystem Governance different scenarios



Source: Basile and Tani (2024)

The *first scenario*, "*diffused*" ecosystem governance, is characterised by a community-led ecosystem with limited core and peripheral visibility. It also highlights a high level of decisional openness, resulting from an informal structure representing *hetherarchical* governance, as already presented in the Voron Project.

The Linux Operating System case illustrates that the *second scenario*, named *emergent*, features a high-innovation opening with unknown connections in an unstructured problem space *to foster* novelty. Here, leadership is clear and focused on a platform; nevertheless, it operates in a diffuse and less-defined platform. Several actors serve as stimulators even if they do not assume the role of leaders in these modular processes.

The *third scenario* is typified by unclear leadership, similar to the diffused scenario, characterised by a temporary assembly of economic and social agents who communicate using a horizontal model, collaborating on knowledge and resources to achieve modular results (Hedlund, 1994). This context, labelled as *defined*, shows low innovation openness, wherein agents leverage their knowledge within known connections to address a delimited problem. Governance is diffused and unclear in this scenario, which may be driven by social and economic motivations, exemplified by the urgent need for masks during the pandemic.

The *fourth* and final scenario presents a dominant player-led context with low decisional openness and distinct core and peripheral ecosystem roles. This situation showcases a traditional *hierarchical* governance model where innovation processes follow a top-down path, as evidenced by the British Museum and Lego that engage end-users in the world in producing innovation within Become a Volunteer-like initiatives that becomes "Become a Patron" in the British Museum case or "Share your creation with us" in the Lego case. In both cases, the organisation asks its users to become one of the foundations of their innovative processes.

This ecosystem model not only engages consumers but also shows a multidivisional organisation, a permanent structure, and a vertical dialogue among different levels of personnel. In this scenario, top management acts as a catalyst and amplifier of the knowledge disseminated within the ecosystem. Consequently, they possess the power and legitimacy to concentrate ecosystem efforts on enhancing their company's competitive advantage.

In this regard, Simon (2012) argued that hierarchical models typically signify subordination to an authoritative relationship. However, using an ecosystem perspective, modular creation reflects a state with reduced or no overt exercise of managerial authority. Therefore, this modular condition, aimed at problem-solving, can facilitate collective, collaborative, and open processes to discover shared solutions (Newig and Fritsch, 2009) or be prompted by focal agents, often public agents, in response to a diffuse problem within a defined territory or target (Primmer *et al.*, 2015).

In the first case, open processes are shifting the governance model towards *community-based* ones, as seen in the first scenario, responding to the inadequacies of top-down command-and-control governance methods in addressing social and environmental issues (Koontz and Thomas, 2006; Loft *et al.*, 2015; Bodin, 2017; Koontz and Thomas, 2006; Wallington and Lawrence, 2008).

Autonomous, loosely coupled, and easily reconfigurable organisations that share and combine experiences should cultivate these modular processes to enhance performance. Indeed, adopting standards reduces asset specificity (Argyres 1999; Cainarca *et al.* 1993) and consequently diminishes the need to exercise managerial authority.

These organisational forms are characterised by flatter hierarchies, decentralised decision-making processes, a greater capacity to tolerate ambiguity, permeable internal and external boundaries, employee empowerment, capability renewal, self-organising units, and self-integrating coordination mechanisms (Daft and Lewin, 1993; Campagnolo and Camuffo, 2010). Similarly, Langlois (2003) argued that in the late 20th century, modular product and process architectures made hierarchical coordination unnecessary in many venues. In this scenario, the prominence of the crowd in innovation and product development is often temporary, reflecting the extent of knowledge combination, transfer and learning. Consequently, knowledge is affected by the fact that it flows between agents with minimal boundaries during product design and development, and in more frequent cases (such as in

the bitcoin markets or machine learning logic), this flow is regulated by algorithms (Hsieh and Vergne, 2023). Usually, these ecosystem models are characterised by producing impacts deriving *from community* involvement.

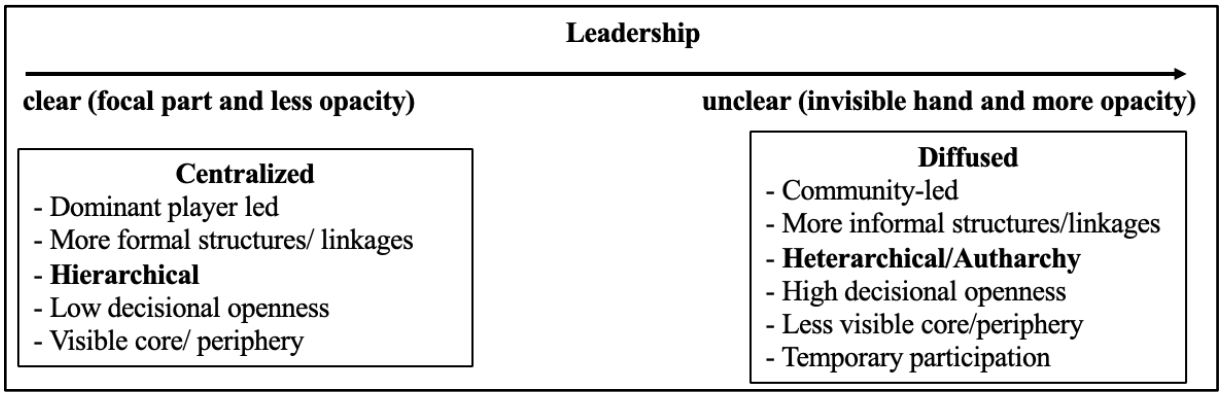
In contrast to the cooperation between solver-producers and decision-makers, ecosystems can be swayed by values incorporated into decision-making via a top-down process led by a dominant player (e.g., a public institution or focal agent, as represented in the fourth scenario in Figure 2) within more formal connections that make the ecosystems' boundaries visible (Young, 2013). These circumstances define an ecosystem model that fills its cause and activities *with* components.

This more or less flattering hierarchy trend, shown in Figure 3, influences different ecosystem models, characterising them with a governance range from hierarchical to heterarchical.

An example of a centralised ecosystem is the one defined by the Unipol Group, a prominent Italian insurer. It provides a compelling case study of a focal firm strategically managing an innovation ecosystem. Unipol orchestrates collaborative ventures with external startups through its InnovHub platform and a network of internal Innovation Champions. This dual approach leverages internal capabilities and external expertise to drive innovation. Emphasising knowledge diffusion, Unipol invests in specialised training for its Innovation Champions to promote organisational change. Metrics-driven monitoring, coupled with proactive startup engagement, cultivates a dynamic ecosystem to achieve tangible economic, social, and environmental impacts, underscoring innovation as a key driver of Unipol's strategic advancement.

Conversely, The Fab Lab network exemplifies a diffused governance innovation ecosystem. Lacking a dominant focal firm, innovation emerges from the collective actions of individual labs guided by a shared "Fab Charter." Local autonomy and global collaboration foster grassroots innovation tailored to their community needs. Standardised digital fabrication tools facilitate rapid prototyping and skill development. This model promotes open access to technology and knowledge-sharing processes in favour of their components and outside agents, resulting in locally relevant solutions ranging from low-cost medical devices to sustainable agriculture initiatives. The ecosystem's sustainability depends on navigating funding challenges while maintaining cohesion across distributed nodes.

Figure 3: Governance trend: from Hierarchical to Etherarchical



Source: Basile and Tani (2024)

Concerning the governance model, Ball (2009) argued that there is a growing trend in shifting from a hierarchical/centralised to a heterarchical/diffused model. This trend is supplanting bureaucracy and administrative structures, as the relationships within the system must be redundant, overlapping, and multiplexed, characterised by various and not always coherent patterns.

In this context, the term governance itself changes meaning. It shifts from a general concept associated with leadership and control to illustrating its capacity to guide ecosystems in responding to, adapting to, and addressing their social and economic environmental needs (Mäkinen and Dedehayir, 2012; Tiwana *et al.*, 2010; Leckel *et al.*, 2020).

6. Conclusion

This manuscript has focused on ecosystems' leadership dynamics, highlighting that they are not always derived from a top-down process, as they may grow out spontaneously from deliberate, collaborative activities of social, economic, public, and cultural agents driven by some complex motivation that may have some impacts on the social, the environmental, and/or the economic dimensions. In this perspective, in line with Powell and Finger (2013), we have argued that an ecosystem can even be seen as a way to bridge between the profit and the non-profit-oriented drives in the system components when it results from some processes that were initially less structured.

Furthermore, this work aimed to show the effect of adopting modular co-creating activities, shared strategies, responsibilities, and goals in an ecosystem to support and enhance the systemic ability to create and combine collective efforts and intelligence.

The ability of economic agents to create a network of relationships with a set of heterogeneous actors may be easily found by looking at modern companies' drive to ESG, as shown in many social reports highlighting companies' commitment to sustainability.

An example is the initiative by Patagonia, which integrated sustainability into its supply chain (https://www.patagonia.com/our-footprint/supply-chain-environmental-responsibility-program.html). Patagonia, a focal firm in the apparel industry, prioritises organic cotton, traceable sourcing, and fair labour practices. The firm actively cultivates relationships with organic farmers, certification bodies, and NGOs like the Fair Labor Association, ensuring transparency and accountability.

Their "Worn Wear" program (https://wornwear.patagonia.com/) promotes circularity by encouraging repair and reuse, further reducing environmental impact. Patagonia's Benefit Corporation status legally requires consideration of social and environmental factors, solidifying its dedication to a stakeholder-oriented approach.

This condition highlights that sustainable corporate environmental and social performances, if supported by a modular-stakeholder approach, have not always depended on successful economic performance.

Furthermore, looking at the ecosystems with a bottom-up approach shows that they evolve like natural ecosystems. This approach fits into the classical theory in economics, where ecosystems evolve, governed by an 'invisible' hand that we can find in the engagement of "mutual support", which coordinates and motivates the members of a *heterarchical*/*autarkic* ecosystem just because of their self-interested behaviour. Such bottom-up ecosystems benefit from path dependencies and a specific culture that coordinates and motivates the ecosystem members. Culture, the sum of rules, norms, and behaviours shared by a specific group of individuals as informal institutions that interrelate with the formal ones, serves as the "engagement to co-creating an economic, social and environmental solution" in governing ecosystems (Colombo *et al.*, 2019). This trend can help redirect capitalism by recognising the ecosystem's role in the new social contract and the creation of collective value. This role increasingly relies on new types of businesses, new business models and new organisational forms. Consequently, these stakeholders engaged through joint participation should have the power to influence and benefit from economic, social, and environmental decisions (Mazzucato, 2024). Accordingly, traditional business models change to accommodate and exploit the increasing social and environmental needs, driving companies to become increasingly embedded in ecosystems to satisfy their need for know-how and knowledge.

These changes show that the modern company is increasingly a "two-faced Janus", needing to fight in an ever more competitive scenario while operating in a social open innovation context. This scenario hints at the existence of a trend favouring developing innovative solutions through an open approach that goes beyond the idea of a "local area," both real and virtual; furthermore, given the collaborative approach, these scenarios allow almost anyone to exploit their creative potential, combining and employing the contribution of different stakeholders to create value both at the individual and at the context level.

Let's agree with the old saying, "necessity is the mother of invention". It becomes natural to read the ecosystem theory as a methodological support for organisations in creating an address set of stakeholder engagement practices, providing, in a modular approach, tools to facilitate their access to external know-how and to identify the actors that can be more effective in delivering new solutions (Porter and Kramer, 2011; von Hippel and Suddendorf, 2018).

Besides, the emerging crowdsourcing trend, brought to evidence in recent years and broadly acknowledged during the COVID-19 pandemic or even before the Hurricane Katrina events, is further affecting business models and strategies and is changing the role and behaviour of end-users/consumers. This new factor, adequately supported by technological innovation, could represent the scenario in which for-profit and non-profit organisations, public institutions, consumers and communities will find solutions to their social, environmental and economic needs together.

Regarding future research implications, the authors believe that one of the essential considerations emerging from the ecosystem approach and its evolution is that it will help develop different forms of decentralised and heterarchical governance models, increasingly diffused and dispersed along the innovative chain. These new models will be capable of managing social and economic relationships, norms, and trust values, which are fundamental for innovative products, mainly when they don't occur in a specific environment.

Moreover, a functioning and efficient governance system should ensure that all stakeholders contributing to value creation within the ecosystem receive a return on the collaboratively created value they expect. Contributing to the ecosystem is only reasonable if the value created within the ecosystem is higher than the sum of all values potentially created by actors without their involvement in the ecosystem, i.e., if the overall benefits exceed the overall costs within the ecosystem.

To this end, a Dynamic Performance Governance (DPG) approach may enhance policy analysis and a "modular" perspective in developing ecosystems through collaborative stakeholder relationships.

Finally, the collaborative context could also change how the various actors assess a given scenario's risk. Therefore, this variable moves to the concepts of interdependence risk, the uncertainties of coordinating with complementary innovators, and the integration risk, the uncertainties presented by the adoption process across the value chain.

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Track 6
Marketing

Corporate communication and marketing: dynamics of specialization and coordination towards a holistic approach

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Abstract

Frame of the research. *Literature on corporate communication and marketing has studied the organizational models of business-related communication for a long time, considering corporate communication and marketing as the most relevant organizational functions competing to coordinate business-related communication.*

Purpose of the paper. *To explore multiple coordination strategies that can be applied in response to the increasing specialization of business-related communication.*

Methodology. *Qualitative interviews were conducted with 10 Chief Corporate Communication Officers (CCCOs) and 9 Chief Marketing and Communications Officers (CMCOs).*

Results. *Findings highlight differing perspectives between CCCOs and CMCOs, with an incomplete perception of one another, and at the same time that a high-level cooperation strengthens both functions. Both the Corporate Communication department and the Marketing & Communications department segment their areas of responsibility based on the groups of communication recipients and the required competencies.*

Research limitations. *The qualitative nature of the study does not allow to generalize results, and further research could be useful to include the perspective of Chief Marketing Officers.*

Managerial implications. *The study gives managers insights to enhance the coordination of business-related communication to increase the overall value produced for the organization.*

Originality of the paper. *The study has explored two organizational solutions aimed at fostering coordination: at a medium level of integration, with a department centralizing all corporate communication activities and coordinating with the separate marketing communication department; and at the maximum level of integration, with a single department managing all marketing and corporate communications.*

Key words: *Corporate Communication; Marketing Communication; Organization; Specialization: Coordination; Integration*

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1. Framing of the research

Literature on corporate communication and marketing has questioned for a long time the organizational structure of the function of business-related communication, meant as the phenomenon studied by several disciplines as organizational communication, business communication, management communication, and corporate communication (Shelby, 1993), very often named communication. Indeed, it can be stated that the corporate communication and marketing units are the most relevant organizational functions that compete to manage and coordinate business-related communication in contemporary organizations.

The need to deal with the organizational structure of the business-related communication function is that on the one hand this aspect is an indicator of the degree of maturity of the function and on the other hand it is a factor capable of influencing its development. Moreover, it should be taken into account that the organizational configuration of the communication function is the result of the type of vision related to communication, which can be strategic or tactical, and that the organizational model adopted is decisive for the type of effects that communication can have on the organizational system, weakening or amplifying the effects on business strategies and decisions (Mazzei, 2010).

When addressing the organizational structure of the communication function, organizations need to make *choices* regarding specific topics; handle peculiar *complexities* of business-related communication*;* take into consideration a series of *influencing variables* that have an impact on the organizational configuration of the communication function; and deal with a series of *elements to be designed* (Daft, 2021). These are illustrated in the following.

The choices related to the configuration of the organizational structure

Regarding the *choices* related to the configuration of the organizational structure of the communication function, they can be traced back to two main issues: first, the *degree of specialization* of the activities assigned to the different units dealing with business-related communication and the *criteria* according to which the activities are allocated to different organizational units; second, the *coordination mechanisms*, that is the logic and the methods with which the specialized activities are brought back to unity.

The *degree of specialization* of the function refers to the choices to establish different organizational units responsible for managing the various specialized activities. The *criterion of specialization* can be for example the groups of recipients of the communication activities, the competencies required, or the media or channels to be used. The level of specialization has consequences on the professional roles played by communicators (Cornelissen et al., 2006). If the implementation of communication activities is centralized in the dedicated department, the focus for professionals of this department will be on the technical component of their role. If the implementation of communication activities is at least partly decentralized in other in-line functions, the managerial and consultative role played by communication professionals in the dedicated department will be more relevant (Cornelissen et al., 2006).

The *coordination mechanisms* include the establishment of a single department for all communication activities or a coordination unit (Grunig, Hunt, 1984; Grunig et al., 2002), the establishment of one or more committees (Collesei, 2002; van Riel, 1995); the management coordination through planning processes (Collesei, 2002; van Riel, 1995); the symbolic-value coordination through reference to guiding values and distinctive identity (Baccarani, Golinelli, 1992). These coordination methods are not alternatives but should be used harmoniously. It should be considered that the greater the degree of specialization of activities, the more intense the need for integration (Lawrence, Lorsch, 1976).

The complexities related to the configuration of the organizational structure

Regarding the *complexities* related to the configuration of the organizational structure of the communication function, three peculiar characteristics of business-related communication should be considered: its tendency to *institutionalization* (Amigoni, 1991; Grunig et al., 2002); its nature of a *diffuse function* (Collesei, Ravà, 2004; Fiocca, 2002; Pastore, 2014; Zerfass, Link, 2022); and at the same time the fact it is an *indivisible phenomenon* (Mazzei, 2014).

The tendency of business-related communication to become an *institutionalized function* is connected to the growing awareness regarding its strategic value for the success of organizations, which implies increasingly structured management with managerial principles, earning a place among the managerial functions (Grunig et al., 2002). Institutionalization consists of clearly and explicitly assigning management responsibilities; assigning human and economic resources to specific activities; developing dedicated operational and management systems and specialized skills; rationalizing and formalizing processes, skills, and working methods; and consolidating successful operational practices that become the company's legacy and no longer individuals' legacy (Amigoni, 1991).

The fact that communication is a *diffuse function* is related to its transversality, implying that almost all corporate functions make decisions and perform activities in this field (Fiocca, 2002). Indeed, some corporate functions are defined as "diffused" because they cannot be exclusively centralized in a specialized organizational unit. By its nature, communication tends to be a widespread function since it is inextricably linked to the activities related to the characteristic management of any organization (Airoldi et al., 1989). Communication is therefore inter-functional and its management cannot be solved by simply centralizing it. In this sense, Collesei (2002) highlights that marketing communication is carried out by multiple structures, such as product communication, sales, and merchandising; that internal communication is often a responsibility of the human resources department; that there is also a department for financial communication. Similarly, van Riel (1995) recalls that for instance the human resources department communicates to recruit, retain, and motivate, while the finance department communicates to obtain and maintain financial resources, as well as to encourage the rapid internal collection of correct data to conduct its activities.

But while communication activities are diffused, they constitute also a single complex of flows and initiatives with strategic and operational components that need to be coordinated: business-related communication is an *indivisible phenomenon* (Mazzei, 2014). Therefore, while communication in organizations tends to be diffused, it needs some degree and form of integration because, from a conceptual point of view, it is an indivisible phenomenon. This implies the recourse to a holistic approach to the management of business-related communication.

In this sense, Pastore (2014) underlines that the breadth of the communication areas, the heterogeneity of the stakeholders and the multiple objectives pursued by business-related communication explain the need for specialization that nevertheless must be balanced with the need for integration, the latter made even more relevant by the fact that communication can be deliberate, i.e. planned, but also non-deliberate, i.e. simply acted out.

A large amount of corporate communication literature acknowledges that the communication department is an organizational unit responsible for the management and execution of communication activities within a certain area of responsibility, and at the same time it contributes to defining the communication function beyond their organizational unit and supports other organizational members in other units to perform their communication tasks effectively (Argenti, 2009; Cornelissen, 2020; Mazzei 2024; Zerfass, Link, 2022).

The variables influencing the configuration of the organizational structure

Regarding the *variables* that can influence the configuration of the organizational structure of the communication function, a series of aspects should be considered: the role and weight attributed to

the communication function, the general organizational model, the company size, the geographical diffusion, and the variety of the company offering.

Considering *the role and weight attributed to the communication function*, the more communication is intended as a specialized function sending messages to the greatest number of stakeholders to maximize public exposure and the consequent visibility of the company, the more the organizational configuration can be that of a specialized unit in-staff to the CEO. On the contrary, if communication is considered essential to developing the company's reputation, line management is more suitable, since more capable of influencing the company's strategic choices (van Riel, 1995).

The organizational configuration of the communication function can be also influenced by the *general organizational model* adopted by the company. Thus, in a function-based organization, the tendency will be to have a communication function; in a divisional or business unit organization, communication will be one of the central departments as well as one of the functions replicated in the main business units; in a matrix organization, communication will be a service center (Mazzei, 2010).

The choice of the organizational model of communication also depends on the *size of the company*, in the sense that in small companies institutionalization can occur without the foundation of a unit exclusively dedicated to communication, but rather with the ad interim assignment of this responsibility. Considering the *geographical dispersion* of the organizations, those with branches disseminated throughout the territory will have to equip themselves with peripheral communication offices. Finally, the *variety of services and products* offered can influence the organizational model of communication, since the presence in multiple markets requires a higher specialization of the offices (Argenti, 2009). Other aspects to be considered are the corporate structure, the company's history, and the personal characteristics of top managers.

The elements to be designed to define the organizational structure of the communication function

Three main elements should be designed when defining the organizational model for communication (Mazzei, 2010): the *tasks* to be assigned to the central communication function, which affects the ability of the communication function to contribute to strategic decisions; the *organizational placement*, which determines its legitimacy and power of negotiation; the *level of centralization/decentralization*, which defines its specialist and consultancy roles.

Considering the *tasks* that can attributed to the central communication function, they can be summarized in the following: having the responsibility of developing and protecting the company's reputation (Argenti, 2009; Cornelissen, 2020; Goodman, Hirsh, 2010; Mazzei, Ravazzani, 2024; Zerfass, Link, 2022); defining the positioning of the distinctive identity (Balmer, Greyser, 2003; Cornelissen, 2020; Hatch, Schultz, 2000; Mazzei, Ravazzani, 2024; van Riel, 1995; Zerfass, Link, 2022); providing a framework for the governance of the relationships with key stakeholders (Cornelissen, 2020; Mazzei, Ravazzani, 2024); formulating the communication strategy and having the responsibility of its implementation (Cornelissen, 2020; van Riel, 1995); defining and monitoring the integrated communication plan (Collesei, Ravà, 2004; Cornelissen, 2020; van Riel, 1995); coordinating and integrating the different communication activities located in other departments (Collesei, Ravà, 2004; Cornelissen, 2020; Mazzei, Ravazzani, 2024); define and monitor compliance with communication standards, visual identity (Collesei, Ravà, 2004) and Common Starting Points (van Riel, 1995); carry out listening activities of the internal and external context (Argenti, 2009; Cornelissen, 2020; Mazzei, Ravazzani, 2024); define the micro-organization, that is the specialized sub-units, roles and processes within the function (Grunig, Hunt, 1984).

Considering the *organizational placement*, the definition of the organizational model of communication refers to the positioning of the units dedicated to communication in the organizational architecture of the company (Mazzei, 2010). A first decision is therefore related to the hierarchical level of the organizational unit, which defines the type of vertical relationships between the unit itself and those of a higher level and the number of hierarchical levels that exist between the unit and the organizational top (Grunig, Hunt, 1984). The existence of a direct line between the top of the

organization and the communication function ensures the connection of the latter with the company strategies (Argenti, 2009; Grunig et al., 2002; van Riel, 1995), allows the communication manager to be part of the organization's management committee and therefore to contribute to the most important decision-making processes (Grunig et al., 2002), and helps the communication manager to support the top management of the organization regarding the communication activities that involve the top management itself (Argenti, 2009). A second decision related to the organizational placement of communication concerns the positioning of the unit in line or in staff. If the choice falls on the placement in line, communication will have the rank of department at the level of other company functions that participate in strategic decision-making processes. If the choice falls on the placement in staff to the top management, communication will have a more privileged relationship with the top management and a more intense consultancy and support role both towards the top management and towards line functions, but with little decision-making autonomy (Mazzei, 2010).

Regarding the *level of centralization/decentralization*, the definition of the organizational model of communication refers to what extent the organization centralizes communication activities in the main unit or decentralizes them to other company functions. This trade-off originates from the fact that communication is a diffuse function, as already highlighted, and at the same time centralized governance is essential to ensure coherence (Argenti, 2009; Grunig, Hunt, 1984; Mazzei, Ravazzani, 2024; van Riel, 1995). As already stated in the previous pages regarding the coordination mechanisms, there are various solutions to coordinate communication, spanning from structuring a single department responsible for all communication activities to adopting formal or informal coordination methods when several departments carry out specific communication activities.

As already mentioned, the marketing unit and the corporate communication unit are the most relevant organizational structures that historically compete to manage and/or coordinate business-related communication in contemporary organizations. Therefore, in the following this review briefly focuses on two hypotheses related to the organizational structure of the communication function: one of the corporate communication discipline and one of the marketing discipline.

The organizational structure of the communication function: a corporate communication hypothesis

According to corporate communication literature, business-related communication includes the set of stakeholder relationship activities aimed at supporting the success of the company through the generation of valuable resources (Cornelissen, 2020; Mazzei, 2024; Pastore, Vernuccio, 2008; Siano et al., 2015). It is meant to be a single framework that includes all relational and communication areas of communication according to a holistic vision (Christensen et al., 2008). In particular, relationships with specific stakeholder groups configure the areas of business-related communication: corporate, marketing, financial, and supply chain communication (Mazzei, 2024; Pastore, Vernuccio, 2008; Siano et al., 2015).

It is a managerial and strategic function that offers a framework for the governance of relationships with the company's stakeholders based on the understanding and co-creation of meaning and value, to establish and maintain a favorable reputation (Mazzei, 2024). All in all, according to corporate communication literature, from a conceptual point of view, *business-related communication is an indivisible phenomenon* (Mazzei, 2014).

From the point of view of the organizational structure, most corporate communication literature support the hypothesis of a corporate communication department that includes several areas of specialization that can transform into sub-units, as for example, public affairs, investor relations, media relations, employee communication, and community relations (Mazzei, 2024; Mohamad et al., 2019; van Riel, 1995). Additionally, the communication department has the responsibility of orchestrating the activities of all departments carrying out communication activities. Therefore, the communications department carries out its role at two levels: in reference to the specific stakeholders with which it relates, it conducts a series of communication activities to produce and disseminate content and messages, employing methods, practices, tools, and skills which are specific to

communicate with definite groups of stakeholders; and in reference to the company's overall communication activity, it is in charge of coordinating and orchestrating the set of communication activities carried out by all company departments.

The organizational structure of the communication function: a marketing hypothesis

Similarly, marketing literature argues for a comprehensive understanding of businesses-related communication by means of the concepts of totally integrated communication (Kitchen, Schultz, 2003) and total communications (Aberg, 1990). They refer to the integration of communication at both single brand and company levels and encompass all communication initiatives carried out by the company directed toward its stakeholders, from a coordinated and synergetic management perspective (Mazzei, 2024).

From the point of view of the organizational structure, Sfodera (2014) underlines that every company has a peculiar and unique configuration of the marketing department, nevertheless it is possible to trace back some recurrent ways of organizing. The most common organizational configuration is a *functional* one: the marketing director chiefs a series of functional specialists, such as the sales manager, the marketing research manager, the new products manager, the customer care manager, the marketing planning manager, and the direct marketing manager. The marketing department can be designed also using an organization based on *geographic* areas, as a further level of the functional organization: for example in this case the sales director will supervise a series of regional managers. An additional level of the functional organization can be also based on *products* or *brands*, on *product categories*, on *markets* with specific customer preferences or consumer practices. Finally, a matrix organization can be designed, including both managers responsible for products and for markets, when the organization deals with a broad offering of products and operates in a wide range of markets. It is worth noticing that in this hypothesis of organizational configuration, the typical activities attributed to communication are not included, even if the author recalls possible communication profiles that are related to communication and associated to marketing: (online and offline) communication director, creative director, media/product manager, copywriter, media manager, editor.

2. Purpose of the study

Both disciplines of corporate communication and marketing argue for a holistic vision of the concept of business-related communication. While, when looking at the hypotheses they develop about the organizational structure, they reciprocally do not include the other discipline in the scope of activities of the communication department.

Nevertheless, the relationship between marketing and corporate communication within the organization is a relevant issue when dealing with the organizational structure of the communication function. Focusing on the relationship between the marketing and communication functions, Casalegno and colleagues (2024) affirm that, considering that both corporate communication and marketing disciplines adopt a multi-stakeholder perspective, these two functions are called to work together. Specifically, the results of their qualitative study highlight the strategic relevance of corporate communication in guiding corporate strategies and actions. At the same time, the integration between corporate communication and marketing emerges to be fundamental to defending brand reputation, and corporate communication support is recognized to be necessary for marketing in reformulating advertising campaigns according to a multi-stakeholder perspective. This viewpoint implies that the two organizational units remain separated.

The objective of this study has been to explore the *multiple coordination strategies that can be applied in response to the increasing specialization that characterizes business-related communication*.

In particular, this study has aimed to assess how companies apply organizational solutions aimed at fostering coordination: at a medium level of integration, with a department centralizing all corporate communication activities and coordinating with the separate marketing communication department; and at the maximum level of integration, with a single department managing all marketing and corporate communications. In particular, to answer this main research question, this study has explored:

1) how organizations specialize communication activities when adopting these two organizational solutions;
2) how professionals working in these two forms of communication departments perceive the dynamics between marketing and corporate communication and the possible coordination mechanisms;
3) what are the risks and the challenges of the organizational solution based on the maximum level of integration.

3. Methodology

The objective of this study has been to explore the *multiple coordination strategies that can be applied in response to the increasing specialization that characterizes communication-related professions*.

To investigate this topic, 19 semi-structured interviews have been conducted with senior managers operating in the field of communication (D'Onofrio, 2025). 10 respondents were Chief Corporate Communication Officers (CCCOs), while 9 were Chief Marketing and Communications Officers (CMCOs). These professionals have been selected through a snowball sampling method and involved in the study as key informants, offering valuable insights based on their expertise and direct involvement in the strategic management of marketing and corporate communication within Italian and/or international companies operating in Italy.

The companies involved belong to a variety of industries, including technology, financial services, management consulting, real estate and asset management, logistics, utilities, luxury, food and beverage, wholesale, insurance, pharmaceuticals, consumer goods, e-commerce, and advertising. These companies also differ in terms of overall size and organizational structure: some have more established and structured communication departments, while others operate with leaner departments. Additionally, the sample includes both B2C and B2B companies, reflecting multiple market orientations.

Each interview lasted approximately 45 minutes and was conducted either in person or via Microsoft Teams platform. The interview framework was organized into three main sections, each addressing a specific dimension allowing to answer to the main research question and related sub-questions, as reported above.

The first section focused on understanding the interviewees' roles, exploring their primary objectives, areas of responsibility, daily activities, and the internal as well as external stakeholder interactions required by their role. Additionally, the first section of the interview examined the competencies and skills necessary to fulfill these roles.

The second section explored the relationship between marketing and corporate communication from the interviewees' perspectives. This involved analyzing the reciprocal contributions of these two functions, defining the boundaries between the roles of CCCOs and CMCOs.

The final section aimed to identify the risks and challenges associated with implementing an organizational solution centered on the maximum level of integration in communication management, particularly in terms of preserving and enhancing an organization's corporate reputational and relational assets. A broader perspective on the challenges that communication professionals are expected to address in the coming years was also explored.

All responses were recorded, transcribed, anonymized, and coded by researchers using a codebook, guiding the categorization of interviewees' responses into predefined categories. Researchers conducted a qualitative analysis of the collected data, to identify recurring themes and outlier perspectives. The analysis of collected data showed a significant recurrence of patterns and themes, suggesting an adequate level of data saturation.

4. Results

This section presents the findings according to the three research sub-questions, offering a comprehensive overview of the key insights emerging from the study (D'Onofrio, 2025).

The specialization of communication activities

First of all, researchers have explored *how organizations specialize communication activities* when adopting the two organizational solutions characterized by a medium level of integration, with a department centralizing all corporate communication activities and coordinating with the separate marketing communication department, and by the maximum level of integration, with a single department managing all marketing and corporate communications. In this perspective, researchers investigated the key *objectives, areas of responsibility and tasks*, and the *internal as well as external stakeholder interactions*, and the key *competencies* of the CCCOs and CMCOs involved in the study, aiming to understand the criteria of specialization adopted by corporate communication departments and marketing and communications departments.

Regarding the key objectives pursued by the two professional roles, data collected reveal that, according to the interviewees, the primary *objective* of *CCCO*s overseeing the corporate communication function is to strengthen, elevate, and preserve corporate reputation (CCCO1, CCCO2, CCCO3, CCCO8), while simultaneously supporting corporate strategy (CCCO3, CCCO4) to generate goodwill around the corporate brand (CCCO6, CCCO7, CCCO9). In line with this mandate, CCCOs operate across multiple strategic *areas of responsibility and tasks*, each playing a crucial role in managing relationships with key stakeholders crucial to the organization's survival and success, both in the short and long term. These areas include reputation and corporate identity management, media relations, internal communication, crisis and issue management, supply chain communication, financial communication, corporate citizenship communication, and public affairs and lobbying, all within an integrated corporate communication framework.

Alongside reputation management, the *CMCO* assumes an additional *objective*: defining corporate positioning. According to CMCOs, this expansion is driven by marketing influence and significantly broadens both the CMCO's areas of responsibility and its overall scope. In addition to the CCCO's *areas of responsibilities and tasks*, the CMCO oversees product and service marketing and communication, landscape intelligence, stakeholder experience management, stakeholder insight, lead generation, content strategy, sales support, retail management, digital marketing, and category management, shaping a department that comprehensively manages relationships with all corporate stakeholders. However, in both CCCO and CMCO roles, "the relevance and presence of these responsibilities can vary depending on multiple factors, including the industry in which the organization operates, the corporate business model, the number of employees, and consequently, the financial resources available" (CCCO 4).

CMCOs also play an internal coordination role within the function. In the context of a maximum level of integration between corporate communication and marketing, the CMCOs do not directly execute all activities under their scope. Instead, they act as orchestrators, assuming a managerial role that involves both leading their team and synthesizing objectives, strategies, and action plans within their function. "The CMCO works with team members to encourage openness, foster mutual

understanding among colleagues within the M&Cs department, and promote alignment with the company's overall strategy" (CMCO 1).

"A key commonality between the two functions is their role in managing a vast network of relationships. In the organizational context, the communication department emerges as a pivotal department positioned at the intersection of a complex network of relationships that the department is expected to manage, by engaging with a broader range of stakeholders than any other corporate department" (CCCO 3). Indeed, they interact daily with a wide range of *stakeholders, both internally and externally*.

Regarding the *internal stakeholders* with whom these two professional roles interact, both CCCOs and CMCOs identify the CEO and C-level leadership team as key stakeholders. However, the way these two roles engage with internal stakeholders differs. CCCOs interact directly with the board of directors and strategic governance bodies, providing high-level strategic counsel. In contrast, CMCOs are, in most cases, formal members of the leadership team. According to CMCOs, this positioning places the M&Cs department in a distinct role compared to corporate communication, enabling it to play a more active part in decision-making and strategic direction. As a result, communication shifts from a support function to a strategic leadership role.

Another critical category of stakeholders for both roles is employees. During the analysis phase, it emerged that both CCCOs and CMCOs recognize the centrality and importance of employees and internal communication, though with different nuances. On the one hand, CCCOs focus primarily on fostering internal well-being and organizational equity, promoting a positive work environment to enhance cohesion and engagement, ultimately contributing to corporate reputation. On the other hand, CMCOs emphasize the strategic role of employee engagement in shaping an authentic brand positioning, leveraging ambassadorship initiatives to strengthen reputational asset. As a result, another key internal stakeholder for the communication departments is the Human Resources department (HR).

Equally central to both professional roles is the legal department, which plays a strategic role in protecting the brand and corporate reputation. Regulatory compliance must serve as the foundation for all marketing and communication activities, ensuring both brand authenticity and the integrity of the surrounding stakeholder ecosystem. The IT department is also gaining increasing relevance, as it is seen by communication professionals as an "essential partner in building a digital infrastructure that enables full integration within the M&Cs department" (CMCO 2) and across the entire organizational system.

CMCOs also identify their own team members as key stakeholders. Unlike CCCOs, M&Cs teams tend to be larger and more structured, requiring CMCOs to manage a broad and complex organizational department. This involves coordinating activities and driving internal integration.

Finally, a key factor that sets the M&Cs department apart from corporate communication is its strong connection to the business. The business itself is a crucial counterpart for a department whose goal is to manage stakeholder relationships in a consistent and integrated manner while overseeing corporate positioning both internally and externally.

Regarding *external stakeholders*, customers and consumers represent a key category for both CMCOs and CCCOs. As noted, "although the corporate communication department does not oversee commercial activities, any form of corporate communication must acknowledge the crucial role of customers and consumers" (CCCO4). Moreover, communication targeted at specific stakeholders, such as investors or employees, can easily become accessible to customers through technology, creating both risks and opportunities with significant reputational implications.

A wide range of external stakeholders play a crucial role, including media, institutions, policymakers, and authorities, who serve as key interlocutors alongside business and commercial partners, investors and financial backers, local communities, associations, advocacy groups, and universities. These stakeholders can either support or hinder the organization's operations and its present and future competitiveness.

Finally, another strategically significant stakeholder category for CMCOs consists of fellow Chief Marketing and Communications Officers and C-level executives from other companies (CMCO1, CMCO2). CMCOs have placed even greater emphasis than CCCOs on the importance of building and maintaining strong, collaborative relationships with their counterparts in other organizations. "This network not only facilitates the exchange of best practices and alignment on shared issues but also enables the creation of synergies that can translate into mutual competitive advantages. Intercompany cooperation enhances the ability to effectively tackle external challenges and seize opportunities that would be difficult to capture individually" (CMCO 1), strengthening the CMCO's capacity to influence and shape strategies with a broad, positive impact.

Regarding the *key competencies* required for these roles, both CCCOs and CMCOs must possess a broad set of skills, encompassing both hard and soft competencies to effectively fulfill their responsibilities. Technical expertise is an essential requirement for communication activities, without which the profession could not be practiced. This is especially true for CCCOs, who are more directly involved in the execution of communication strategies. As one interviewee noted, "when you reach a position like that of a CMCO, technical skills are no longer necessary" (CMCO 2). While all professionals involved recognize technical expertise as a fundamental prerequisite, it is ultimately soft skills that determine the true effectiveness and strategic potential of CCCOs and, even more so, CMCOs. Among these, negotiation skills play a crucial role, particularly in an increasingly polarized social landscape. Furthermore, in the most forward-thinking and innovative companies, communication professionals are increasingly expected to take on the role of project managers, not only for communication-related initiatives but also for cross-functional projects involving multiple internal and external stakeholders. Consequently, strong problem-solving skills are also indispensable.

"Equally crucial is the ability to balance an analytical mindset with a creative one" (CMCO 8), along with strong leadership skills: this is particularly felt by CMCOs, for whom leadership is essential to effectively fulfill their role. This leadership extends both internally and externally. According to CMCOs, they are responsible for building consensus around projects, objectives, and visions that actively engage both internal teams and external partners. By securing their support, CMCOs contribute to the organization's overall success.

In addition, a strong ability to interpret, understand, and analyze complex scenarios is essential. This aptitude is often rooted in the multidisciplinary background that typically shapes the education of both CCCOs and CMCOs.

Dynamics between marketing and corporate communication

Researchers have also explored how professionals working in the two forms of communication departments taken into consideration perceive the dynamics between marketing and corporate communication and the possible mechanisms of coordination.

The findings of the study highlight that achieving an effective integration between marketing and corporate communication requires adopting different organizational solutions, each defined by a distinct degree of integration. As confirmed by the CCCOs and CMCOs involved, the establishment of the most suitable solution depends on a range of contextual factors and organization-specific characteristics (CCCO 4), meaning that what works optimally for one organization may be inadequate for another.

When marketing and corporate communication activities are conducted by different departments, various *formal mechanisms* can be implemented to support *coordination*. One option is to create a communication council or cross-department groups composed of representatives from different corporate departments to ensure effective coordination (CMCO 2). Another possible coordination mechanism is forming a task force; however, its temporary nature may not guarantee sustained collaboration between the departments, potentially limiting its long-term effectiveness. Conversely, permanent cross-department groups are designed to provide continuous coordination, not limited to

specific projects but extending across all activities requiring alignment between marketing and corporate communication. If needed, these groups can also involve other corporate departments to enhance overall organizational synergy (CMCO 2).

In addition to the previously discussed coordination mechanisms, another formal organizational solution is the single department, "which merges all areas of expertise in marketing and corporate communication under a single leadership" (CMCO 1). As already mentioned, this model represents the maximum level of integration among the various solutions available for coordinating communication specializations. In most cases, this unified department is referred to as Marketing & Communications. According to the CMCOs involved in the study, "establishing this holistic model results in an entity that is more than just the sum of its parts, because bringing together individuals with different backgrounds, such as a journalist and someone with expertise in data analytics, allows for the creation of greater value than each could generate on their own" (CMCO 3). As some CMCOs emphasized, unifying leadership under a shared objective, focused on the organization's reputational and relationship assets, ensures that marketing and corporate communication go beyond a simple exchange of information. Instead, it fosters a mutual understanding that enables a true integration of the two functions (CMCO 1, CMCO 2). As highlighted in the analysis of the insights gathered, this organizational model generates added value that exceeds what marketing and corporate communication can achieve by operating independently from one another.

By working toward shared objectives, these specialists are required to interact constantly, as "each area of expertise is closely interconnected with the others" (CMCO 2). This high level of interaction and the resulting mutual influence between areas lead to their expansion.

According to the research findings, three key marketing areas of expertise, i.e., market intelligence, customer experience management, and customer or market insight, evolve under the influence of corporate communication into landscape intelligence, stakeholder experience management, and stakeholder insight. This transformation broadens their focus: rather than being solely centered on markets and consumers, they now operate across both disciplines, addressing the full spectrum of organizational stakeholders and the broader environment in which the organization operates.

Discussions with CMCOs further highlighted that the close cooperation between these areas of expertise, such as landscape intelligence and crisis communication or public affairs and content strategy, can generate a significant competitive advantage.

Beyond the expansion of shared areas of expertise, adopting the maximum level of integration brings multiple advantages. According to CMCO 2, "Marketing is influencing corporate communication by instilling a stronger focus on 'harder aspects' such as structured communication processes and KPIs monitoring. At the same time, corporate communication is enriching marketing with 'softer capabilities' including a broader perspective on macro-environmental dynamics and a more balanced approach to addressing the needs of multiple stakeholders". CMCOs highlight that this cross-fertilization helps the Marketing & Communications department strike a more effective balance between short-term business priorities and long-term strategic positioning. These transformations strengthen the function's internal credibility, while bridging business demands with external global trends further reinforces its strategic importance within the organization.

Similarly, both the CCCOs and CMCOs involved in the study emphasize how marketing is influencing corporate communication by fostering a stronger focus on creating appealing and engaging content, while corporate communication is shaping marketing by enhancing its ability to craft relevant and credible narratives. Striking the right balance between content quality and the way it is presented is crucial. Without meaningful content, even the most engaging format loses impact, while a well-structured presentation can elevate and enhance the visibility of valuable content.

Moreover, "to be truly effective a holistic approach should extend across the entire organization, not only because it would enhance the organization's ability to detect and respond swiftly to both internal and external changes, thereby increasing its competitiveness, but also because all departments inherently contribute to strengthening relationships and reputation assets" (CMCO 2).

Before establishing formal organizational solutions to design and implement an integrated approach, it is essential to first build an organizational culture rooted in shared values such as collaboration, cooperation, leadership, and proactivity. As noted by CMCO 1, "to implement a holistic approach, it is crucial that the holistic vision permeates the corporate culture and is widely embraced". Formal organizational solutions, such as corporate policies, hierarchical structures, and operational processes, are undoubtedly fundamental to the organization's functioning. However, they often prove ineffective if not supported by a coherent organizational culture. As CMCO 9 emphasizes, "this approach must be ingrained in people to ensure that interactions are fluid, natural, and spontaneous" and in this regard internal communication plays a pivotal role.

Indeed, internal communication serves as a key enabler in fostering a shared organizational culture, one that encourages employees to engage and interact with one another. This cultural approach must extend across all organizational levels, from the CEO to the most junior employees (CMCO 2). Additionally, as CMCO 2 highlights, "part of the company's reputation is in the hands of internal employees" who act as the brand's primary interface with stakeholders.

According to both CCCOs and CMCOs, employees play a dual role: they are fundamental to building an effective integrated approach while also serving as key actors in strengthening and safeguarding corporate reputation and supporting brand positioning, both of which are core objectives within the mandate of the CCCOs and CMCOs interviewed.

Thus, internal communication represents a strategic lever capable of fostering a strong corporate community grounded in shared values, positively engaging employees, and creating an enabling environment for the successful implementation of a holistic approach.

Finally, according to the CMCOs involved, integrating marketing and corporate communication reduces the dispersion of value that would otherwise occur if the two units operated separately. This integration strengthens the perceived value of the department within the organization transforming it from two smaller, independent units into a single, strategic entity with greater influence and impact. Instead of being seen as separate units with limited individual power, the Marketing & Communications department is recognized as a unified, high-value department.

As a result, integration creates a new entity that holds a strategically crucial role in value generation. It possesses all the required resources not only to support the leadership team but to be an integral part of it, actively guiding and shaping decision-making processes.

Risks and challenges

Lastly, researchers have explored the risks of the organizational solution based on the maximum level of integration, that is the one of a single department managing all marketing and corporate communications, as well as the challenges for communication professionals. While the discussions with the professionals involved have predominantly highlighted the advantages of adopting a maximum level of integration between marketing and corporate communication, some potential risks and challenges have also emerged.

Regarding *risks*, a maximum level of integration enables an organization to manage stakeholder relationships comprehensively, aiming to maximize opportunities and the value generated. However, if this coordination mechanism is implemented solely for tactical purposes, such as increasing brand awareness in the short term, without genuine strategic coherence, it can trigger a "boomerang effect, where the negative impact could match the intensity of the positive effects that a properly implemented holistic approach would generate" (CMCO 4) on relationship and reputation assets.

Moreover, adopting a model with the maximum level of integration can pose risks related to potential imbalances in priority management. According to CCCOs, this may stem from the personal inclinations of the CMCO, whose "education or professional experience may be more heavily weighted toward either marketing or corporate communication" (CCCO 9). As a result, rather than achieving a perfect balance between the two functions, leadership may favor one area at the expense

of others, for instance, by placing excessive emphasis on short-term business objectives. Such a scenario would ultimately undermine the overall effectiveness of the adopted integrated approach.

However, all professionals agree that the greatest risk lies in the lack of cooperation between marketing and corporate communication, as this would lead organizations toward inconsistency and irrelevance (CMCO 9).

Additionally, discussions with the CCCOs and CMCOs involved have also highlighted a series of *challenges* that are currently shaping and will increasingly impact the field of communication and its related professions.

The professionals emphasized that emerging technologies, particularly AI and generative AI, are progressively transforming communication processes, making it increasingly necessary to rethink them. They also highlighted how technology plays a role in enabling coordination.

Another widely acknowledged challenge among interviewees is the growing uncertainty of the external environment, which requires organizations to adopt flexible and responsive structures. Both professional roles underscored the need for a coordinated approach that removes any siloed logic within the organization, as this could hinder its ability to adapt effectively to both internal and external stimuli.

Furthermore, in a society characterized by information overload and diminishing attention spans, both CCCOs and CMCOs emphasized the growing need to balance aesthetic appeal with content relevance. Creating valuable content that effectively engages organizational audiences requires a strong interplay between marketing and corporate communication, further reinforcing the necessity of a deeply integrated approach (CCCO 1, CMCO 2).

5. Conclusions and implications

This study has aimed to explore the multiple coordination strategies that can be applied in response to the increasing specialization that characterizes business-related communication. Literature in the fields of corporate communication and marketing acknowledges that business-related communication is a diffuse function, considering the heterogeneity of the stakeholders that an organization needs to address and consequently the multiple communication objectives that it has (Collesei, Ravà, 2004; Fiocca, 2002; Pastore, 2014; Zerfass, Link, 2022). At the same time, they state that business-related communication is an indivisible phenomenon, therefore some degree and form of coordination is necessary (Aberg, 1990; Argenti, 2009; Cornelissen, 2020; Kitchen, Schultz, 2003; Mazzei, 2014, 2024; Pastore, 2014; Pastore, Vernuccio, 2008; Zerfass, Link, 2022).

It can be stated that the corporate communication and marketing units are the most relevant organizational functions that compete to manage and coordinate business-related communication in contemporary organizations. For this reason, this study has focused on two possible organizational solutions aimed at fostering coordination and involving the corporate communication and marketing functions: a first organizational solution characterized by a medium level of integration, with a department centralizing all corporate communication activities and coordinating with the separate marketing communication department; and a second organizational solution characterized by the maximum level of integration, with a single department managing all marketing and corporate communications.

In particular, this study has explored how organizations specialize communication activities when adopting these two organizational solutions; how professionals working in these two forms of communication departments perceive the dynamics between marketing and corporate communication; and what are the risks and the challenges of the organizational solution based on the maximum level of integration. To answer these questions, researchers have involved 10 respondents Chief Corporate Communication Officers (CCCOs) and 9 Chief Marketing and Communications Officers (CMCOs) in an interview-based qualitative study.

The research findings reveal differing perspectives between CCCOs and CMCOs regarding the nature of their roles. The major result that emerged from comparing the two roles is that while they partially overlap, they also differ. Their insights further highlighted a lack of mutual understanding, leading to a distorted or incomplete perception of one another. For CCCOs this uncertainty translates into skepticism regarding the establishment of a unified leadership overseeing a single department, prompting them to emphasize the associated risks. Conversely, CMCOs tend to underestimate the strategic role and impact that CCCOs can exert both internally and externally.

Analyzing the objectives, areas of responsibility, and stakeholder categories with which the two professional roles interact, it emerges that, despite favoring two different organizational coordination solutions, both the Corporate Communication department and the Marketing & Communications department rely on the same criteria for segmenting their areas of responsibility within the department: the main groups of recipients of communication activities and the required competencies.

Investigating the dynamics between marketing and corporate communication and the possible coordination mechanisms, the major result that emerges is the expansion of the focus of each area of specialization that occurs especially when the maximum level of integration is adopted. A high-level cooperation strengthens both functions by addressing their weaknesses: corporate communication fosters marketing's attentiveness to the broader social context and its nuances and to the credibility of content, while marketing instills in corporate communication a stronger emphasis on KPIs monitoring and structured processes and on the engagement capacity of content.

A transversal analysis of the findings highlights the major result that a holistic approach limited to the relationship between corporate communication and marketing enhances the strategic relevance of the communication unit but generates limited added value. This value is fully unlocked when the approach is extended to the entire organization. Achieving this requires the development of a shared organizational culture based on values such as collaboration, cooperation, leadership, and proactivity: this recognizes the pivotal role of internal communication, considering it key to consolidate this culture across the entire organization.

When analyzing potential risks and challenges of the organizational solution based on the maximum level of integration, the major result is related to the risk of imbalance in priority management. In the case of unified leadership in a single department, priorities may lean more toward corporate communication or marketing, depending on the leader's discretion. Despite this, both professional roles acknowledge the necessity of adopting a holistic approach to communication management, although they prefer different organizational solutions. By envisioning a continuum with a minimal level of integration (essentially a lack of integration) at one end and a maximum level at the other, CCCOs believe that maintaining two distinct departments is necessary, but they also emphasize that full synergy between corporate communication and marketing is essential if not mandatory. Meanwhile, CMCOs argue that there should be no boundaries. According to them, the combination of relationship management and a meticulously designed experience tailored to the characteristics of the target audience creates a self-sustaining virtuous cycle, capable of generating the highest added value. Multiple organizational solutions can contribute to the effective implementation of a holistic approach within the communication department and broadly across the organization, each generating specific effects with varying degrees of impact.

Managerial implications

The coordination of business-related communication within an organization is necessary to bring to unity the multiplicity of activities and messages that arise from the specialization of different areas of the business-related communication itself. This requires the joint management of aspects that range from the most technical and structural coordination mechanisms to those soft coordination mechanisms related to culture and behaviors. In order to apply what can be indicated as a holistic approach to the management of business-related communication, the results of this study highlight that interventions are necessary on two fronts: on the one hand, it is necessary to act on formal

solutions, that is, on the adoption of organizational structures, processes and infrastructures that can facilitate integration and cooperation between the different functions or specialized areas of communication; on the other hand, it is crucial to address cultural aspects by promoting a corporate culture that values active collaboration and openness among the various functions and actors within the organization. Beyond the formal coordination mechanisms that are designed and implemented, it is therefore essential that organizations work to create the conditions for a fluid and constant sharing of information and knowledge between the different organizational actors. So on one side, it is necessary to implement systems and infrastructures that are able to foster inter-functional dialogue, and on the other side, it is essential to work on the creation of an organizational culture that promotes open discussion and constructive interaction. In this sense, one fundamental step is to remove operational and mental silos that can hinder cooperation between different areas of expertise, within the single department that manages a more or less broad series of communication activities as well as between the different departments that are involved in various ways in the management of business-related communication. The elimination of these barriers requires a strong commitment from the leadership, called to act as a guide in the organizational evolution process. For this reason, a redefinition of roles is also necessary, which sees in C-level positions not only professionals who are experts in their area of expertise but leaders who are able to guide and inspire their colleagues, aligning people and departments towards a common goal: the creation of value for the long-term success of the organization.

Limitations and future research

The present study has some limitations that offer fruitful directions for future research. First, the qualitative nature of the study does not allow any generalizations of the results. Additional studies are needed to enlarge the number of companies and organization-specific conditions explored. In this sense, this study lays the foundations for new quantitative research.

Second, further research could be useful also to include the perspective of Chief Marketing Officers. Indeed, it could be valuable to explore the point of view of managers who are the counterparts of Corporate Communication Officers in the organizational solution characterized by a medium level of integration which was analyzed in this study, that is the one of with a department centralizing all corporate communication activities and coordinating with the separate marketing communication department.

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Track 7
Purpose-driven Businesses

Leveraging Digital Technologies in Social Entrepreneurship: A Multiple Case Study

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Abstract

Frame of the research*: Digital transformation is reshaping social entrepreneurship by introducing innovative value-creation models. This study examines how digital platforms integrate technology to foster social impact while addressing societal challenges.*

Purpose of the paper*: This research explores how digital tools enhance entrepreneurial models. In particular, it focuses on Sharing Economy Platforms (SEPs) and Gig Economy Platforms (GEPs), analyzing their role in promoting inclusivity, sustainability, and new opportunities for social value creation.*

Methodology*: A multiple case study approach has been applied, gathering data from company reports, academic research, and industry analyses. This approach provided a holistic understanding of how digital platforms generate and distribute entrepreneurial value.*

Results*: The research reveals several differences between SEPs and GEPs in economic, environmental, and social terms. Indeed, SEPs focus on resource optimization, sustainability, and equitable access to resources. Differently, GEPs emphasize operational efficiency and labor flexibility, considering the environmental aspect less. Such differences highlight the different value contributions and the potential impact these platforms generate.*

Research Limitations*: reliance on secondary data sources and a restricted number of cases, which may impact the broader applicability of the findings. In addition, it does not consider long-term effects or potential regulatory changes.*

Managerial Implications*: Platform operators and policymakers can implement well-designed strategies to foster inclusivity, ensure equitable opportunities, promote fair value creation and distribution, and support long-term sustainability. This, in turn, can create a more balanced digital ecosystem that benefits workers, entrepreneurs, and society.*

Originality of the paper*: This paper aims to advance the discourse on the socioeconomic impact of digital platforms by proposing a theoretical framework explaining digital value creation, highlighting the challenges and opportunities of digital social entrepreneurship while offering insights into the role of technology in fostering social impact.*

Key words: *Digital Transformation; Platform Innovation; Social Entrepreneurship; Sharing Economy; Gig Economy*

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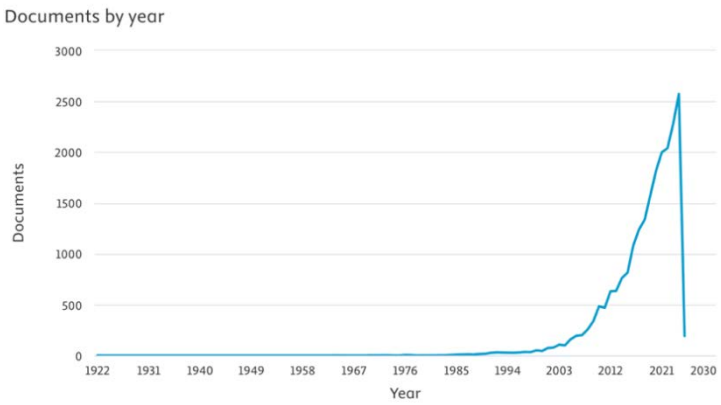
1. Introduction

The rapid growth of organizations with a social purpose and their potential to generate social value has driven increasing interest in social entrepreneurship (SE) among academics, practitioners, and policymakers (Dwivedi & Weerawardena, 2018). As illustrated in Figure 1, which represents the annual count of scientific papers on social entrepreneurship indexed in Scopus, the growing volume of publications in recent years highlights the rise of a rapidly expanding field.

Fig. 1: Annual number of scientific papers on social entrepreneurship indexed in Scopus, Source: Scopus



This trend reflects an increasing effort to address emerging societal challenges. SE, by its interdisciplinary nature, draws from diverse fields such as anthropology, economics, political science, psychology, and sociology (Dacin *et al.*, 2011), offering a multifaceted lens for addressing pressing societal challenges. Recently, the emergence of digital technologies has reshaped the landscape of SE, giving rise to the concept of Digital Social Entrepreneurship (DSE). DSE integrates digital tools into entrepreneurial ventures, fostering innovation, collaboration, and impactful solutions to societal needs (Ghatak *et al.*, 2023; Skivko, 2021). Sharing Economy Platforms (SEPs) and Gig Economy Platforms (GEPs) exemplify how digital platforms have become critical enablers of social entrepreneurship. These platforms lower barriers to entry by fostering access to entrepreneurship, allowing individuals to monetize underutilized resources and participate in the economy with minimal initial investment. SEPs, for instance, promote collaborative consumption and sustainability by encouraging the sharing and reuse of assets, while GEPs offer flexible employment models that serve diverse worker needs. Moreover, the technological innovation driven by these platforms including AI, machine learning, and predictive logistics enhances operational efficiency, improves user experiences, and fosters trust between participants. By leveraging these capabilities, SEPs and GEPs not only create economic value but also build communities and networks that align with the goals of SE (Popov *et al.*, 2022; Frenken *et al.*, 2020).

Despite these opportunities, significant challenges remain. SEPs and GEPs often exacerbate economic inequality by disproportionately benefiting asset owners or platform operators, leaving workers vulnerable to precarious conditions and limited protections. Moreover, the growing reliance on algorithmic control has raised concerns about worker autonomy and welfare in gig platforms (Eyert *et al.*, 2022). Questions about long-term sustainability and regulation persist, particularly for SEPs, where rebound effects such as increased consumption may undermine their environmental goals. These tensions highlight the need for a deeper exploration of how digital platforms can balance innovation with inclusivity, equity, and sustainability. In particular, SEPs have been exploited to foster collaborative consumption, optimize resource use, and drive sustainable practices. Airbnb, for example, has been studied as a model of peer-to-peer exchange that promotes community engagement and creates economic opportunities for asset owners (Álvarez-Herranz & Macedo-Ruíz, 2021).

Similarly, platforms like Vinted have been associated with advancing circular economy principles, particularly in the fashion industry, by encouraging the reuse of goods and reducing waste (Palomo-Domínguez *et al.*, 2023). In contrast, GEPs such as Uber and Deliveroo have drawn attention for their ability to leverage digital technologies to improve logistics, offer flexible work schedules, and enhance customer experiences (Cram *et al.*, 2022; Popan, 2024). However, these platforms have also faced challenges regarding worker precarity, algorithmic control, and income inequality, which challenge their alignment with the principles of social entrepreneurship (Casagrande *et al.*, 2021; Hickson, 2024).

While these studies provide insights into the operational dynamics of SEPs and GEPs, there is limited understanding of how these models collectively contribute to social entrepreneurship across different sectors. Examining these platforms together offers an opportunity to bridge theoretical gaps and inform holistic strategies for balancing innovation with inclusivity and sustainability. Addressing these gaps is crucial to uncovering the mechanisms through which digital transformation shapes social entrepreneurship and determining the methods required to mitigate the challenges inherent to these models. In this regard, this study aims to fill a gap in the literature by investigating the interaction between digital transformation and SE through multiple case studies of Airbnb, Vinted, Uber, and Deliveroo. By examining how these platforms foster social value while considering actual challenges, this research provides a comprehensive understanding of their contributions to SE and offers a roadmap for future research. Moreover, it aims to guide stakeholders, policymakers, entrepreneurs, and platform operators toward building more sustainable digital ecosystems.

2. Theoretical Background

2.1 Social entrepreneurship

SE is an interdisciplinary concept initially introduced by William Drayton, a MacArthur fellow (Rahim & Mohtar, 2015). It aims to promote community empowerment, protect the environment, and create innovative solutions (Harsono, 2024). Over time, diverse definitions have emerged, reflecting varying academic perspectives. For example, Abu-Saifan (2012) views SE as entrepreneurial actions centered on creating social value, while Cardella *et al.* (2021) emphasize the use of innovative concepts to achieve social value. Pless (2012) highlights SE as leveraging creativity and resource integration to address societal challenges. Despite these variations, Dacin *et al.* (2011) identify four central aspects of SE: individual characteristics of social entrepreneurs, their domains of operation, the resources and processes they employ, and their mission to create social value. In this regard, existing studies analyzed the connection of SE with sustainable development (Al-Qudah *et al.*, 2022; Anh *et al.*, 2022; Ramadani *et al.*, 2022; Baquero & Monsalve, 2024), as environmental responsibility presents a valuable opportunity to access new markets, enhance their reputation with stakeholders, and distinguish their products (Méndez-Picazo *et al.*, 2021). Moreover, it has been recognized as an effective tool for addressing poverty, driving social transformation, enabling inclusive growth in subsistence marketplaces and facilitating institutional change. In essence, the process of SE involves the creative utilization of resource combinations to seize opportunities with the goal of establishing organizations or practices that generate and maintain social value (Saebi *et al.*, 2019). To this end, the adoption of digital tools can facilitate the achievement of social entrepreneurs by fostering interaction and information sharing, advertising, and communication strategies for social entrepreneurs (Sviko, 2021).

2.2 Digital social entrepreneurship

Recently, digitally driven business models have become increasingly prevalent among social enterprises (Masiero & Ravishankar, 2019), transforming SE practices and creating an innovative

field, Digital Social Entrepreneurship (DSE). These are integral to achieving social impact (Ghatak *et al.*, 2023). Existing literature emphasizes the potential of DSE to provide income opportunities for marginalized communities. The challenges associated with the DSE model have also been explored, including the critical role of securing institutional support from government entities, the necessity of tailoring venture presentations to suit diverse audiences, and the sociocultural adjustments employees must make as they transition from their home communities to the workplace. These studies view DSE as social-commercial hybrids, striving to balance the dual logic of charity and business that they integrate (Masiero & Ravishankar, 2019). Technologies such as Web 2.0 and social media have improved shared resource exchange by offering frameworks for online platforms that support swapping, sharing, and lending models (Richter *et al.*, 2017). Thus, the rapid digitization of modern society introduces a transformative element to this domain. As a result, the digitally powered sharing economy, facilitated by platforms, fosters both entrepreneurial growth and innovative forms of entrepreneurship (Vinogradov *et al.*, 2022). A practical example is represented by sharing economy platforms (SEPs), which introduce innovative business models and opportunities (Garud *et al.*, 2022). SEPs operate as intermediaries linking supply and demand for services, enabling interactions between people and businesses (Aloisi, 2016). For instance, individuals who own cars, homes, tools, or other assets can generate income from these possessions, tapping into their unused potential and decreasing their reliance on earnings from work (Vallas & Schor, 2020). On the other hand, gig economy platforms (GEPs) offer opportunities for individuals to provide personal services like transportation, cleaning, and delivery tasks (Frenken *et al.*, 2020). While these platforms leverage advanced digital technologies such as real-time tracking and algorithmic management to optimize logistics and enhance user experiences, they also pose significant challenges. Studies have highlighted the precarious nature of work on GEPs, as workers face limited protections, algorithmic control, and inconsistent incomes (Cram *et al.*, 2022; Popan, 2024).

3. Methods

3.1 Research Design

A qualitative field study was conducted, which is suitable for exploring emerging phenomena and addressing the preliminary stage of theory development (Giudici *et al.*, 2020). A multiple case study approach was utilized to investigate the research question. This method supports replication logic, treating each case as an experiment to validate or contest conclusions drawn from others (Santos & Eisenhardt, 2009). Compared to single-case studies, this approach facilitates the creation of more robust and generalizable theories (Santos & Eisenhardt, 2009).

3.2 Research Setting

The study focused on four digital companies operating in different sectors that leverage digital platforms to develop innovative business models. The selection criteria included: (1) the design and scope of their business models, (2) their use of digital platforms, (3) their social influence, and (4) their contribution to social entrepreneurship. To ensure contextual diversity, companies from various sectors were chosen. The final selection comprised two representatives from the Sharing Economy and two from the Gig Economy, represented in Table 1:

Tab. 1: Operating Sectors of Selected Companies

Company	Sector	Reference
Airbnb	Hospitality	Oskam, J., & Boswijk, A. (2016); Airbnb (2025).
Deliveroo	Food Delivery	Drahokoupil, J., & Piasna, A. (2019); Deliveroo (2025).
Uber	Mobility & Transportation	Khosrowshahi (2019); Uber Technologies Inc. (2025)
Vinted	Second-Hand Fashion	Tournois, (2025); Vinted (2025)

3.3 Data Collection

Data was collected from multiple sources, including official company websites, surveys, annual reports, and academic literature, to ensure comprehensiveness and triangulation. These data sources encompassed key dimensions of the companies, such as their core business activities, historical development, ethical practices, and innovation strategies. This approach ensured a holistic understanding of each company's structure and strategies. Furthermore, business models were analyzed to identify commonalities and sector-specific distinctions in the application of digital platforms. While these data sources provided valuable insights, potential biases in corporate self-representation were mitigated by cross-referencing with independent academic and industry reports (Ganapati & Reddick, 2018).

3.4 Data Analysis

To ensure empirical observations aligned with existing theoretical concepts, a three-step data analysis process was followed (Giudici *et al.*, 2020):

Database Development: A structured database was created to organize and facilitate interpretation of the material, focusing on information related to the companies' business models, digital strategies, and social entrepreneurship outcomes.

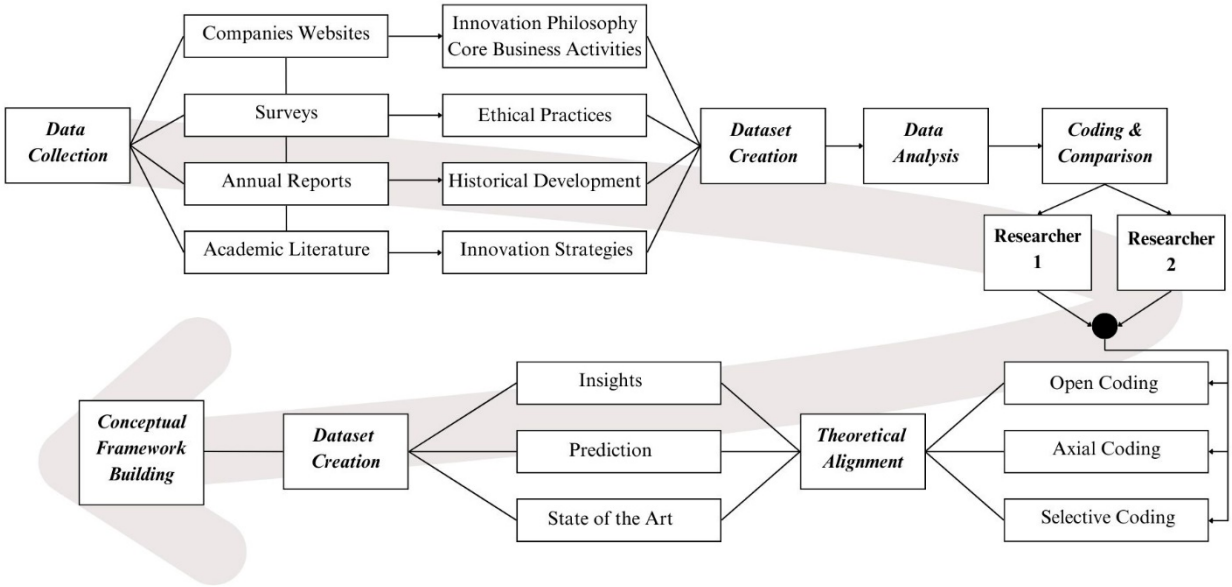
Coding and Comparison: Data were analyzed through multiple cycles of comparison with theoretical frameworks. Open, axial, and selective coding techniques were employed to identify key themes and patterns. Two researchers independently reviewed and coded the data to ensure reliability, engaging in detailed discussions to refine coding frameworks.

Theoretical Alignment: The findings were compared with theoretical predictions and insights from existing literature (e.g., social entrepreneurship and digital transformation theories) to contextualize the results and generate new conceptual insights (Tracey & Jarvis, 2007).

This iterative process ensured rigor and theoretical coherence in the analysis.

Figure 2 illustrates the methodological structure, including the interconnections between research design, data collection, and analysis.

Fig. 2: Methodological Overview, Source: Author's Own Elaboration



4. Results and Discussion

4.1 Key differences between the sharing economy and gig economy models

The preliminary results provide a perspective on how companies have shaped the digital platform across different sectors. In particular, Airbnb allows home-sharing, enabling residents to generate income by renting out underutilized living spaces (Álvarez-Herranz & Macedo-Ruíz, 2021). Unlike traditional businesses operating in the hospitality sector, which face physical limitations, the digital model adopted by Airbnb enables flexibility, faster growth, and "shared" value creation. In doing so, the digital business model proposed by Airbnb combines different elements. For instance, the adoption of algorithms offers the possibility to calculate rental prices for properties on specific dates. Such calculations consider around 150 variables, including factors such as location (country, market, neighborhood), average prices for the date in question (including stay costs and additional cleaning fees), property availability, and quality metrics (such as the number of reviews and user ratings), among many others (Moreno-Izquierdo *et al.*, 2018). Moreover, AI is utilized across Airbnb to minimize the inherent friction within the platform, addressing areas such as enhancing search functionality, preventing fraud, and assisting hosts in optimizing pricing (Airbnb, 2018). This, in turn, improves the value creation process, shifting from a profit-oriented concept to a multidimensional one. In this regard, a recent interview with Brian Chesky, CEO and one of the founders of Airbnb (Cimpanelli, 2022) assessed:

"*Airbnb wants to bring social and economic value to communities, to cities. As already said, we focus mainly on places that are still untouched by mass tourism, so in reality we diversify it*"

Similarly, Vinted uses a platform to sell and swap second-hand clothing (De Bruyne & Verleye, 2023). In this way, it enables users to balance their preference for renewing their wardrobe with a more responsible and sustainable consumption model, reducing the need for excessive purchases of new items and minimizing the waste of products that remain in good, usable condition (Palomo-Domínguez *et al.*, 2023). This, in turn, helps reduce waste in the fashion industry, which is known for its environmental footprint (Palomo-Domínguez *et al.*, 2023). Thomas Plantenga, Vinted CEO's, identified the driving factors of the company's success (Van Elven, 2019):

"There are two main drivers: purchasing power and the rapidly growing trend around the circular economy. When it comes to fashion, that's exactly what we do, offering our members a convenient and easy-to-use tool to earn some extra money and afford a wide variety of fashion at lower prices. But we also believe that we exist to make fashion more circular and enable people to consume more responsibly, giving their clothes a second or even third life".

On the other hand, GEPs exploit an algorithm-driven movement of gig workers to signal a new era of automation, adaptability, and employment opportunities (Popan, 2024). In particular, Uber leverages technology to evaluate driver eligibility for the platform, direct drivers to passenger pick-up locations, conduct regular background checks, offer feedback to help drivers enhance their performance, and take corrective actions against drivers who fail to meet the required standards (Cram *et al.*, 2022). This, in turn, has led to rapid growth built on technology applications, where tasks such as booking rides, planning routes, calculating fares, and processing payments are managed through a smartphone app (Dudley *et al.*, 2017). Benedetta Arese Lucini, Manager of Uber Italy, highlighted the crucial role of digital technology as follows (Montegiove, 2014):

"We believe that technology and the spread of the sharing economy can improve people's lives. These values are at the core of the Uber platform"

In the same way, Deliveroo's platform provides various digital tools to support restaurants in offering delivery services. These include features for menu setup, order and payment processing, and access to a network of riders (Rodriguez & Piccoli, 2020). By leveraging digital technology, this platform integrates all three components of its target marketplace (restaurants, grocers, and retailers), benefits from increased sales, and helps riders improve their potential earnings. (Deliveroo, 2025a). This is achieved through the application of machine learning systems that enhance the marketplace experience. Therefore, Deliveroo improves service quality and operational efficiency and drives continuous improvements in rider productivity and earnings, operational efficiency for partners, customer satisfaction, and overall economic performance (Deliveroo, 2025b). Hence, the exploitation of micro logistics through such platforms allows the access of a new entrepreneurial paradigm for workers and restaurants. In this context, Matteo Sarzana, General Manager of Deliveroo Italy, assesses:

"It is much "easier" for the restaurateur-entrepreneur to optimize their offering, testing new services or meeting customer needs, with a level of security that was difficult to obtain previously"

At this stage, the commitment and the benefits regarding the implementation of digital platforms have been highlighted. Table 1 graphically summarizes the use and the enabler technologies from each platform.

Proposition 1: *Sharing economy platforms (SEPs) foster economic and social value creation by leveraging digital technologies to promote resource optimization and sustainable consumption, aligning with circular economy principles.*

Proposition 2: *Gig economy platforms (GEPs) prioritize operational efficiency and labor flexibility through algorithmic management to increase overall performance.*

Proposition 3: *While SEPs typically drive value through sustainable consumption and resource optimization, and GEPs emphasize labor flexibility and algorithmic efficiency, many digital platforms may operate along a spectrum that incorporates both characteristics. This hybridization enhances their ability to meet diverse social, economic, and environmental objectives.*

4.2 How do digital platforms contribute to social value creation and entrepreneurship?

The analysis of these platforms highlights the strategic use of digital technologies to create economic, social, and environmental value. Moreover, they foster innovative modes of interaction, collaboration, and novel pathways for pursuing opportunities that have significantly transformed the competitive environment, introducing new challenges for entrepreneurial ventures across various domains (Chandna, 2022). In this context, platforms like Airbnb offer low-risk micro-entrepreneurship opportunities, allowing individuals to gain early career experience in similar ventures, earn additional income, expand their skills, and build a wider professional network (Mahmuda *et al.*, 2022). Vinted, instead, exemplifies the "Impact Entrepreneurship" concept by providing users with a platform that encourages active entrepreneurial practices (Buying, Selling, Promoting, Shipping, etc.). By enabling these exchanges, Vinted not only enhances economic participation but also cultivates a sense of connection and community among its users (Emmie, 2024). In addition, considering the direct relation of Vinted with the SE principle, it is reasonable to assess the connection between their business model and the development of "Social Commerce" (Puschmann & Alt, 2016). Uber has also contributed to creating an entrepreneurial hub that provides flexible work options. Such flexibility enables drivers to manage their work schedules alongside other responsibilities, potentially enhancing their overall quality of life and satisfaction (Ferreira *et al.*, 2024). In the same vein, Deliveroo has played a role in reshaping employment dynamics within the

gig economy by offering riders flexible work arrangements (Deliveroo, 2025c). However, as observed in the case of Uber, Deliveroo riders do not fully align with traditional definitions of entrepreneurs. Instead, they operate as precarious workers within an automated management system and algorithmic oversight, reflecting "traditional" work structures. The commitment and the benefits of the implementation of digital platforms have been highlighted. Table 1 graphically summarizes the use and the enabler technologies from each platform.

Tab. 1: Digital Platform's Overview, Source: Author's Own Elaboration

Company	Platform Type	Use of Digital Platform	Main Technologies	Value Creation Process
Airbnb	SE	Temporary Accommodation	AI, Machine Learning, (Recommendation Systems)	Matches hosts with guests, optimizing pricing and availability
Deliveroo	GE	Delivery services	Real time tracking, Machine Learning	Connects restaurants with customers and riders, optimizing delivery times
Uber	GE	Cars for transportation	Location services, Machine Learning	Links drivers with riders, optimizing routes and pricing
Vinted	SE	Reuse of clothes	Machine Learning, AI (Recommendation Systems)	Enables second-hand selling while promoting sustainable trade

Proposition 4: *Digital platforms contribute to social entrepreneurship by enabling innovative business models that balance economic, social, and environmental value creation; however, their alignment with social entrepreneurship principles varies based on their operational focus.*

4.3 Social and environmental challenges for digital platforms

Although there are different benefits, both models operating in both the GE and SE face several social challenges. Indeed, companies within this context are capitalizing on the widening income inequality by presenting gig work as a form of "micro-entrepreneurship" (Ahsan, 2020). In their study, Ganapati & Reddick (2018) identified four major challenges. First, renting may lead to significant limitations, fostering social class divisions and increasing inequalities. For instance, space-sharing platforms such as Airbnb do not own the properties listed, but the rental income goes to the landlords. Hence, individuals without property or other assets do not take any benefit from the SE systems. Moreover, property owners earn higher returns than wage workers, resulting in economic inequality (Ganapati & Reddick, 2018). Second, internet platforms do not inherently promote equality and may undermine the benefits available to gig workers. Indeed, Gig work offers individuals the freedom to decide their working hours, locations, and the tasks to take on. Nevertheless, the other side of the coin is represented by unfixed income and limited access to traditional employment benefits like health insurance and retirement plans (Joshi *et al.*, 2024). Third, the long-term sustainability advantages of the SE remain uncertain. Indeed, the environmental impact of the SE, its rebound effects, and how these impacts measure up against those of similar business models still need to be clarified. Such impacts will largely depend on the future development of business models and user practices and the establishment of complementary institutions, which are still being designed (Frenken, 2017). Lastly, issues related to security and trust present ongoing concerns within this economic model. From a security perspective, governments are responsible for maintaining society's proper functioning (D'Hauwers *et al.*, 2020). Moreover, regulation constraints do exist. With a particular focus on GE models, there is an absence of a structured framework and governmental backing to establish an environment that promotes quality work and projects, ensures worker protection, and grants access to benefits typically associated with traditional employment (Roy & Shrivastava, 2020). In this regard, Deliveroo faced legal action from a rider over allegations of underpayment (Gladkaja). Similarly, trust in such models is built by reviews and feedback. Platforms gather reputational data and convert it into ratings, simplifying the information for user comprehension. Such ratings, often accompanied by written reviews, act as indicators of a participant's reliability and trustworthiness (Stemler, 2017). In this context, the major threats are

represented by fake reviews and the "cold start challenge". This refers to the newcomers because of the lack of feedback history, while established players planning to leave the market might exploit their reputations to the fullest without concern for long-term consequences (Ganapati & Reddick, 2018).

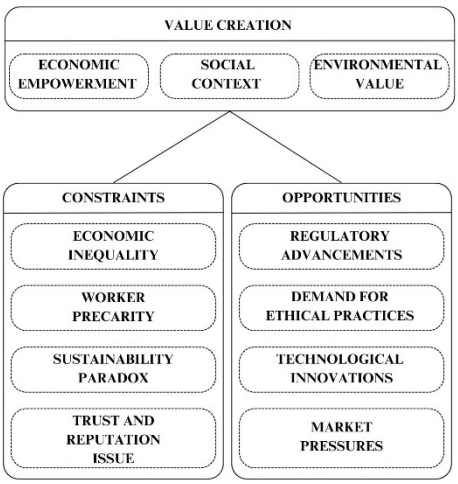
Nevertheless, despite these challenges, the implementation of advanced digital technologies such as geolocation, logistics optimization, and predictive algorithms has enabled these platforms to improve operational efficiency.

Proposition 5: *The sustainability and inclusivity of digital platforms depend on the establishment of complementary policies and frameworks that address economic inequality, worker precarity, and environmental impact.*

4.4 Theoretical Framework

Digital platforms face various challenges, opportunities for growth, and external threats. Their ability to drive economic empowerment and provide income-generating opportunities. Examples like Airbnb and Vinted highlight their potential to empower users by enabling them to earn from unused spaces (Caccese, 2019) or by encouraging sustainable consumption through purchasing and selling second-hand clothing (Balińska *et al.*, 2024). Differently, Uber Drivers and Deliveroo riders represent the benchmark category in terms of flexibility and technological efficiency. If, on one side, the on-demand employment model is fostering the elimination of restrictions on the ability to decide when, where, and how to provide labor, offering individuals greater autonomy in shaping their professional lives (Hickson, 2024), on the other side, it lacks traditional "benefits" such as job security, health insurance, and retirement plans. This, in turn, creates a paradox where workers enjoy the freedom to set their schedules but remain vulnerable to income instability, making it challenging to determine an individual's creditworthiness (Roy & Shrivastava, 2020). Indeed, relying on algorithm-driven management systems fuels these challenges, as workers are subjected to automated controls, limiting their autonomy and influence over work-related decisions. Nevertheless, while SEPs and GEPs are often conceptualized as distinct economic models, recent developments suggest that this binary classification might be overly simplistic. Indeed, many platforms have started to merge their characteristics. For example, platforms like Airbnb may involve gig-like service elements (e.g., cleaning, management, personalized hosting), while GEP like Uber can incorporate asset-sharing when drivers lease or rent vehicles to access the platform. This suggests a continuum rather than a dichotomy, where digital platforms may combine sharing and gig economy features to meet evolving user and market needs. Following our aim to provide a holistic understanding of the impact of digital platforms on SE, a conceptual framework has been created (Figure 3).

Fig. 3: Theoretical Framework of Digital Social Entrepreneurship, Source: Author's Own Elaboration



4.4.1 Value Creation

Digital platforms are becoming intermediaries in many industries, changing how they operate, how work is done, and how value is created and gained (Kenney *et al.*, 2019). For instance, SEPs, such as the Airbnb platform, serve as a catalyst for innovation by fostering micro-entrepreneurship, enabling individuals and small businesses to monetize underutilized assets and spaces, creating economic value (Mahmuda *et al.*, 2022). By facilitating access to alternative income streams, these platforms contribute to broader economic participation, particularly in contexts where traditional employment structures may be restrictive or exclusionary. Similarly, GEPs allow workers to engage in the digital economy with autonomy over their schedules. In this regard, Van Doorn & Badger (2021), introduced the concept of "dual value production", which explains how platforms extract two distinct forms of value from gig work: the direct monetary value derived from service transactions and the more uncertain, speculative value generated through data produced during service delivery. Moreover, digital platforms foster new forms of social engagement beyond economic contributions by strengthening community networks and enabling collaborative consumption. Engaging in peer-to-peer interactions through digital platforms, even in anonymous or semi-anonymous settings, introduces a novel approach to building and utilizing interpersonal relationships while also reshaping participation in social communities (Sutherland & Jarrahi.,2018). At the environmental level, earlier research has ignored the significant impact of sustainable development factors, particularly the quality of firms' environmental innovation, on the internal evolution of their digital platform capabilities and competitive edge. Indeed, while scholars recognize that merely implementing digital platforms does not automatically lead to success, gaining a competitive advantage depends on a firm's ability to adaptively leverage these platforms to enhance and execute its existing strategies (Liao *et al.*, 2024). However, while these platforms generate economic and social value, their benefits are not always distributed equally, and their long-term impact remains subject to ongoing debate.

4.4.2 Constraints

Despite the benefits of digital social entrepreneurship, platform-based models present significant structural constraints. Digital inequality represents a significant challenge confronting social entrepreneurship in the digital age. While digital technologies present numerous opportunities, not all individuals or communities can take advantage of them equally. This gap is evident in various aspects, including the availability of advanced technological devices, reliable and high-speed internet connectivity, and the necessary digital skills to leverage technological advancements (Setiawan, 2025). Moreover, it remains uncertain whether the advantages can be fully realized in a society with income inequality (defined as the unequal distribution of wealth among individuals) since economic disparities may weaken the potential benefits associated with collaborative consumption (Hussain *et al.*, 2023). In practice, platforms such as Vinted, high-volume sellers with extensive inventories, have a competitive advantage over casual users, demonstrating how digital marketplaces can perpetuate disparities based on resource accessibility. In addition, labor is characterized by precarious working conditions, as gig workers lack access to employment protections, including healthcare benefits, paid leave, and social security. According to Wood *et al.* (2019), the algorithmic management of platform-based labor affects workers' autonomy, flexibility, and authority, ultimately shaping their experiences of job insecurity within the gig economy (Anwar & Graham, 2021). What is more, while sharing products as a service via digital sharing platforms is increasingly recognized as a key facilitator of the circular economy (Schwanholz & Leipold, 2020), they may also generate unintended negative externalities. For instance, Airbnb has been linked to over-tourism and rising real estate prices, displacing long-term residents and increasing socio-economic inequalities in urban areas. Similarly, while gig economy platforms optimize delivery and transport logistics, they also contribute to increased environmental emissions. Studies have highlighted how such initiatives assist drivers in delivering faster and more flexible logistics services to customers, contribute to cost optimization,

and help lower the transportation sector's carbon footprint. However, the potential downsides of crowd logistics have received limited attention, with only a few studies addressing concerns such as its ambiguous environmental impact and critical social issues, particularly regarding precarious working conditions and road safety (Moncef & Monnet Dupuy, 2021). Lastly, due to asymmetric information and economic risks in peer-to-peer marketplaces, businesses have implemented reputation systems to foster trust among traders. One of the most prevalent reputation mechanisms is the display of online reviews from experienced users regarding the seller's reliability. In the context of sharing economy platforms, establishing trust between participants is even more important than in earlier peer-to-peer marketplaces. A key distinction between these two types of platforms is that traditional peer-to-peer marketplaces primarily involve the sale of goods, whereas sharing economy platforms focus on services. As a result, conventional peer-to-peer marketplaces are mainly associated with financial risks, whereas sharing economy platforms introduce additional risks, including those unrelated to monetary transactions (Ert *et al.*, 2016).

4.4.3 Opportunities

Despite these constraints, various emerging opportunities can reshape digital social entrepreneurship toward a more inclusive and sustainable future. Regulatory advancements present one of the most significant mechanisms for addressing labor precarity and economic inequality. The efforts of governments and social entrepreneurs complement each other, as the public sector has successfully mobilized large-scale initiatives at various times but has struggled to adopt models that ensure sustained efficiency and effectiveness (Arasti et al, 2015). Moreover, policymakers are increasingly recognizing the need for legal protections that ensure fair wages, algorithmic transparency, and access to social security benefits for gig workers. Legislative frameworks aimed at regulating short-term rental markets, data privacy, and environmental sustainability could further mitigate the unintended consequences of platform economies. Beyond regulatory interventions, shifting consumer expectations drive demand for ethical and sustainable business practices. Fortunately, the importance of sustainable business practices in both the marketplace and society has been recognized for quite some time (Svensson *et al.*, 2010). It has been determined that the advancement of sustainable business approaches should fulfill current needs and demands while ensuring that future generations can meet their requirements without compromise (Brundtland, 1985). Moreover, the rise of responsible consumerism has incentivized platforms to adopt sustainability-focused initiatives, such as eco-friendly logistics, ethical supply chains, and fair labor policies. Vinted, for example, has capitalized on the increasing consumer preference for circular economy models, demonstrating how shifting market behaviors can align platform incentives with environmental and social goals. Technological advancements further offer promising pathways for enhancing equity and transparency, simplifying data interpretation, and supporting the strategic planning of corrective actions. Consequently, these technologies act as a dynamic link between the physical and digital realms, expanding human capabilities and enabling systems to operate independently (Di Vaio *et al.*, 2023). Furthermore, the competitive pressures within the platform economy are compelling companies to differentiate themselves by integrating socially responsible business models. As investor interest in Environmental, Social, and Governance (ESG) continues to grow (Dmuchowski *et al.*, 2023), businesses that align with ethical labor standards and sustainability objectives are likely to gain a competitive advantage. The rise of worker-owned cooperative platforms further signals a shift toward more inclusive digital entrepreneurship models, challenging traditional hierarchical structures of platform governance. The extent to which these opportunities translate into lasting change will depend on the collaborative efforts of policymakers, businesses, and digital platform communities in shaping regulatory frameworks, business strategies, and governance innovations that balance economic efficiency with social impact.

5. Conclusion

This study explores the intersection between digital transformation and social entrepreneurship, analyzing how the sharing economy and gig economy platforms utilize digital technologies to foster the creation of value in the SE panorama. The findings reveal that digital platforms reshape entrepreneurial landscapes by providing novel business models promoting accessibility, efficiency, and innovation. In particular, SEPs enable individuals to optimize underutilized resources, fostering sustainability through collaborative consumption and circular economic principles, allowing users to engage in low-barrier entrepreneurial activities, facilitating income generation while reducing environmental impact. Differently, GEPs have revolutionized labor markets by offering flexible employment opportunities, enabling workers to participate in the digital economy with fewer traditional constraints. Both platforms leverage digital technologies such as artificial intelligence, machine learning, and algorithmic management to enhance service efficiency and optimize user experiences. However, while digital entrepreneurship opens new economic and social empowerment pathways, it also introduces critical challenges. SEPs exacerbate socio-economic disparities, favoring asset owners rather than those without access to capital or property. Similarly, GEPs lack workers in terms of worker protection, leading to precarious labor conditions, algorithmic control, and inconsistent incomes. The increasing reliance on digital intermediaries has further raised concerns regarding data privacy, transparency, and ethical governance in platform-based ecosystems. Consequently, the study underscores the relationship between digital innovation and social responsibility, emphasizing the need for balanced models that ensure sustainable and inclusive growth. However, despite its contributions, this study presents some limitations. First, the reliance on secondary data sources such as company reports, academic literature, and industry analyses may introduce potential biases or selective reporting. Future research could incorporate primary data collection, such as interviews with entrepreneurs, platform workers, and policymakers, to provide a more comprehensive perspective. Second, the study focuses on a limited number of cases, which may not fully capture the diversity of digital social entrepreneurship across different industries and geographic regions. Expanding the scope to include emerging platforms and regional variations would enhance the generalizability of the findings. Third, the research does not account for long-term impacts and regulatory developments as digital business models continue to evolve rapidly. Future studies should adopt longitudinal approaches to assess the shifting dynamics between platform innovation, labor conditions, and policy interventions over time. From a managerial perspective, this study provides valuable insights for platform operators, policymakers, and social entrepreneurs seeking to harness digital transformation for positive impact. To build a more equitable and sustainable digital economy, platforms must implement inclusive governance structures that protect workers' rights, ensure fair compensation, and foster ethical AI and algorithmic decision-making. Regulators must establish policies that address income disparities, worker protections, and the environmental consequences of digital platforms, ensuring that technological advancements do not exacerbate socioeconomic divides. In the same vein, entrepreneurs and businesses leveraging digital models should prioritize social innovation strategies that balance profitability with community well-being, reinforcing the role of digital social entrepreneurship as a force for good rather than an enabler of inequality. In conclusion, fostering collaborative approaches between stakeholders will be crucial in shaping responsible innovation as digital transformation continues to evolve. Future research should explore the potential of policy frameworks, technological advancements, and new business models that promote sustainability and equity in platform-based entrepreneurship. In addition, understanding how platforms increasingly blend SEP and GEP features, potentially leading to hybrid models that transcend traditional categorizations and offer novel pathways for DSE. By addressing the complex relationship between digital technologies and social impact, this research contributes to a deeper understanding of how the digital economy can be leveraged to drive inclusive, ethical, and sustainable entrepreneurship in the modern era.

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From Shareholder primacy to Stakeholder governance: rhetoric or reality?

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Abstract

Frame of the research. *The increasing emphasis on stakeholder governance has profoundly reshaped the corporate governance debate, challenging the traditional primacy of shareholder value. The 2019 Business Roundtable (BRT) Statement represented a pivotal moment in this shift, pledging a broader corporate commitment to all stakeholders. However, doubts persist regarding the substantive implementation of these principles, raising concerns about the sincerity of corporate engagement with stakeholder-oriented governance.*

Purpose of the paper. *We examine* whether signatory companies of the BRT Statement have translated their commitments into concrete governance changes.

Methodology. *Drawing on an empirical analysis of corporate governance guidelines from leading publicly traded firms, we assess the evolution of governance structures from 2019 to 2024.*

Results. *Our findings reveal a persistent gap between rhetoric and reality, as despite public declarations, the governance structures of most firms remain fundamentally anchored in shareholder primacy. While some companies exhibit a gradual transition toward stakeholder integration, for the majority, stakeholderism appears more as a reputational strategy than a structural transformation.*

Research limitations. *A limitation is that the sample is restricted to only 39 companies. Additionally, a limitation concerns the nature of the metrics used to assess the stakeholder governance orientation. Measuring corporate transformation requires more sophisticated tools that go beyond textual analysis and integrate empirical data on business decisions, value distribution among different stakeholders, and the social and economic impact of governance strategies.*

Managerial implications. *For firms, explaining how and if governance structures are evolving to integrate stakeholder interests without compromising financial performance.*

Originality of the paper. *This paper contributes to the corporate governance research by offering an updated empirical assessment of stakeholderism's actual adoption in major corporations that signed the BRT Statement.*

Key words: *shareholder primacy; stakeholder; governance; regulation; Business Roundtable*

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1. Introduction

In recent years, stakeholder governance has assumed an increasingly central role in academic debate and public policies related to corporate regulation (Freeman et al., 2020). The growing attention to the impact of companies on communities, workers, and other stakeholders has led to an in-depth discussion of the limitations and potential of stakeholderism (Amis et al., 2020). The concept of stakeholder-oriented governance has been presented as an alternative to the traditional doctrine of shareholder primacy, suggesting that companies should assume broader responsibilities toward all stakeholders, not just their investors (Schaltegger et al., 2019; Odunjo et al., 2023). However, while many scholars and policymakers view stakeholderism as a fairer and more sustainable model, others raise doubts about its actual implementation and the sincerity of companies in adhering to their stated commitments (Yoshikawa et al., 2021).

In this scenario, the 2019 Business Roundtable (BRT) statement marked a key moment, with over 180 CEOs of major companies declaring their commitment to more inclusive governance. The CEOs pledged to adopt a set of guidelines for sustainable corporate behavior, rejecting the idea of a company based solely on profit for shareholders. The document sought to mark the end of shareholder primacy in favor of stakeholder primacy. However, fundamental questions remain regarding the actual operational and structural transformation of the participating companies. On one hand, the 2019 BRT Statement was welcomed as a significant step toward this transformation (Bebchuk & Tallarita, 2020); on the other hand, some studies question the real effectiveness of such declarations. Specifically, Bebchuk and Tallarita (2020) highlight how BRT signatory companies have not effectively changed their governance guidelines, maintaining a clear centrality of shareholders in strategic decisions. Additionally, an analysis of corporate documents (such as Corporate Governance Guidelines, Requests for SEC No-Action Letters, Bylaws, Proxy Statements, and Director Compensation Principles) has shown that companies have systematically rejected shareholder proposals aimed at strengthening stakeholder-oriented governance and have not adopted stakeholder-related performance metrics.

This discrepancy between statements and actions raises critical questions about the nature of stakeholderism: are companies genuinely implementing a more inclusive governance model, or is it merely a rhetorical mechanism aimed at enhancing corporate reputation and reducing regulatory pressures? The academic literature on corporate governance has increasingly focused on stakeholderism, analyzing its potential benefits and risks (Bebchuk & Tallarita, 2020; Freeman et al., 2021). The academic debate is divided between stakeholderism advocates, who see its potential to mitigate corporate negative externalities, and critics who consider it a primarily rhetorical phenomenon, lacking substantive operational change. Bebchuk and Tallarita's (2022) empirical analysis revealed that in the two years following the Business Roundtable Statement, signatory companies did not implement substantial governance changes, instead reaffirming shareholder centrality in their official documents. However, the regulatory and social context is constantly evolving, and there is a need to update this evidence in light of more recent developments.

The lack of substantial changes in governance structures suggests that many companies may be using stakeholderism language to respond to growing social expectations without, however, translating these commitments into concrete actions (Dmytryev et al., 2021; Stocker et al., 2020). Examining this issue is crucial, as corporate governance not only influences wealth distribution and social well-being but also determines capital allocation strategies and investment approaches (Attanasio et al., 2021). If stakeholderism were genuinely adopted as a guiding principle, we should observe a redefinition of corporate objectives, integrating metrics that consider value creation for all stakeholders, not just shareholders (Zaman et al., 2022).

In light of the latest evidence and emerging challenges, our study aims to verify whether, drawing inspiration from the empirical analysis conducted by Bebchuk and Tallarita (2020) with updated data from 2024, the companies that signed the Business Roundtable Statement have effectively modified their governance practices toward a stakeholder-oriented model. Our goal is to analyze whether large

corporations are genuinely shifting toward stakeholderism or if, instead, traditional governance models persist. This study will help clarify whether stakeholderism is evolving into a consolidated practice or remains a mere communication tool with no concrete impact on corporate governance. Thus, our research seeks to answer the following research question:

RQ: Have the companies that signed the Business Roundtable Statement effectively modified their corporate governance practices to reflect a stakeholder-oriented model, or does their adherence to the BRT remain purely symbolic?

To address this question, we conduct an empirical analysis based on the collection and review of corporate governance guidelines from the companies in our sample. Our results indicate that, despite the ongoing debate on stakeholderism, the analyzed companies have not implemented significant structural changes in their governance approach. Corporate guidelines continue to emphasize shareholder primacy, and responses to investor proposals confirm a tendency to maintain a traditional model. Only one of the analyzed companies has explicitly aligned managerial incentives with stakeholder-oriented metrics, demonstrating that this phenomenon remains an exception rather than a widespread practice. These findings suggest that the BRT Statement has had a limited impact on actual corporate practices. This study contributes to the literature on stakeholderism by providing an updated empirical analysis of the real implementation of stakeholder-oriented governance in large corporations. Our results highlight that, despite principled declarations, many companies have not implemented substantial changes in governance approach. This discrepancy between rhetoric and concrete actions raises crucial questions about the authenticity of stated commitments. Specifically, our study confirms that the governance guidelines of companies that signed the BRT Statement have not undergone structural transformations favoring greater stakeholder involvement in corporate strategies This suggests that stakeholderism is often used as a marketing tool rather than a genuine evolution of the governance model.

Our study has significant implications for policymakers and investors, emphasizing the need for more rigorous measurement tools to assess corporate commitment to stakeholders. Finally, we provide a clear framework on the role of institutional investors and regulatory pressures in shaping the evolution of corporate governance, highlighting the need for regulatory reforms that ensure greater accountability and transparency in corporate strategies.

2. Literature Review

2.1 Shareholder Primacy

The debate on corporate governance has historically contrasted two fundamental paradigms: shareholder primacy and stakeholder governance. The shareholder perspective, rooted in agency theory, argues that the primary objective of a company is to maximize shareholder value (Jensen & Meckling, 1976). From this standpoint, corporate performance is measured through financial indicators, while the role of stakeholders is marginal and instrumental in achieving shareholder value (Tirole, 2010). One of the strengths of this paradigm is the clarity of corporate objectives and the ability to assess performance objectively through financial returns and stock value growth (Hart & Zingales, 2017). Moreover, financial markets play an external monitoring role, mitigating the risk of managerial misalignment and incentivizing operational efficiency (Shleifer & Vishny, 1997). However, this view has been criticized, particularly following financial crises and growing pressures for a more sustainable business model. Excessive emphasis on profit maximization has led to opportunistic behaviors such as cost-cutting, production offshoring, and reduced investments in human capital, with long-term negative consequences (Stout, 2013). The short-term orientation has driven many companies to prioritize immediate financial decisions at the expense of sustainable

growth strategies (Lazonick, 2014). In contrast to shareholder primacy, stakeholder theory, formulated by Freeman (1984), proposes a model in which businesses must serve a broader set of stakeholders, including employees, customers, suppliers, and communities. This theory argues that companies do not operate in a social and economic vacuum but are part of an interdependent system where corporate success also depends on stakeholder well-being (Donaldson & Preston, 1995). Shared value creation is thus seen as a key element for corporate sustainability and organizational resilience (Kramer & Porter, 2011). Recent research has highlighted that a balanced strategy between shareholders and stakeholders not only reduces reputational and regulatory risks but also enhances firms' attractiveness to long-term investors (Baah et al., 2023; Kyaw et al., 2022; Turker et al., 2023). However, despite the ongoing debate and the formal adoption of stakeholder-oriented principles by many companies, evidence suggests that the shareholder model remains predominant in practice. Therefore, we hypothesize:

H1: Firms continue to follow a shareholder-oriented governance model.

2.2 The Growing Influence of Stakeholderism

In recent years, stakeholder-oriented governance has gained relevance due to the evolution of regulations, investor pressure, and society's growing focus on corporate responsibility (Fransen, 2012; Ortas et al., 2019; Endo, 2020). A significant turning point was represented by the 2019 Business Roundtable Statement, in which over 180 CEOs acknowledged the need to serve all stakeholders, marking a break from the traditional doctrine of shareholder primacy. However, doubts remain regarding the actual implementation of these principles and the consistency between public statements and concrete corporate strategies (Bebchuk & Tallarita, 2022).

In addition, global asset managers such as BlackRock have begun integrating ESG criteria into their investment decisions, encouraging companies to improve transparency and accountability (Eccles & Klimenko, 2019). Yet, numerous studies have highlighted the limitations of the shareholder-oriented model. For instance, Edmans (2011) demonstrated that companies investing in employee well-being achieve higher long-term financial performance, suggesting that value creation for stakeholders is not in conflict with business success. Similarly, Bebchuk and Tallarita (2020) emphasized how an exclusive focus on shareholders can lead to short-termism, neglecting the long-term sustainability of the company. Another relevant factor is the emergence of ESG metrics as a central tool for evaluating companies. According to an analysis by Gupta and Argawal (2024), companies that adopt structured ESG strategies gain better access to capital and reduce the perceived risk among investors. The growing focus on these factors is leading to a redefinition of the very concept of corporate value, which is no longer limited to financial results alone but also includes social and environmental impacts (Heeb et al., 2023). In this context, some companies are integrating ESG criteria into managerial performance evaluations, thereby aligning executive incentives with corporate sustainability goals (Jang et al., 2022). The convergence of regulations across different jurisdictions could accelerate the adoption of more inclusive governance models while simultaneously reducing greenwashing and managerial opportunism (Eng et al., 2021).

The rise of stakeholderism is not merely a regulatory and market trend but also reflects an evolution in social expectations regarding businesses. The main challenge remains the ability of companies to translate these principles into concrete actions, avoiding the risk of rhetoric unsupported by real operational changes. On the other hand, with the evolution of regulations and the increasing pressure from investors and civil society, it is likely that the stakeholder-oriented paradigm will become a structural element in the corporate governance of the future (Tibiletti et al., 2021; Thrall, 2021). Thus, stricter regulations, investor attention, and the growing importance of ESG metrics are driving many companies toward more inclusive governance models (Eccles & Klimenko, 2019; Heeb et al., 2023). Based on this analysis, we hypothesize:

H2: Companies are progressively adopting a stakeholder-oriented governance model, recognizing that value creation for all stakeholders represents a sustainable competitive strategy in the long term.

2.3 Challenges and Constraints of Stakeholderism

Despite its growing diffusion, stakeholderism is not exempt from criticism. One of the main objections is the lack of clear and measurable objectives, which can lead to ineffective management and reduced managerial accountability (Bebchuk & Tallarita, 2020). Unlike the shareholder-oriented model, which relies on well-defined financial metrics, stakeholder-oriented governance involves greater discretion and ambiguity in defining corporate priorities (Bhandari et al., 2022). Some studies have shown that this uncertainty can make it difficult to implement effective and consistent strategies (Vural-Yavaş, 2021).

From an agency theory perspective, the inclusion of multiple stakeholders can dilute managers' fiduciary responsibility, increasing the risk of opportunistic and self-referential decisions (Easterbrook & Fischel, 1996). The literature highlights the discrepancy between corporate rhetoric promoting stakeholder interests and the actual governance practices implemented by firms. This raises the issue of consistency between declared commitments and actual actions, a crucial topic for the future of stakeholder-oriented management strategies (Yoshikawa et al., 2021; Shahzad et al., 2016). Another limitation concerns the complexity of balancing stakeholder interests, which can generate internal conflicts and hinder firms' adaptability (Jensen, 2009; Hall & Vredenburg, 2005; Donaldson & Preston, 1995). The diversity of stakeholder priorities makes it difficult for companies to make effective decisions without compromising operational efficiency. Additionally, recent research has highlighted that companies adopting a multi-stakeholder governance model often struggle to measure and quantify their impact, leading to challenges in transparency and accountability (Dias et al., 2025).

An additional issue concerns the role of regulatory authorities. While many jurisdictions are implementing regulations that encourage a stakeholder-oriented approach, there is also the risk that adopting mandatory standards may lead to excessive bureaucracy and operational inefficiencies as companies must invest significant resources to comply with regulatory requirements, facing high administrative costs and an increasing documentation burden (Freeman et al., 2020; Braun & Busuioc, 2020). Some scholars argue that regulation should strike a balance between flexibility and mandatory requirements so that companies can implement stakeholder strategies without sacrificing competitiveness and operational agility (Green et al., 2013; Collins, 2001).

Stakeholder-oriented governance also presents challenges in terms of innovation and competitiveness. While some argue that an inclusive approach fosters the creation of shared value, others highlight that excessive attention to the needs of multiple stakeholders can slow decision-making processes and limit firms' agility in highly competitive markets (Martin & Philips, 2022; Minoja et al., 2010). Although stakeholderism is considered a more inclusive model compared to shareholder primacy, its practical implementation presents multiple obstacles (Sternberg, 2019). The main challenge remains the development of more effective tools and metrics to ensure that multi-stakeholder governance can be implemented efficiently and measurably without generating inefficiencies or internal conflicts (Joshi et al., 2024).

In response to these challenges, many companies are seeking to integrate elements of both models to achieve competitive advantages and enhance corporate resilience (Joshi et al., 2024). In this sense, shareholderism and stakeholderism should not be seen as opposing and irreconcilable models but rather as two complementary perspectives that, if properly balanced, can optimize value creation for both shareholders and other stakeholders (Esposito De Falco, 2024). Based on this analysis, we hypothesize:

H3: Companies are increasingly moving toward a hybrid governance model in which economic-financial value creation and stakeholder considerations coexist in a strategic, sustainable, and long-term balance.

3. Method

3.1 Research Design and Sample Selection Criteria

This study adopts a qualitative research approach to explore the corporate governance orientation of companies with the highest market capitalization within the Business Roundtable (BRT). Specifically, the analysis aims to determine whether these companies adopt a shareholder-oriented or stakeholder-oriented governance model and whether their corporate governance guidelines reflect a linguistic preference for shareholderist or stakeholderist discourse. The qualitative nature of this research is particularly suited to capturing the nuances and subtleties embedded in governance documents, enabling an in-depth analysis of corporate intentions, strategic priorities, and underlying governance philosophies (Jalilvand et al., 2024). The decision to focus on companies with the highest market capitalization among those belonging to the BRT is based on both theoretical and methodological considerations. From a theoretical perspective, larger companies tend to exert a more significant influence on corporate governance norms and best practices, given their visibility, the level of regulation they are subject to, and their impact on financial markets (Becht et al., 2005). These firms often set precedents that smaller organizations may follow (Li & Nair, 2009), making them an ideal point of observation for assessing the prevailing governance paradigms within the BRT. From a methodological perspective, limiting the sample to companies with the highest market capitalization ensures a manageable yet representative dataset, avoiding the distortive effects arising from the heterogeneity that could emerge when analyzing organizations with very different governance structures and strategic imperatives. Through this selection, the study maintains analytical rigor and ensures that the results are generalizable to companies of similar scale and influence (Luttmer, 2007). The final sample includes the 39 largest companies by market capitalization that signed the Business Roundtable statement.

Tab. 1: Selected Sample

Company	**Market Capitalization (in billion of $)**
Abbott	$224.58
Amazon	$2.441
American Express	$216.02
Apple	$3.460
Bank of America	$358.4
BlackRock, Inc.	$159.54
Bristol-Myers Squibb	$122.91
Chevron Corporation	$282.56
Citigroup, Inc.	$153.32
Comcast Corporation	$146.29
Exxon Mobil Corporation	$484.21
Goldman Sachs	$198.79
Honeywell	$146.78
Mastercard	$502.64
Morgan Stanley	$219.6
PepsiCo	$212.2
Pfizer Inc.	$152.22
Qualcomm Incorporated	$189.22
Salesforce	$332.17
Progressive Corporation	$144.64
Texas Instruments	$170.38
The Coca-Cola Company	$275.14
The Home Depot	$422.05
UPS	$116.28
Visa Inc.	$656.04
AT&T Inc.	$173.21
Boeing	$131.05
Cisco Systems, Inc.	$235.3
IBM Corporation	$207.24
Johnson & Johnson	$368.1

JPMorgan Chase & Co.	$748.46
Oracle	$442.7
Procter & Gamble	$397.83
Raytheon Technologies Corporation	$166.44
S&P Global	$161.59
Stryker	$152.45
Union Pacific	$154.24
Walmart, Inc.	$782.45
Lockheed Martin Corporation	$119.39

Source: our elaboration

The selection of this sample is not arbitrary but represents a deliberate choice aimed at maximizing the relevance and interpretability of the study's findings. These companies collectively account for a significant portion of the market, and their governance choices often attract the attention of investors, policymakers, and academics.

Since corporate governance guidelines represent formalized expressions of a company's governance philosophy, they serve as an ideal data source for analyzing the governance orientation of these firms. Their standardization across companies enables a systematic comparative analysis, strengthening the robustness of the research design.

3.2 Data Collection

To ensure the reliability and authenticity of the dataset, only official corporate governance guidelines were collected directly from the companies' official websites. This methodological choice minimizes the risk of issues related to document credibility, ensuring that the analyzed texts reflect the companies' official governance positions rather than third-party interpretations. Moreover, by relying exclusively on primary sources, the study maintains a high degree of methodological transparency and replicability.

The data collection process involved the systematic download of the most recent versions of corporate governance guidelines available at the time of the study. Since governance policies are subject to periodic revisions, particular attention was given to ensuring that only the most up-to-date versions were analyzed, capturing the latest governance orientations. To further validate the integrity of the dataset, each document was cross-checked with publicly available governance reports to confirm its consistency.

3.3 Data analysis & Validation

The primary analytical approach adopted in this study is a systematic textual analysis of corporate governance guidelines. This methodological choice enables an in-depth investigation of both explicit governance commitments and the underlying linguistic frameworks. The analysis was conducted in multiple stages to ensure accuracy and interpretative depth.

First, each corporate governance guideline was examined to determine whether it articulated a governance orientation aligned with a shareholder-centric or stakeholder-centric model. This assessment was carried out by identifying key textual indicators that signal governance priorities. A shareholder-oriented approach was inferred from explicit references to shareholder primacy, fiduciary responsibilities towards shareholders, and commitments to maximizing shareholder value. Conversely, a stakeholder-oriented approach was identified through references to the broader responsibilities of the company towards employees, customers, communities, and other non-shareholder stakeholders.

To systematically code these orientations, predefined linguistic markers were used as analytical heuristics. For example, expressions such as "The primary responsibility of the Board... is to oversee the affairs of the Company in the interest of shareholders" or "maximize shareholder value in the long term" were classified as indicative of a shareholder governance framework. Conversely, statements

emphasizing commitments to "all stakeholders" or the integration of environmental, social, and governance considerations into corporate decision-making were categorized as representative of a stakeholder-oriented model.

In cases where governance orientations were not explicitly stated, an additional analysis was conducted to determine implicit governance commitments. This process involved a second review of the guidelines to identify structural or thematic elements that could provide indirect evidence of governance orientation. Furthermore, to enhance the reliability of the classification process, ambiguous cases underwent a review process in which each study author independently assessed the governance orientation of the company under examination. In cases of discrepancies, a deliberative process was adopted, where the authors engaged in structured discussions until a majority decision was reached on classification. Through the identification of key terms, recurring expressions, and specific linguistic structures, it was possible to classify the language adopted by companies into two main categories: shareholder-oriented and stakeholder-oriented. A shareholder-oriented language is characterized by the use of terms focused on shareholder value creation, market efficiency, maximizes value for stockholders, and alignment of management and shareowner interests. Expressions such as "maximization of shareholder value", "performance-based compensation", "investor confidence", and "competitiveness in the global market" are typically associated with this perspective.

Conversely, a stakeholder-oriented language places greater emphasis on corporate social responsibility, sustainability, and the creation of value for a broader range of stakeholders, including employees, customers, local communities, and the environment. Terms such as "commitment to the community", "long-term sustainability", "employee well-being", "shared value", and "environmental responsibility" indicate a more inclusive approach toward stakeholders.

To ensure the reliability and validity of the qualitative research, several strategies were implemented throughout the research process. The use of predefined textual indicators improved the consistency of the classification process, reducing the inherent subjectivity of qualitative textual analysis. Additionally, the involvement of multiple researchers in the verification process strengthened inter-coder reliability, mitigating potential interpretative biases.

Our methodological approach not only allows for a precise classification of governance guidelines but also provides a robust justification for our selective focus. From a scientific perspective, this methodology aligns with the need to ensure that data are not interpreted outside the specific or current context of the company and provides an empirical basis for drawing meaningful conclusions about governance trends that could have a decisive influence on future regulatory and strategic developments in the field of global corporations.

4. Results

4.1 Persistence of Shareholderism and Limited Transition Towards Stakeholderism

The analysis of corporate governance guidelines of the companies in our sample highlights a complex dynamic between shareholder-oriented and stakeholder-oriented approaches. This study has allowed us to identify the evolution of the language and strategic orientation adopted by firms in terms of governance.

From the analysis, it emerges that 38 companies out of 39 continue to operate under a shareholder-oriented governance model, despite their adherence to the BRT and public statements suggesting a greater stakeholder orientation. Companies such as Apple, Morgan Stanley, Abbott Laboratories, and Home Depot maintain a primarily shareholder-focused perspective, as evidenced by the wording of their corporate governance guidelines. For instance, Apple explicitly states: "The Board oversees the Chief Executive Officer (the "CEO") and other senior management in the competent and ethical operation of the Corporation on a day-to-day basis and seeks to ensure that the long-term interests of shareholders are being served". Similarly, Morgan Stanley declares: "Directors should also have the

ability to represent the interests of shareholders". These statements reinforce the persistence of the shareholder model in numerous companies.

A notable example is Honeywell, which, despite having updated its governance guidelines multiple times, has consistently maintained the same formulation, reaffirming the centrality of shareholder interests with statements such as: "The primary functions of the Honeywell International Inc. Board of Directors are to oversee management performance on behalf of the shareowners, to ensure that the long-term interests of the shareowners are being served". Likewise, Home Depot, both before and after joining the BRT, has continued to emphasize that: "The Board of Directors of The Home Depot, Inc. is committed to maximizing long-term shareholder value while supporting management in the business and operations of the Company".

These examples demonstrate that for many companies, adherence to the BRT has not led to a substantial change in governance practices but rather a continuity with the shareholder primacy paradigm. The consistent use of expressions emphasizing shareholder value as a priority objective suggests that, in many cases, the alleged transition towards stakeholderism remains more of a formal than a substantive change.

Tab. 2: Shareholder Governance

Company	**Excerpt**
Abbott	*They must be first and foremost able and willing* ***to represent the stockholders' short-term and long-term economic interests.***
Apple	*The fundamental role of the directors is to exercise their business judgment to act in what they reasonably believe* ***to be the best interests of the Corporation and its shareholders.***
Chevron Corporation	*The Board Nominating and Governance Committee annually reviews the composition of the Board as a whole to assess the skills and characteristics that are currently represented on the Board, and in individual Directors, as well as the skills and characteristics that the Board may find valuable in the future, in light of the current and anticipated strategic plans and operating requirements of the Corporation and* ***the long-term interests of stockholders.***
Exxon Mobil Corporation	*The directors' fiduciary duty is to exercise their business judgment* ***in the best interests of ExxonMobil's shareholders***
Honeywell	*The primary functions of the Honeywell International Inc. Board of Directors are to oversee management performance on behalf of the shareowners,* ***to ensure that the long-term interests of the shareowners are being served***
Morgan Stanley	*Directors should also have the ability* ***to represent the interests of shareholders.***
The Home Depot	*The Board of Directors of The Home Depot, Inc. is committed* ***to maximizing long-term shareholder value*** *while supporting management in the business and operations of the Company.*
Procter & Gamble	*It is expected that Board members (in that role) will exercise diligently and in good faith their independent judgment* ***in the best interests of the Company and its shareholders*** *as a whole, notwithstanding their other activities or affiliations.*

Source: our elaboration

4.2 Genuine Transition or Facade Strategy?

On the contrary, some companies have demonstrated a genuine shift in their governance approach. BlackRock, for instance, underwent a clear transition from 2020 to 2022, moving from explicitly shareholder-oriented language to an approach that explicitly includes stakeholders among the beneficiaries of corporate decisions. In 2020, BlackRock's corporate governance guidelines stated: "The members of the Board are elected by the Company's shareholders and use their business judgment to direct, provide counsel and oversee the management of the Company in the interest of and for the benefit of the Company and its shareholders". However, in 2022 and in 2024, this statement was significantly modified to also include stakeholders: "The members of the Board are elected by the Company's shareholders and use their business judgment to direct, provide counsel and oversee the management of the Company in the interest of and for the benefit of the Company and its shareholders and other stakeholders". This transformation is particularly significant, considering that it occurred after the company's adherence to the BRT. This suggests that, at least in some cases, membership in the organization has acted as a catalyst for a more inclusive governance

model. However, BlackRock's case remains an exception rather than the norm. Many companies that have joined the BRT continue to operate under a shareholder primacy logic, merely introducing linguistic adjustments in their governance guidelines without implementing a true strategic transformation. This phenomenon can be interpreted as an attempt to build an image of corporate social responsibility without making substantive changes to governance practices. In some cases, the modifications introduced appear to be more of a facade operation rather than a genuine strategic transformation.

Tab. 2: Governance Transition

Company	**Excerpt 2020**	**Excerpt 2022**	**Excerpt 2024**
BlackRock, Inc.	*The members of the Board are elected by the Company's shareholders and use their business judgment to direct, provide counsel and oversee the management of the Company* ***in the interest of and for the benefit of the Company and its shareholders***	*The members of the Board are elected by the Company's shareholders and use their business judgment to direct, provide counsel and oversee the management of the Company* ***in the interest of and for the benefit of the Company and its shareholders and other stakeholders***	*The members of the Board are elected by the Company's shareholders and use their business judgment to direct, provide counsel and oversee the management of the Company* ***in the interest of and for the benefit of the Company and its shareholders and other stakeholders***

Source: our elaboration

4.3 Hybrid Models: Boeing and Citigroup

Another interesting aspect that emerged from the analysis concerns companies that had already adopted a hybrid governance model before joining the BRT, balancing attention between shareholders and stakeholders. Boeing and Citigroup are clear examples of this trend: their corporate guidelines have always acknowledged the need to act in the interests of shareholders while simultaneously emphasizing the importance of considering other stakeholders, such as employees, customers, and communities. For instance, Citigroup states: "taking into account and balancing the legitimate interests and concerns of all of Citi's stockholders and our other stakeholders in reaching decisions". This demonstrates that the company has consistently embraced a more inclusive approach compared to the traditional shareholder model.

With the update of their governance guidelines, these companies have further strengthened their stakeholder-oriented approach, as evidenced by new formulations explicitly referencing the importance of relationships with various stakeholders. For example, Boeing, in its updated governance guidelines, states: "The Board and the officers recognize that the long-term interests of the Company and its shareholders are advanced when they take into account the concerns of employees, customers, suppliers, and communities". Additionally, it highlights that "The CEO and other officers are responsible for establishing effective communications with the Company's stakeholders, including shareholders, employees, customers, suppliers, communities, governments, creditors, and corporate partners". These statements indicate a clear evolution in recognizing the role of stakeholders. This evolution suggests that, in some cases, the transition toward stakeholderism is not merely a facade but rather a gradual shift in governance strategies. The presence of these companies, which had already adopted a more balanced governance model before joining the BRT, reinforces the idea that the transition is underway, albeit not uniformly across all the analyzed firms.

Tab. 3: Hybrid Models

Company	Excerpt
Boeing	*The Board and the officers recognize that the long-term interests of the Company and its shareholders are advanced when they* ***take into account the concerns of employees, customers, suppliers, and communities.***
Citigroup, Inc.	*(...) taking into account and balancing* ***the legitimate interests and concerns of all of Citi's stockholders and our other stakeholders in reaching decisions.***

Source: our elaboration

4.4 Language as an Indicator of Change

A particularly significant element emerging from the study concerns the use of language in governance guidelines, highlighting that 34 companies adopt a shareholder-oriented language, only 5 use a stakeholder-oriented language. While many companies maintain a shareholder-oriented governance model, there is a growing adoption of more inclusive language that emphasizes the role of stakeholders. A significant example is Walmart, which, while remaining committed to a shareholder-driven governance approach, has introduced references to the importance of relationships with customers, suppliers, and local communities. Its governance guidelines state: "The Board acknowledges that the Company's long-term success depends upon its strong relationship with its customers, associates, suppliers, and the communities, including the global community, in which it operates".

The same applies to S&P Global, which, although not having altered its governance structure, has included in its guidelines statements centered on ESG issues, such as: "Monitoring the Corporation's strategy and material activities, practices, and policies related to environmental, social, and governance matters". Additionally, S&P Global emphasizes the importance of diversity within its board of directors with statements like: "The Board believes that its membership should reflect a diversity of occupational and personal backgrounds and experience, including gender, race, ethnicity, and age, to obtain a wide range of viewpoints and perspectives".

On the other hand, companies such as Lockheed Martin, Stryker, Raytheon Technologies Corporation, and JPMorgan Chase continue to use explicitly shareholder-oriented language, highlighting that for many firms, linguistic transformation has not yet occurred. For example, Lockheed Martin states: "The Board is responsible for succession planning for the Chief Executive Officer, ensuring leadership continuity that maximizes value for stockholders". Similarly, Stryker underscores the centrality of shareholders with statements like: "All non-employee directors are expected to have a meaningful share ownership position in the Company to reinforce the alignment of the interests of the Board and shareholders". Raytheon Technologies Corporation follows a similar approach, stating: "To further encourage the alignment of management and shareowner interests, the Board will, from time to time, adopt stock ownership requirements for non-management directors and the Company's Executive Leadership Group". Finally, JPMorgan Chase clarifies its shareholder-oriented stance with statements such as: "Directors are expected to act in the best interests of the Firm's shareholders".

The case of these companies demonstrates that adherence to the BRT has not yet led to a structural shift in how governance is conceived and communicated.

The analysis of corporate governance guidelines among BRT companies reveals a complex and, in many cases, contradictory landscape. On one hand, there are signs of a gradual transition toward a more stakeholder-oriented governance model, with some companies significantly updating their guidelines in both governance principles and language. On the other hand, the majority of firms continue to adhere to a strongly shareholder-oriented governance approach, merely adopting more inclusive language without making substantial changes to their practices.

This phenomenon suggests that the transition toward stakeholderism, while present, is not yet fully established and often appears more rhetorical than substantive. However, the presence of companies

that have undertaken a genuine transformation, such as BlackRock and Citigroup, leaves open the possibility that this trend could accelerate in the coming years. It will be interesting to observe how BRT firms continue to evolve and whether external pressures from investors, customers, and regulations will further push corporate governance toward a more inclusive and sustainable model.

Tab. 4: Language

Company	**Excerpt**
JPMorgan Chase & Co.	*Directors are expected to act **in the best interests of the Firm's shareholders.***
Raytheon Technologies Corporation	*To further encourage **the alignment of management and shareowner interests,** the Board will, from time to time, adopt stock ownership requirements for non-management directors and the Company's Executive Leadership Group.*
S&P Global	*Monitoring the Corporation's strategy and material activities, practices, **and policies related to environmental, social, and governance ('ESG') matters.***
Stryker	*All non-employee directors are expected to have a meaningful share ownership position in the Company **to reinforce the alignment of the interests of the Board and shareholders.***
Walmart, Inc.	*The Board acknowledges that the Company's long-term success depends upon its strong relationship **with its customers, associates, suppliers, and the communities, including the global community, in which it operates.***
Lockheed Martin Corporation	*The Board is responsible for succession planning for the Chief Executive Officer, ensuring leadership continuity **that maximizes value for stockholders.***

Source: our elaboration

5. Discussion and Conclusion

This study examines the shift from shareholder primacy to stakeholder governance, highlighting both its practical implications and its rhetorical aspects. The analysis of corporate governance guidelines reveals a more complex reality than public declarations suggest. Empirical data indicate that most companies remain primarily focused on shareholders, reinforcing the persistence of an entrenched paradigm. The research unveils a scenario in which corporate statements have adapted to social and regulatory pressures without a corresponding structural transformation in decision-making dynamics and governance models. While some companies have adopted more inclusive language, this has not translated into operational and structural mechanisms that genuinely balance the interests of stakeholders and shareholders.

The following discussion rigorously and deeply explores the implications of these findings, providing a significant theoretical and empirical contribution to the governance debate. The emerging evidence not only clarifies the nature of the ongoing transformation but also challenges the actual effectiveness of corporate public statements, raising crucial questions about the future balance between shareholder and stakeholder-oriented interests. The examination of corporate governance guidelines highlights a marked divergence between public declarations in favor of stakeholderism and actual corporate management practices. Despite the 2019 Business Roundtable statement advocating a shift toward more inclusive governance, our analyses indicate that many companies have not translated these intentions into significant structural changes. Decision-making priorities remain strongly anchored in shareholder value maximization, with language that continues to emphasize fiduciary duty toward shareholders. This discrepancy strengthens the hypothesis that, for many companies, adopting a stakeholder-oriented rhetoric serves more as a strategy for social and reputational legitimacy rather than a substantial change in governance dynamics. Although some firms have integrated stakeholder references into their official statements, the lack of concrete tools, such as redefining performance metrics or creating stakeholder representation bodies, suggests that the traditional paradigm of shareholder primacy continues to dominate corporate governance. This trend underscores the importance of critical monitoring and stricter regulation to ensure that stakeholderism does not remain confined to a purely rhetorical level.

The persistence of shareholder-oriented language in governance documents is particularly telling. While some companies have incorporated stakeholder references, these additions appear more rhetorical than operational. The absence of concrete mechanisms, such as stakeholder representation on boards, stakeholder-linked performance metrics, or revisions to executive compensation structures, indicates that stakeholder governance largely remains an aspiration rather than a codified governance principle.

5.1 Evaluation of Hypotheses

Our findings strongly support hypothesis H1. The majority of the analyzed companies maintain governance frameworks that prioritize shareholder value maximization. This is evident in the explicit statements found in corporate governance guidelines, where fiduciary duty to shareholders remains central. Companies such as Apple, Morgan Stanley, and Home Depot illustrate this trend, as their governance policies continue to emphasize shareholder interests without substantial references to stakeholders.

This result aligns with the work of Bebchuk and Tallarita (2020), who argue that companies have not implemented structural changes following the BRT statement. Instead, their adherence to shareholder primacy remains intact, with governance structures and executive incentives still heavily tied to financial performance metrics. The persistence of this paradigm suggests that, despite growing external pressures, companies are reluctant to deviate from established governance norms that prioritize shareholder returns. Although there is some evidence of a shift toward stakeholderism, our findings indicate that this transition is far from universal, consequently, we do not support hypothesis H2. Companies like BlackRock and Citigroup have made significant changes to their governance language and structures, incorporating explicit references to stakeholder considerations. BlackRock, for instance, has revised its governance guidelines to acknowledge the importance of stakeholders beyond shareholders, signaling a possible evolution in governance philosophy. However, these cases remain exceptions rather than the norm. The broader corporate landscape continues to reflect a strong shareholder orientation, with many firms using stakeholder rhetoric without implementing meaningful governance reforms. This suggests that, while stakeholderism is gaining traction in public discourse, its practical adoption remains limited. The increasing regulatory focus on ESG factors and investor pressures may accelerate this shift in the future, but for now, the transition appears more incremental than transformative. Our findings provide partial support for hypothesis H3. Some companies, such as Boeing and Citigroup, demonstrate a hybrid approach, integrating stakeholder considerations while maintaining a strong shareholder orientation. These companies recognize the importance of stakeholder relationships for long-term value creation but have not fully institutionalized stakeholder governance. This hybrid model aligns with emerging research suggesting that companies may adopt a dual-focus approach, acknowledging the need to balance financial performance with broader social and environmental concerns (Freeman et al., 2020). The integration of ESG considerations into governance frameworks further reinforces this perspective, as companies seek to mitigate reputational risks and respond to evolving investor expectations. For most firms, however, these efforts remain supplementary rather than fundamental to their governance strategies.

5.2 Theoretical Relevance and Practical Implications

This study provides a crucial contribution to the corporate governance debate by highlighting the critical challenges and practical implications of the transition from a shareholder primacy-dominated model to a more inclusive one. From a theoretical perspective, the research underscores how stakeholderism is often adopted more as a communicative tool than as a genuine transformation of the decision-making paradigm. Our analysis demonstrates that many companies maintain structural and decision-making frameworks that predominantly favor shareholders, leaving stakeholders in a

secondary position. This persistence indicates that change cannot be limited to a mere revision of corporate narratives but requires a radical rethinking of governance mechanisms and the adoption of concrete tools to ensure the effective inclusion of stakeholders in decision-making processes. Only through structural modifications, such as greater transparency in defining corporate objectives and better alignment between managerial incentives and social impacts, will it be possible to overcome the dichotomy between principled statements and actual practices. The shift toward a truly stakeholder-oriented governance model cannot remain a symbolic evolution but must translate into a tangible transformation of corporate management.

From a practical standpoint, the findings of this research have significant implications for various stakeholders. For policymakers, there is an urgent need for more effective regulatory instruments to transform principled declarations into concrete actions, promoting governance that genuinely balances financial and social interests. For institutional investors, our study provides a valuable framework for assessing the authenticity of corporate commitments to sustainability and social responsibility, emphasizing the need for more rigorous metrics to monitor actual governance practices (Early, 2016). For corporate leaders, this research highlights the importance of adopting strategies that go beyond mere regulatory compliance, credibly and measurably integrating stakeholder interests into decision-making processes.

5.3 Limits and perspectives for future research

Our study presents several limitations that pave the way for future research. First, the analysis is based on the examination of corporate governance guidelines, which represent an important source of information but do not necessarily reflect the full spectrum of corporate practices. A more in-depth investigation, including interviews with corporate executives, analysis of actual business behaviors, and comparative evaluations across different jurisdictions, could provide a more comprehensive understanding of the real implementation of stakeholderism. Another limitation concerns the nature of the metrics used to assess the stakeholder governance orientation. Measuring corporate transformation requires more sophisticated tools that go beyond textual analysis and integrate empirical data on business decisions, value distribution among different stakeholders, and the social and economic impact of governance strategies. In this regard, future studies could develop more detailed evaluation frameworks to measure the degree of stakeholderism adoption in corporations.

Our study highlights the need for a more critical and systematic analysis of corporate statements of principle and their actual governance practices. Through continuous monitoring and the adoption of more rigorous measurement tools, it will be possible to distinguish between genuine commitment and mere communication strategies. Whether the future of corporate governance will be truly stakeholder-oriented will depend on the ability of companies to translate rhetoric into action and on institutions to create a regulatory framework that rewards the most inclusive and sustainable practices. The evolution of the stakeholderism debate in the coming years will therefore be crucial to understanding whether this paradigm can become a new standard or remain an unfulfilled promise.

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Track 10
Strategic Communication

Communicating mitigation strategies in SMEs manufacturing firms

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Abstract

This study explores how manufacturing Small and Medium Enterprises (SMEs) communicate their sustainability and mitigation strategies in the context of reducing greenhouse gas emissions by 33% by 2030. SMEs are under increasing pressure to adopt and communicate sustainable practices, as global environmental concerns intensify. Previous studies have highlighted the importance of adopting sustainability and effectively communicating it to meet regulatory and consumer expectations. Our research addresses three key questions: Is there a link between the adoption of mitigation strategies and their communication? Is there a difference between the communication of the mitigation and the sustainability strategy? Does a firm's perception of being a sustainability leader influence its communication efforts? To investigate, we surveyed 1,500 SMEs in 2024 about their sustainability and mitigation practices, focusing on Scope 1, Scope 2, and Scope 3 emissions. The survey responses were paired with web scraping analysis of company websites to assess how these firms communicate their actions.

Findings indicate that while many firms focus on Scope 2 emissions (purchased energy), fewer address Scope 1 or Scope 3 emissions. The majority of firms do not communicate their sustainability or mitigation strategies online, despite implementing some actions. This gap suggests that many companies are either at risk of "greenwashing" or "greenhushing". Interestingly, firms that perceive themselves as sustainability leaders are more likely to communicate their efforts, particularly those addressing all three scopes of emissions. This study contributes to the literature by revealing the significant disconnect between SMEs' environmental actions and their public communication efforts, emphasizing the need for better transparency and accountability in the manufacturing sector. Our findings suggest that stronger communication of mitigation strategies could enhance stakeholder trust and support Italy's broader climate goals.

Key words: *communication, sustainability, mitigation, strategies, climate change*

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1. Introduction

In the contemporary business environment, firms are increasingly pressured to address environmental, social, and economic challenges, making sustainable development a critical framework for achieving long-term success. This pressure stems from growing stakeholder expectations, regulatory demands, and the recognition that unchecked environmental degradation and social inequality pose significant risks to business continuity. Sustainable development, as defined by the Brundtland Commission (1987), emphasizes meeting the needs of the present without compromising the ability of future generations to meet their own needs. In the context of firms, this involves integrating economic growth with environmental protection and social equity. Firms pursuing sustainable development aim to create long-term value while minimizing negative impacts on society and the environment (Elkington, 1997). By adopting sustainable development principles, it can balance profitability with responsibility, ensuring resilience and relevance in a rapidly changing global landscape. In a corporate context, sustainability strategy involves adopting practices that ensure the continuity of business operations without depleting natural resources or harming societal well-being (Bansal & DesJardine, 2014). Unlike sustainable development, which focuses on a balance of economic, environmental, and social goals, sustainability strategy aims to produce the outcome of achieving such a balance.

Of particular interest are the strategies related to the management of the emission of greenhouse gases (GHGs) and other environmental impacts primarily due to the burning of fossil fuels and industrial processes (IPCC, 2021). In this context, mitigation and adaptation are complementary strategies for addressing these points. Mitigation focuses on reducing the causes of emissions (IPCC, 2014), while adaptation focuses on managing its impacts (Smit & Wandel, 2006). At the firm level, mitigation contributes to sustainability by reducing environmental degradation, while adaptation ensures the firm's resilience to environmental changes, thereby supporting long-term sustainability (IPCC, 2014, Smit & Wandel, 2006, Engert *et al.*, 2016). The manufacturing sector is a significant contributor to global greenhouse gas (GHG) emissions, accounting for approximately 20-30% of total emissions due to its reliance on energy-intensive processes and fossil fuels (International Energy Agency [IEA], 2021). Mitigation strategies in this sector can include the implementation of circular economy practices like recycling and reusing materials, which are essential for minimizing waste and emissions, enhancing resource efficiency, and reducing environmental impact (Geissdoerfer *et al.*, 2017). On the other hand, adaptation strategies can include diversification of suppliers and investments in climate-resilient infrastructure to address supply chain disruptions caused by extreme weather events or resource scarcity (Linnenluecke *et al.*, 2013). Small and medium-sized enterprises (SMEs) in the manufacturing sector face unique challenges in implementing these strategies due to limited resources and expertise, but they can leverage partnerships, government incentives, and industry networks to overcome these barriers (Revell *et al.*, 2010). Effective communication of sustainability, mitigation, and adaptation strategies is also critical for SMEs, as transparent reporting and stakeholder engagement can enhance their reputation, build trust, and attract environmentally conscious customers and investors (Delmas & Burbano, 2011). Government policies, including carbon pricing and subsidies for clean energy, play a vital role in encouraging these efforts (Porter & van der Linde, 1995). By integrating sustainability, mitigation, and adaptation into their strategies, manufacturing firms, including SMEs, can not only reduce emissions and pollution but also improve operational efficiency, competitiveness, and resilience, aligning with global climate targets such as those outlined in the Paris Agreement (IPCC, 2018). In this context, we focused on the communication of sustainability and mitigation strategies of Italian SMEs, in particular we aims to identify if:

- there is a relationship between the development of mitigation strategies adopted by SMEs and their communication strategies;
- there a difference between the communication of the mitigation and the sustainability strategy;

- firms' perception of being sustainability leaders increase their level of communication of mitigation strategies.

2. Mitigation in the manufacturing sector

The urgent need for mitigation strategies is underscored by the escalating climate crisis. As mentioned before, mitigation refers to efforts to reduce or prevent the emission of greenhouse gases, which can be achieved through various means including technological changes, improved energy efficiency, and shifts in management practices. These efforts are critical in limiting the global temperature increase to well below 2°C above pre-industrial levels, as stipulated in the Paris Agreement (UNFCCC, 2015). For the manufacturing sector, this translates into a pressing need to transform production processes, energy sources, and supply chains.

A crucial aspect of understanding mitigation strategies is the categorization of greenhouse gas (GHG) emissions into three scopes, as defined by the Greenhouse Gas Protocol (GHGP) (Patchell, 2018). This framework, widely adopted by companies and organizations worldwide, provides a comprehensive approach to measuring and managing GHG emissions.

- Scope 1 emissions refer to direct emissions from owned or controlled sources. For manufacturing companies, these typically include emissions from on-site fuel combustion, company vehicles, and any process emissions (Blanco, Caro & Corbett, 2016).
- Scope 2 emissions are indirect emissions from the generation of purchased energy. In the manufacturing context, this primarily relates to electricity consumption. The mitigation of Scope 2 emissions often involves improving energy efficiency and transitioning to renewable energy sources (Brander *et al.*, 2011).
- Scope 3 emissions include all other indirect emissions that occur in a company's value chain. For manufacturers, this can encompass a wide range of activities, from the extraction and production of purchased materials to the use and end-of-life treatment of sold products (Huang, Weber & Matthews, 2009). Scope 3 emissions often represent the largest share of a company's carbon footprint but are also the most challenging to measure and mitigate.

The link between climate change and mitigation in the manufacturing context is multifaceted. Firstly, the manufacturing sector must drastically reduce its direct emissions through improved energy efficiency, electrification, and innovative production processes (Bataille *et al.*, 2018). Secondly, manufacturers must consider the entire lifecycle of their products, addressing emissions from raw material extraction to end-of-life disposal (Scope 3 emissions).

However, challenges remain in implementing such mitigation strategies. Several barriers to industrial energy efficiency and mitigation were identified, including high upfront costs, lack of information, and split incentives (Fischedick *et al.*, 2014). Additionally, the impacts of climate change itself pose risks to manufacturing operations, necessitating adaptation strategies alongside mitigation efforts. Companies implementing robust mitigation strategies often find themselves better positioned to adapt to climate-related disruptions, demonstrating the synergies between mitigation and adaptation (Gasbarro *et al.*, 2017). Moreover, in the last years the COVID-19 pandemic has added a new dimension to this discourse. Despite the disruptions caused by the pandemic present an opportunity to rebuild manufacturing systems with sustainability and resilience at their core (Sarkis *et al.*, 2020). This perspective aligns with the concept of "building back better" and highlights the potential for integrating mitigation strategies into post-pandemic recovery plans. All these challenges underscore the need for comprehensive approaches that address both technological and organizational aspects of mitigation.

As we move forward, the integration of innovation and digital technologies in mitigation efforts presents new opportunities. Both internal capabilities and external pressures play significant roles as drivers of eco-innovation in manufacturing firms (Mazzanti *et al.*, 2015), suggesting that effective mitigation strategies need to consider both firm-level factors and broader policy environments. Even

Industry 4.0 concepts can contribute to sustainable manufacturing, potentially enabling more efficient and less carbon-intensive production processes; however, realizing these benefits requires careful planning and implementation (Beier, Niehoff & Xue, 2018). In this context, the digitalization can play a role in the communication of mitigation efforts as effective communication of the strategies can enhance a company's legitimacy and stakeholder support (Hahn, Reimsbach, & Schiemann, 2015).

3. A focus on Small-Medium Enterprises

Despite extensive research on climate change mitigation strategies in the manufacturing sector, there remains a significant gap in the literature when it comes to understanding how Small and Medium-sized Enterprises (SMEs) address this issue globally. Globally, Small and Medium-sized Enterprises play a vital role in the manufacturing sector, often forming the backbone of industrial ecosystems. According to the World Bank (World Bank, 2020), SMEs account for about 90% of businesses and more than 50% of employment worldwide. Understanding how these companies address climate change mitigation is therefore crucial to assessing the sector's overall environmental impact.

Most existing literature focuses on large enterprises, which often have significantly different resources and capabilities compared to SMEs, particularly when it comes to addressing different Scope emissions. Understanding these challenges can help develop more effective policies and support for these companies on a global scale (Hoogendoorn *et al.*, 2015).

Several barriers are encountered by SMEs in implementing energy efficiency measures, which directly impact their ability to manage Scope 1 and 2 emissions. These barriers include limited financial resources, lack of in-house expertise, and insufficient access to information about best practices (Cagno *et al.*, 2013; Ormazabal *et al.*, 2018). Regarding Scope 1 emissions, SMEs often struggle with accurate measurement and reporting. SMEs lack the sophisticated monitoring systems that larger companies use to track their direct emissions. This can lead to underreporting or inaccurate assessment of their environmental impact (Jansson *et al.*, 2017) Scope 2 emissions present another challenge for SMEs. While larger corporations might have the resources to invest in renewable energy or negotiate favourable contracts with utility providers, SMEs often have less flexibility in their energy sourcing. SMEs frequently face higher barriers to adopting energy-efficient technologies, which could help reduce their Scope 2 emissions (Trianni *et al.*, 2016). The complexity of Scope 3 emissions poses perhaps the greatest challenge for SMEs. Many SMEs struggle to fully comprehend and account for their value chain emissions due to limited resources and the complexity of supply chain relationships. This can result in incomplete or superficial reporting of Scope 3 emissions (Johnson, 2015). Despite these challenges, there are opportunities for SMEs to improve their emission management and mitigation strategies. SMEs that adopt environmental management systems (EMS) are better positioned to track and reduce their emissions across all scopes (Testa *et al.*, 2017). Furthermore, collaborative approaches, such as industrial symbiosis networks, can help SMEs share resources and knowledge to improve their environmental performance (Patricio *et al.*, 2018; Borghesi *et al.*, 2021). In terms of communicating their mitigation efforts, SMEs often adopt different strategies compared to larger corporations. For example, Borga *et al.* observed that SMEs in the Italian furniture industry tended to focus on qualitative descriptions of their environmental initiatives rather than quantitative emission data (Borga *et al.*, 2009). This approach, while less comprehensive, can still provide valuable insights into an SME's commitment to sustainability. As policy makers and stakeholders increasingly recognize the importance of SMEs in achieving climate goals, targeted support mechanisms are emerging. For instance, the European Union's SME Strategy for a Sustainable and Digital Europe includes provisions to help SMEs transition to more sustainable business models and improve their energy efficiency (European Commission, 2020).

While there is extensive literature on corporate sustainability communication, there is a dearth of research focusing specifically on how SMEs communicate their mitigation strategies. SMEs often lack the resources and expertise to effectively communicate their sustainability efforts, but few studies have examined this aspect in detail in the context of mitigation strategies across different cultural and economic contexts (Baumann-Pauly *et al.*, 2013).

Additionally, there is a lack of research exploring the relationship between the actual implementation of mitigation strategies and their communication in SMEs. This gap is particularly relevant considering that SMEs may have very different approaches to sustainability compared to large companies, both in terms of actions and communication, and these approaches may vary across different countries and sectors (Johnson & Schaltegger, 2016).

4. The communication of sustainability and mitigation efforts

Effective communication plays a pivotal role in the successful implementation of sustainability strategies within organizations, particularly in the manufacturing sector. It acts as a bridge between stakeholders, ensuring that sustainability goals are understood, supported, and effectively executed (Genc, 2009). A critical point is that communication to be effective must be perceived correctly by the target audience, otherwise it has an opposite effect of repulsion instead of attraction (Cox, 2008). On the other hand, it must be taken into account that the ambitious targets, set by governments and agencies, regarding emission reduction may tend to force company to be green leading to negative perception by the stakeholders (Lee *et al.*, 2015). In addition, ambiguous and incorrect external communication behaviors typical of greenwashing may be done especially by firms that do not have sufficient expertise or funding (Ockwell, 2009).

Sustainability communication can be internal and external. Internally, communication is essential for engaging employees and fostering a culture of environmental and social responsibility (for example training programs and regular updates), aligning their actions with organizational sustainability objectives (Baumgartner & Rauter, 2017). Externally, communication with stakeholders such as customers, investors, and regulators is important to avoid greenwashing, which can damage an organization's reputation and erode stakeholder trust (Crijns *et al.*, 2018).

Some considerations can be made on the external communication of specific strategies related to climate change. Companies that effectively communicate their climate change strategies tend to perform better in terms of emissions reductions (Dahlmann *et al.*, 2019) suggesting that transparent and robust communication is not just a matter of public relations but can actually drive better environmental performance. Also stakeholder engagement in mitigation communication plays a role. For example, it has been found that firms involving their employees, suppliers, and local communities in their mitigation efforts were more likely to achieve their sustainability goals and effectively communicate their progress (Ferraro *et al.*, 2019). This collaborative approach not only improves the effectiveness of mitigation efforts but also enhances the credibility and reach of communication strategies (Penz & Polsa, 2018). Moreover, typical communication patterns, including "selective disclosure" and "proactive transparency" can be identified in industries communicating their climate innovation strategies (Pinkse & Gasbarro, 2019).

It is mandatory to deeply understand "how" and "where" the communication takes place. Concerning the "where" issue, recent studies highlight that sustainable business models are useful to depict firms' mitigation communication efforts. Bocken, Short, Rana & Evans (2014) proposed a framework for sustainable business model archetypes, which has been widely adopted by manufacturing companies to communicate their mitigation strategies, emphasizing the importance of integrating sustainability into the core business model rather than treating it as an add-on. The integration of mitigation strategies into corporate sustainability reports (CSRs) has also been a growing trend, reflecting a more holistic approach to sustainability communication (Reilly & Hynan, 2014). It has been observed an increase in the quality and quantity of information disclosed about

mitigation efforts in sustainability reports, particularly among manufacturing firms (Michelon *et al.*, 2019). This trend indicates a growing recognition of the importance of comprehensive and transparent reporting on environmental initiatives.

In recent years, digital and social channels have become the perfect medium ("how") to communicate sustainability strategies (Gill *et al.*, 2008). Digital media technologies offer significant potential for promoting climate mitigation and sustainability strategies by enabling targeted communication, fostering emotional engagement, and facilitating peer-to-peer and community-level action (Testa *et al.*, 2020). However, challenges such as misinformation, political polarization, and the need for long-term behavior change must be addressed to maximize their effectiveness (Chatterjee *et al.*, 2024).

Looking towards the future, innovation and emerging technologies such as blockchain, artificial intelligence, ICT, are poised to revolutionize how companies track, verify, and communicate their mitigation efforts (Hermundsdottir & Aspelund, 2021). Recent studies have explored the role of environmental innovation in the manufacturing firms' communication strategies. For instance, firms engaging in environmental innovation are more likely to cooperate with external partners, highlighting the importance of collaborative approaches in developing and communicating mitigation strategies (De Marchi, 2012). Furthermore, a crucial point is the need for effective communication of these strategies to stakeholders (De Marchi & Di Maria, 2015). In addition, Kouhizadeh, Saberi & Sarkis (2021) explored the potential of blockchain technology in enhancing transparency and traceability in sustainable supply chains, which could significantly impact how manufacturing companies communicate their mitigation strategies across complex global value chains.

5. Research Framework and Empirical Analysis

As mentioned above, the communication of mitigation strategies is relevant for manufacturing companies, which often face scrutiny regarding their environmental impact, as the global community intensifies its efforts to address climate change and environmental sustainability. Italy's commitment to reducing greenhouse gas emissions by 33% by 2030, as part of the European Union's climate goals, has placed significant pressure on its manufacturing sector (European Commission, 2021). This commitment, coupled with growing stakeholder expectations and the transformative impact of the COVID-19 pandemic, has accelerated the trend towards adopting and communicating robust mitigation strategies among Italian manufacturers. Moreover, in Italy, SMEs represent a significant part of the economy and the manufacturing sector. According to ISTAT (2020), SMEs constitute over 99% of Italian businesses and contribute to about 67% of the added value in the manufacturing sector. Understanding how these companies address climate change mitigation is therefore crucial to assessing the sector's overall environmental impact. On this context, our work aims to answer these research questions:

- Is there a relationship between the development of mitigation strategies adopted by SMEs and their communication strategies?
- Is there a difference between the communication of the mitigation and the sustainability strategy?
- Does firms' perception of being sustainability leaders increase their level of communication of mitigation strategies?

We employed a multi-faceted research approach by quantifying the levels of sustainability strategy and mitigation efforts, analyzing the associated communication strategies, and cross-referencing self-reported data with publicly available information, in order to identify best practices, common challenges, and areas for improvement in how the analyzed firms articulate their environmental commitments and actions.

Initially, we developed a detailed close-ended survey structured to gather information on various aspects of sustainability practices and mitigation strategies implemented by these companies. This allowed us to gain insights into the depth and breadth of environmental initiatives across the sector.

The survey was provided to 1500 SMEs Italian manufacturing firms in 2024, containing 11 questions, 5 on the sustainability strategy and 6 about the mitigation strategies. Concerning the sustainability strategy we asked strategic question related to CSRs (Kassier, 2024), B-corps (Richardson & O'Higgins, 2019) and environmental reports (Christensen *et al.*, 2021). On the other hand, regarding the mitigation we asked something about direct/indirect emissions (Fawzy *et al.*, 2020) and Carbon credits (Probst *et al.*, 2024). More details on the questionnaire are reported in Appendix A.

A sample of Nanswers=1497 answers was finally collected. All the answers were coded as dummy variabes Qs_i^n, for the sustainability strategy related questions, and Qm_i^n, for the mitigation-related ones (where n=1, …, Nanswers and i the number of the question), assuming value 1 or 0. More details on the coding of each answer are reported in Appendix A. These variables have been combined for the generation of new dichotomic indicators; the sustainability strategy level of a n-th firm has been evaluated as:

$$\text{Sustainability Strategy Level}^n = \begin{cases} \text{High} & if \ \sum_{i=1}^{4} Qs_i^n \geq 3 \\ \text{Low} & otherwise \end{cases}$$

indicating high level if a firm obtained 1 in at least three of the first four questions related to the sustainability strategy. Firms who answered "Don't know/prefer not to answer" in all four questions were removed from the sample. The last question regarding the sustainability strategy (Qs_5^n) was used to evaluate if a firm perceive to be a sustainable leader in the sector, thus the related variable has been defined as:

$$\text{Perceived Sustainability Leader}^n = \begin{cases} \text{Yes} & if \ \ Qs_5^n = 1 \\ \text{No} & otherwise \end{cases}$$

All the questions related to the mitigation were used to code the effort of each firm related to each Scope emissions. The indicators of such Scopes emissions were defined as:

$$\text{Scope1}^{\,n} = \begin{cases} 1 & if \ \ OR(Qm_1^n, Qm_2^n) = 1 \\ 0 & otherwise \end{cases}$$

$$\text{Scope2}^{\,n} = \begin{cases} 1 & if \ \ OR(Qm_3^n, Qm_4^n) = 1 \\ 0 & otherwise \end{cases}$$

$$\text{Scope3}^{\,n} = \begin{cases} 1 & if \ \ OR(Qm_5^n, Qm_6^n) = 1 \\ 0 & otherwise \end{cases}$$

being $OR(\cdot,\cdot)$ the logical or operator that assumes value equal to one if at least one of the two analyzed variables is equal to one. Firms who answered "Don't know/prefer not to answer" in all six questions were removed from the sample.

Finally, exploiting the single Scopes indicators, an overall variable indicating the global Mitigation level assuming value "High" only if a firms employed efforts on at least two Scopes:

$$Mitigation\ Level^n = \begin{cases} \text{High} & if \ \sum_{i=1}^{3} \text{Scope } i^{\,n} \geq 2 \\ \text{Low} & otherwise \end{cases}$$

Thus, a refined final sample of $N_{refined}$=1335 firms was recorded with full characterization of sustainability strategy level and mitigation level.

Following the survey analysis, we employed web scraping techniques to analyze the public communication of sustainability and mitigation efforts on the $N_{refined}$ firms' websites. This step was

crucial in complementing the information obtained through the questionnaire to compare the self-reported data from the survey with publicly available information.

The web scraping process was performed by using a custom-made Phyton code. Each company's website has been extrapolated and analyzed. A list of general sustainability-related relevant words was set as reference for the text mining process. Then two buckets of keywords were identified in order to categorize the words specifically related to sustainability strategy or mitigation efforts. The complete list of words and details on the two buckets are reported in Appendix C. We counted the number of times that the firms communicate on the website the words belonging to the complete list ($AllWords^i_{counts}$) and then specifically belonging to the restricted buckets ($BucketSust^i_{counts}$ and $BucketMitigation^i_{counts}$) leading to the generation of three discrete categorical variables:

$$Communication\ of\ General\ Sustainability^i = \begin{cases} \text{Zero} & if\ \ AllWords^i_{counts} = 0 \\ \text{Low} & if\ 0 < AllWords^i_{counts} \leq C \\ \text{High} & if\ C < AllWords^i_{counts} \end{cases}$$

$$Communication\ of\ Sustainability\ Strategy^i = \begin{cases} \text{Zero} & if\ \ BucketSust^i_{counts} = 0 \\ \text{Low} & if\ 0 < BucketSust^i_{counts} \leq C \\ \text{High} & if\ C < BucketSust^i_{counts} \end{cases}$$

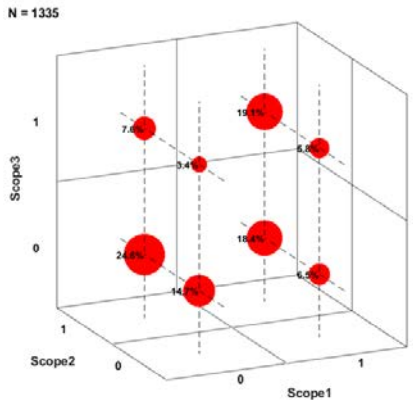
$$Communication\ of\ Mitigation^i = \begin{cases} \text{Zero} & if\ \ BucketMitigation^i_{counts} = 0 \\ \text{Low} & if\ 0 < BucketMitigation^i_{counts} \leq C \\ \text{High} & if\ C < BucketMitigation^i_{counts} \end{cases}$$

being *C* a threshold value set as the median value of communicated words, either bucket-restricted or not depending on the case, among all firms.

6. Results and Discussions

We started analyzing the firms' mitigation efforts in relation with the three scopes. As depicted in Figure 1, the major efforts are related to Scope 2 emissions.

Figure 1: 3D representation of the firms' mitigation efforts in relation with the three Scopes. Only 19.1% of the sample (255 firms) can be considered as mitigation leaders.



Source: Our elaboration.

Actually, 69.7% (930 firms) of the sample undertakes initiatives on the mitigation of purchased energy, in particular electricity; this can be motivated by the fact that in last years Italy gives benefits on the purchasing or re-arrangement of energy production with renewable energy sources (Canelli *et*

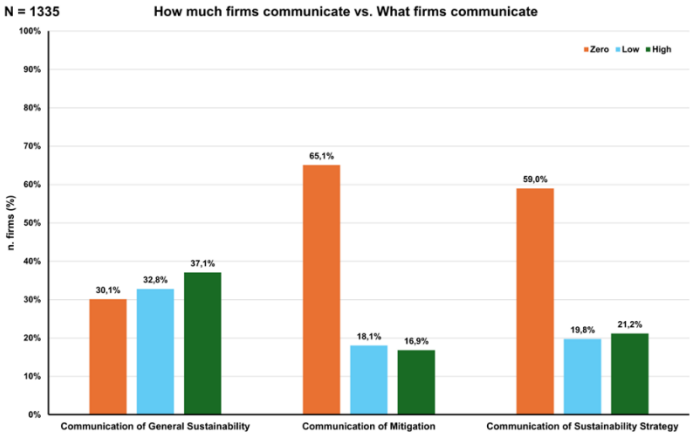
al., 2024) especially to SMEs. Scope1 emissions related mitigation efforts were still relevant, as taken into account by about 1 out of every 2 firms (49.8%) but, on the other hand, the Scope 3 emissions efforts were not very high (35.9%) probably due to the known difficulties of SMEs to control the emission along the whole value chain (Olekanma *et al.*, 2024). However, 19.1% of the sample (255 firms) declared mitigation efforts on all three Scopes emissions placing them as Mitigation leaders.

Then, we started investigating the communication of sustainability strategy and mitigation adopted by firms without any restriction on their level. The 30.1% of the sample don't communicate anything about sustainability in their websites and, in addition, most of the sample have a high level of communication related to sustainability in general. The result is completely reversed when the communication is specifically focused on the sustainability strategies or to the mitigation efforts. In these two cases, more than one out two firms (precisely 65.1% for the mitigation and 59.1% for the sustainability strategies) don't communicate anything.

Another detail concerns the fact that the communication of sustainability strategies is still slightly higher than that of mitigation. One possible explanation lies in the fact that it is much easier for an SME to carry out sustainability strategies activities than mitigation activities.

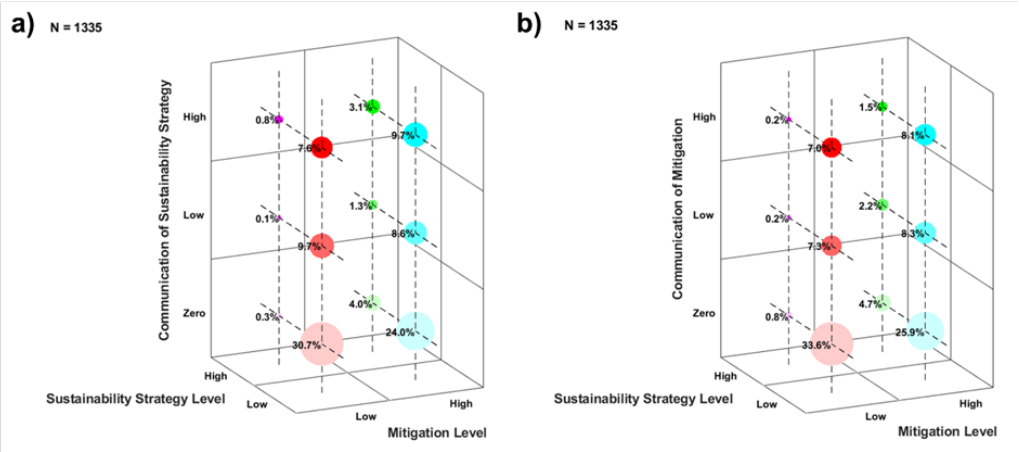
Then we explored the possible relationship between the Sustainability strategy level and the Mitigation level of each firm with respect to their specific communication of the sustainability strategy and mitigation.

Figure 2: Analysis on the different types of communications. Generally, firms are inclined to communicate sustainability efforts but not so effectively when it is strictly related to their sustainability strategies or mitigation efforts. The percentages among each group are calculated over the whole sample (N=1335 firms).



Source: Our elaboration.

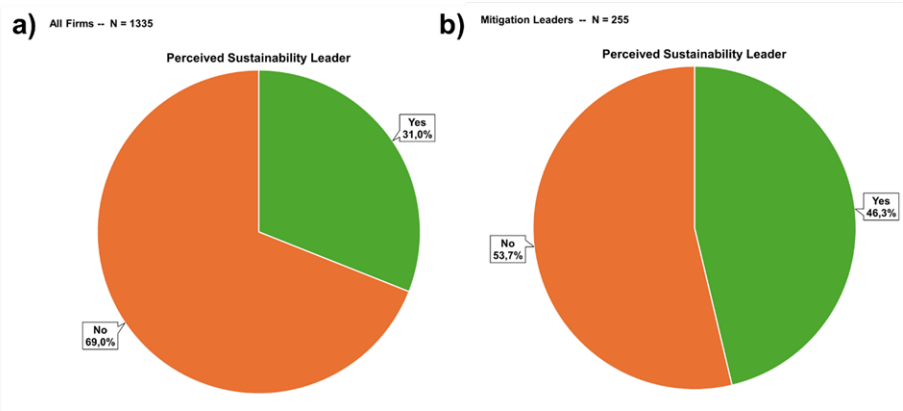
Figure 3: Communication of Sustainability strategy (a) and Mitigation (b) with respect to the Sustainability Strategy level and the Mitigation level.



Source: Our elaboration.

As shown in Figure 3, the behaviour is basically the same independently to the specific type of communication. There are many firms that have both low sustainability strategy level and low mitigation level (30.7% in Figure 3a and 33.6% in Figure 3b, depicted with circles in pink), and in line with their strategy don't communicate anything. On the other hand, there is a small number of firms with high sustainability strategy level and mitigation level that also have a high level of communication (3.1% in Figure 3a and 1.5% in Figure 3b, depicted with circles in bright green). The complementary cases are represented by the firms associated with bright red spots and the ones associated with light green circles. Firms belonging to these categories are potentially exposed to greenwashing and greenhushing respectively; it is clearly evident that the firms potentially exposed to green washing are almost double to the ones potentially exposed to greenhushing (approx. 7% vs approx. 4%). The last interesting thing about this analysis is that there are many firms with high Mitigation level and low Sustainability strategy level (depicted with cyan circles in Figure 3) that are inclined to not communicate neither Sustainability strategy nor Mitigation.

Figure 4: Analysis of firms' perception to be a Sustainability Leader

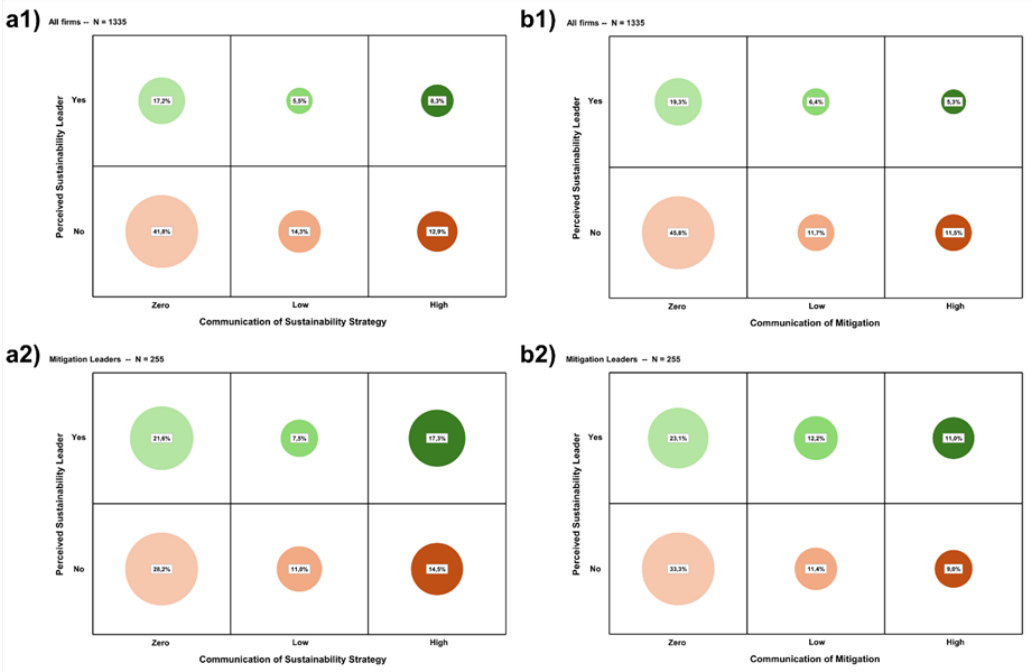


Source: Our elaboration.

Thereafter, we assessed whether firms' perceptions of being sustainability leaders affect the communication of sustainability strategies and mitigation. Considering the whole sample, only 31.0% of firms perceived to be sustainability leader (Figure 4a). Moving to the sample restricted to mitigation leaders only (Figure 4b), that is, those who take actions regarding mitigation of all three Scopes, this percentage increase up to 46.3% suggesting that the more is the mitigation efforts the more is the perception to be a sustainability leader.

Shifting the focus to the analysis of communication as a function of perceptions of sustainability leaders (Figure 5), we can clearly say that at the global sample level and the perception of sustainability does not affect the communication of sustainability strategy (Figure 5(a1)) and the communication of mitigation (Figure 5(b1)). In contrast, when analyzing only the sample of Mitigation leaders, the perception of being sustainability leaders increases high-level communication by twice as much as the percentage referring to the full sample (form 8.3% to 17.3% and from 5.3% to 11%).

Figure 5: Analysis of how the perception to be a sustainability leader impact the communication of Sustainability strategy and Mitigation.



Source: Our elaboration.

7. Conclusions

This study adds a fresh perspective to the ongoing conversation about sustainability in SMEs, especially within the manufacturing sector. One of its key contributions is shedding light on the gap between the sustainability actions that SMEs are taking and how they communicate these efforts. While many companies are making strides in reducing their environmental impact, their communication often falls short, leaving stakeholders unclear about the true extent of their commitment. This disconnect raises important questions about how SMEs can better align their actions with their messaging to build trust and transparency (Adams & Frost, 2008; Hahn *et al.*, 2015).

We also deepen the discussion around emission mitigation, particularly in the context of SMEs tackling Scope 1, 2, and 3 emissions. The findings highlight how Scope 3 emissions remain a significant challenge due to the complexity of managing environmental impacts across supply chains. This aspect is critical, as it underscores the need for more tailored solutions that help SMEs navigate these obstacles and strengthen their sustainability practices (Gadde & Dubois, 2010; Matthews *et al.*, 2008).

Another valuable insight from this research is the nuanced view it offers on greenwashing and greenhushing. By exploring these two extremes-overstating or downplaying environmental efforts-we provide a better understanding of how these practices can influence public perception and stakeholder trust. This is especially relevant today, as transparency becomes an increasingly important driver of corporate reputation (Delmas & Burbano, 2011).

Looking ahead, there's a lot more to uncover in this field. Future research could explore how SMEs approach sustainability in different regions or industries, considering how cultural and regulatory differences might shape their strategies and communication. The challenges of Scope 3 emissions also deserve more attention-what innovative tools, like blockchain or collaborative networks, might help SMEs better manage their supply chains and reduce emissions? (Saberi *et al.*, 2019).

It would also be valuable to understand how effective sustainability communication impacts key business outcomes, such as customer loyalty, investor interest, or brand reputation. This could help SMEs craft strategies that not only showcase their environmental efforts but also support their growth

(Chkanikova & Mont, 2015). Public policies and incentives are another area worth exploring. Research here could guide governments and organizations in designing programs that genuinely empower SMEs to adopt greener practices (Brammer *et al.*, 2012).

Finally, technology opens up exciting possibilities for the future of sustainability. How can tools like artificial intelligence or advanced analytics make it easier and more affordable for smaller companies to measure, report, and communicate their progress? Exploring these questions could unlock new opportunities for SMEs to lead the way in sustainability, despite their limited resources.

By diving into these areas, future studies can help bridge the gap between theory and practice, offering practical solutions that benefit SMEs, policymakers, and stakeholders alike in the journey toward a more sustainable future.

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Appendix A

Here we report in detail the questions and the available answers provided to the firms. The questions are divided depending on the contribution they have either on sustainability strategy or mitigation. In addition we reported how we coded each question.

Sustainability Strategy

Question 1: Is your company a Benefit Corporation and/or a certified BCorp?
Yes No Don't know/Prefer not to answer

$$Qs_1^n = \begin{cases} 1 & if \quad answer = Yes \\ 0 & otherwise \end{cases}$$

Question 2: Have you ever produced an environmental report? Examples: social report, environmental report, impact report, mission statement, sustainability report.
Yes No Don't know/Prefer not to answer

$$Qs_2^n = \begin{cases} 1 & if \quad answer = Yes \\ 0 & otherwise \end{cases}$$

Question 3: What environmental certifications have you achieved? Select from the list.
CAM
CARBON FOOTPRINT
ECOLABEL
EMAS
ISCC
ISO13009
ISO14001
ISO14006
ISO 14040/14044
ISO 14064
14067
14090/14091
ISO 21401
ISO 50001
Made Green in Italy
Life Cycle Assessment
No One
Don't know

$$Qs_3^n = \begin{cases} 0 & if \quad OR(No\ One, Don't\ know) \\ 1 & otherwise \end{cases}$$

being OR(•,•) the logical or operator.

Question 4: To what extent is environmental sustainability part of your mission or "corporate goal"?
1 (Very unlikely) 2 3 4 5 (Very Likely)
Don't know/Prefer not to answer

$$Qs_4^n = \begin{cases} 1 & if \quad answer \geq 4 \\ 0 & otherwise \end{cases}$$

Question 5: How much do you agree with the following statement, "Regarding environmental sustainability actions (example: reducing carbon emissions), our company acts ahead of competitors."
1 (Very unlikely) 2 3 4 5 (Very Likely)
Don't know/Prefer not to answer

$$Qs_5^n = \begin{cases} 1 & if \quad answer \geq 4 \\ 0 & otherwise \end{cases}$$

Mitigation

Question 1: To reduce emissions, your company had to :

Introduce new products Modify existing products Change the production process Update employee skills Identify new ad hoc professionals Find new sources of funding Other (specify) No action Don't know/prefer not to answer

$$Qm_1^n = \begin{cases} 0 & if \ \ OR(No\ Action, Don't\ know\ \backslash prefer\ not\ to\ answer) \\ 1 & otherwise \end{cases}$$

Question 2: Does your company purchase carbon credits (carbon offsets) or participate in reforestation projects and other similar environmental initiatives to reduce its environmental impact?
Yes No Don't know/Prefer not to answer

$$Qm_2^n = \begin{cases} 1 & if \ \ answer = Yes \\ 0 & otherwise \end{cases}$$

Question 3: Does your company produce its own electricity? If yes, through what facilities? [multiple answers possible].
Wind
Solar/Thermal
Photovoltaic
Thermoelectric
Hydroelectric
Geothermal
We do not produce our own energy
Don't know/prefer not to answer

$$Qm_3^n = \begin{cases} 0 & if \ \ OR(We\ do\ not\ produce\ \ldots, Don't\ know\ \backslash prefer\ not\ to\ answer) \\ 1 & otherwise \end{cases}$$

Question 4: Do you buy energy from renewable sources (but not self-generated)? [choose one]
Yes No Don't know/Prefer not to answer

$$Qm_4^n = \begin{cases} 1 & if \ \ answer = Yes \\ 0 & otherwise \end{cases}$$

Question 5: Let us now consider "scope 3 emissions," i.e., emissions related to activities that occur outside your company boundaries but are linkable to your product and/or production process (e.g., emissions related to the raw materials you use). How often have you assessed these emissions in your business discussions? [choose one]
Never Rarely Occasionally Often Very often
Don't know/prefer not to answer

$$Qm_5^n = \begin{cases} 1 & if \ \ OR(Often, Very\ often) \\ 0 & otherwise \end{cases}$$

Question 6: Which of these activities did you consider as sources of indirect emissions?
Other: emissions related to production cycle and business travel; waste generated in operations; employee commuting
Emissions related to the purchase of materials, products or services for your business
Emissions related to the transportation of the products, materials or services you purchase (inbound logistics, handled by you or companies you contract)
Emissions related to the transportation of the products, materials or services you sell (outbound logistics, managed by you or companies contracted by you)
Emissions related to the end-of-life of products
Emissions related to the distribution network of your products
Emissions related to the use of your products by consumers
None of these
Don't know/prefer not to answer

$$Qm_1^n = \begin{cases} 0 & if \ \ OR(None\ of\ these, Don't\ know\ \backslash prefer\ not\ to\ answer) \\ 1 & otherwise \end{cases}$$

Appendix B

Buckets of keywords used for the web scraping step. Some keywords are in Italian because the analyzed firms are from Italy and the majority of the websites have only the Italian language website format.

Mitigation Bucket:

Basse emissioni, Carbon free, Carbon footprint, Carbonio, Carbon negative, Carbon neutral*, Conservazione dell'energia, decabonizzazione, Emissioni CO2, Emissioni di carbonio, Efficientamento energetico, Efficienza energetica, GHG, gas serra, greenhouse, greenhouse gas emissions, Impronta ambientale, Impronta di carbonio, impronta cabonio, impronta carbonica, Innovazione verde, net zero, neutralità carbonica, Ottimizzazione energetica, riduzione delle emissioni, Riduzione anidride carbonica, Riduzione C02, risparmio energetico, scope 1, scope 1, scope 2, scope 2, scope 3, scopo 1, scopo 2, scopo 3, Sequestro del carbonio, Tecnologie pulite, twin transition.

Sustainability Strategy Bucket:

anticorruzione, codice etico, comitato etico, Corporate Social Responsibility, CSR, degrado ambientale, Diritti Umani, diversity management, Environmental, social corporate governance, equity movement, ESG, etica, etico, Gestione della diversità, Governance ambientale, Impact invest*, impatto ambientale, impatto sociale, Investimenti sostenibili, Movimento per la diversità, obiettiv* ambient*, obiettiv* social*, Obiettivi di sviluppo sostenibile, Obiettivi sociali, preservazione dell'ambiente, Reporting ESG, Responsabilità ambientale, Responsabilità sociale, sbti, Science Based Targets initiative, SDG, SGI, social goals, Sostenibilità aziendale, stakeholder, Sustainable developments goals, Sustainable Governance Indicators, Tutela dei consumatori, valorizzazione dell'ambiente, WGI, World Governance Index.

Other words:

ANAC, Analisi degli impatti ambientali, Analisi degli impatti sociali, Analisi degli impatti socio-ambientali, Analisi del rischio climatico, Analisi Multicriterio, Autoconsumo, B-Corp, BREEAM, Bike Sharing, Bilancio ambientale, Bilancio di impatto ambientale, Bilancio di impatto sociale, Bilancio di Massa, Bilancio di missione, Bilancio di sostenibilità, Bilancio Sociale, Bilancio integrato, Biomassa, Biomateriali, Biomimetica, Building Research Establishment Environmental Assessment Method, Capacità adattiva, Car Sharing, Carpooling, CDP, Celle a Combustibile, Certificazione LEED, Chiusura del Ciclo, Ciclo di Vita, Circolarità, climate change, climate crisis, Comunità resilienti, Commercio equosolidale, Conservazione delle acque, Conservazione degli ecosistemi lacustri, controllo dell'inquinamento, Cradle to Cradle, Cradle to Cradle Certified, crisi climatica, CSRD, Dati di ciclo di vita, Design per la Sostenibilità, dichiarazione non finanziaria, Digital Product Passport, DNF, Documento di sostenibilità, Downcycling, Due diligence ambientale, ecodesign, Economia della Performance, Economia del riciclo, Efficienza Energetica, EMAS, Energia da Biomassa, Energia da fonti rinnovabili, Energia da Onde e Maree, Energia da Rifiuti, Energia Eolica, Energia Geotermica, Energia Idroelettrica, Energia Pulita, Energia Solare, Energia solare termica, Energie Rinnovabili, Energy Star, Environmental Product Declaration, EP, ESRS, Fair Trade, Filtri antiparticolato, Forest Stewardship Council, FSC, Gestione delle acque, Gestione delle catastrofi, Global Organic Textile Standard, global warming, GOTS, GRI, Green Seal, Idrogeno Verde, Impatti Ambientali, Impianti Geotermici, Infrastrutture di ricarica, Infrastrutture resilienti, Inventario del ciclo di Vita, IR, ISO 14000, ISO 14001, ISO 14024, ISO 14025, ISO 14040, ISO 14044, ISO 14064, ISO 14067, ISO 14067: 2018, ISO 14090, ISO 14091, ISO 21930, ISO 50001, iso14064, Leadership in Energy and Environmental Design, LCIA, LCA, LCI, leed, Life Cycle Assessment, Longevità, Loop Chiusi, Materiali rinnovabili, Materiali Sostenibili, Mobilità condivisa, Mobilità Sostenibile, Moduli fotovoltaici, Monitoraggio della qualità dell'aria, NFD, non financial disclosure, Normative anti-inquinamento, Norme di sostenibilità, Pannelli Fotovoltaici, Pannelli Solari, Piani di adattamento, Piani di miglioramento della qualità dell'aria, Progettazione sostenibile, protezione dei fiumi, protezione dei laghi, protezione delle falde idriche, Pulizia dell'aria, Purificazione dell'aria, Raccolta Differenziata, Recupero, Recupero delle risorse, Regolamenti sulla divulgazione, Relazione di impatto, Relazione di responsabilità sociale, Relazione di sostenibilità, Relazione ESG, Relazione sulla performance sostenibile, Rendicontazione di sostenibilità, Report ambientale, Report di gestione sostenibile, Report di responsabilità aziendale, Report di Sostenbilità, report integrato, Reporting di sostenibilità, Restauro fluviale, Rete Elettrica Intelligente (Smart Grid), Riduzione dei consumi, Riduzione materie prime, Riduzione rifiuti, Riforestazione, Rigenerazione, Risorse Rinnovabili, Risparmio idrico, Riuso, Servizi di ride-hailing sostenibili, SBTi, SASB, Simbiotica Industriale, Sistemi di accumulo dell'energia, Sistemi fotovoltaici, Sostenibilita, Sostenibilità, Sostituzione delle Materie Prime, Stazioni di Ricarica, Standard ambientali, Stoccaggio di Energia, Strategie di resilienza, Tecnologie di controllo delle emissioni, Tecnologie di purificazione dell'aria, Tecnologie di risparmio idrico, TNFD, Trasporti pubblici verdi, Turbine Eoliche, UNEP FI, UNGC, Upcycling, Uso efficiente dell'acqua, Valutazione del ciclo di vita (LCV), Valutazione degli impatti sociali, Valutazione degli Impatti del Ciclo di Vita, Valutazione di impatto, Veicoli a Idrogeno, Veicoli Elettrici, Veicoli Ibridi, visione sostenibile, Vulnerabilità al cambiamento climatico, Vulnerabilità climatica, VRF, WEF Stakeholder Capitalism Metrics.

Powerful social media tools and use for boosting customer engagement in B2B companies[1]

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Abstract

Frame of the research. *Digital transformation has altered the dynamics of B2B interactions, with social media emerging as a powerful tool for fostering engagement with business customers.*

Purpose of the paper. *The paper explores advertising campaigns conducted on LinkedIn, with the aim of analyzing their impact on digital performance metrics, direct information on user interactions and perceptions, and engagement markers.*

Methodology. *Focusing on real business data, LinkedIn advertising campaigns and website traffic from Google Analytics are examined.*

Results. *Social media help to communicate crucial concerns like the corporate sustainability orientation. In particular, LinkedIn demonstrates its role in increasing user engagement on the website, exchanging contents and advertise items.*

Research limitations. *The analysis precludes comparisons across platforms, data only covers a brief period of advertising activity, and results generalizability is limited because data are from customized LinkedIn ads directed at specific markets.*

Managerial implications. *Managers should prioritize LinkedIn as the central platform for their B2B marketing strategies where professional networks are essential. The ability to generate high-quality engagement on the website through targeted campaigns reflects the importance of the platform in boosting companies' positioning.*

Originality of the paper. *The combination of sources represents an effective basis for examining the relationship between LinkedIn activity and website behavior.*

Key words: *digital marketing dynamics, social media marketing, engagement, LinkedIn advertising campaign, Google Analytics, B2B.*

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1. Introduction

In a changing digital landscape, social media plays a key role in the digital transformation that businesses are undergoing, improving customer engagement, optimizing marketing activities, and fostering innovation through feedback and collaboration (Johnson, 2021). This transformation has been widely studied in the B2C setting with many analyses on the influence of social media on business-consumer interactions (among others: Chatterjee and Kar, 2020; Harrigan et al, 2020; Kapoor *et al.*, 2018). However, much needs to be explored in the B2B context (among others Cartwright *et al.*, 2021; Salo, 2017; Siamagka *et al.*, 2015; Juntunen *et al.*, 2020). The role of social media marketing in B2B has been proved distinct from B2C: Brown *et al.* (2019, p. 169) has found that "B2B organizational members perceive social media to have a lower overall effectiveness as a channel and identify it as less important for relationship-oriented usage than other business models". Additionally, Hollebeek (2019) states that little is known regarding business customer engagement created through B2B engagement-platforms. Moreover, B2B studies has mainly explored the effectiveness of social media as a promotional tool rather than as a source for data and analytics (Agnihotri *et al.*, 2023). However, the increasing adoption of social media analytics by B2B companies needs more studies based on these data (Dwivedi *et al.*, 2023).

In order to contribute to the extant literature on how social media activities impact B2B companies' engagement, we analyze the role of advertising campaigns on social media with the aim of assessing their impact on digital performance metrics, thus collecting information on user interactions and perceptions, and analyzing customer engagement. This is performed using real business data from two sources: LinkedIn advertising campaigns (employing LinkedIn Tag that tracks user interactions and engagement metrics) and Google Analytics (which provides information on website traffic and visitor behavior). This combination of sources represents an effective basis for analyzing the relationship between LinkedIn activity and customer website behavior.

We expect that our analysis can contribute to the academic knowledge on the effectiveness of social media in generating customer engagement and interaction and be useful to B2B companies to involve buyers and business stakeholders.

2. Literature review

Social media marketing is defined as the "utilization of social media technologies, channels, and software to create, communicate, deliver, and exchange offerings that have value for an organization's stakeholders" (Tuten and Solomon, 2014, p. 21). Andersson and Wikström (2017) focus on B2B contexts exploring the use of social media as a communication tool able to enhance customer relationships, support sales and build brands, as well as a recruiting, seeking, service and product information tool.

Other studies have examined the use of digital channels by companies, but with a narrow emphasis, thus focusing on their role in small and medium-sized organizations (Ruliana *et al.*, 2020).

The use of social media among B2B companies has increased in recent years (e.g., Itani, Agnihotri and Dingus, 2017; Lacka and Chong, 2016; Diba, Vella and Abratt, 2019). However, given the key role of these platforms in the business context, there is an increasing need to further explore the impact of social media usage for B2B companies (Tiwary *et al.*, 2021; Balaji *et al.*, 2023).

The B2B audience's requirement for in-depth, technical knowledge is met by these posts, which are designed to showcase particular product features and capabilities. This strategy not only draws in business professionals who are actually interested in the products, but it also strengthens the company's reputation for competence by showcasing its capacity to comprehend and satisfy client wants (Waseem, Biggemann, and Garry, 2018).

Holliman and Rowley (2014) analyze B2B digital content marketing, perceived to be a useful tool for trusted brand status. Creating content has to do with the understanding of the audience's information needs and their purchase cycle. Valuable contents are thus useful and relevant.

The audience's identification of the business as a capable and creative leader in its industry is further highlighted by the high level of engagement with these technical product pages. This emphasizes the importance of personalized content in meeting linguistic preferences, which positively increases engagement (Ko and Megehee, 2012; Dehghani and Tumer, 2015).

Agnihotri *et al.* (2016) show that engagement and interaction between salespeople and customers via social media platforms may lead to increased inter-organizational trust and commitment, while other studies prove that aligning social media sales activities (e.g., contacting potential customers through LinkedIn) with marketing activities (e.g., generating online data to support sales activities) can result in a successful consultative selling approach through the development of a customer-focused strategic orientation (Guesalaga, 2016). Although previous research has examined the relationship between social media and the B2B sector, considerable gaps persist, particularly regarding the nuanced functions of platforms like LinkedIn. The B2B setting is inherently complicated, with specific decision cycles characteristics and buyer-supplier relationships. Additionally, many B2B firms are not able to embrace the overall social media marketing potential (Tiwary *et al.*, 2021), while they can really help B2B marketers in developing their trust globally if used strategically.

3. Data collection methods

This paper relies on secondary data sources: LinkedIn and Google Analytics.

Data have been collected in spring-summer 2024 from LinkedIn campaigns and website traffic by a B2B company located in the Province of Modena (Italy).

The LinkedIn Tag tracked and analyzed users' behavior on LinkedIn. It provided information about user interactions with targeted advertising campaigns, including metrics like Click-Through Rate (CTR), impressions and engagement. Every LinkedIn ad post included a link to the company website and this allowed to track the number of users connecting from LinkedIn to the website, helping in the evaluation of campaign effectiveness.

Moreover, Google Analytics tracked and analyzed website traffic and this allowed to collect information about website visitors' activity (e.g., number of visits, the time spent on various pages, how they interacted with marketing material, etc.). The analysis through Google Analytics provides a comprehensive picture of how social media activities impact web engagement.

4. Analysis methods

First, the LinkedIn data analysis employs two different multiple regression analyses: one for sponsored data and one for organic data. These regressions evaluate the effect of clicks and impressions on engagement, in order to understand how these factors affect user interactions during the campaigns period.

In addition, Google Analytics data represent a descriptive examination of the results, with an emphasis on metrics: user and traffic acquisition, engagement times, landing pages, event counts, and engagement metrics. This provides a comprehensive picture of website performance and user behavior in the observed periods.

4.1 LinkedIn ad campaigns

The use of LinkedIn data sheds light on how sponsored advertising activities and organic content influence user engagement, clicks, and impressions obtained during the campaign period.

4.1.1Multiple regression analysis on organic and sponsored data

The campaign period data was broken down and analyzed in a way that allows to distinguish the contribution of organic versus sponsored activities. The aim is to highlight the role of both types of content in generating impressions, clicks, and engagement rates.

Thus, all impressions, clicks, and engagement rates are separated into organic and sponsored content to show the importance of each type of activity.

Organic impressions are interpreted as the number of times non-sponsored content is viewed by the users, whilst sponsored impressions represent the number of views on sponsored content. The latter (95%) outperform organic impressions (5%). This means that investing in sponsored content significantly enhances content visibility.

Organic clicks are the number of clicks on organic contents, whereas sponsored clicks represent the number of clicks on sponsored posts. Similarly to impressions, sponsored clicks are much higher than organic clicks (75% vs 25%), though the difference in this case is less noticeable.

Finally, organic engagement is defined as the proportion of users who interacted with organic content (clicks, comments, shares, etc.) in relation to total impressions and it reach the 5%. Sponsored engagement, instead, is the engagement rate for sponsored content, and it is much lower (1%) despite the sizeable of impressions.

Therefore, organic material seems to produce more interaction, in percentage terms, than sponsored content. This can be interpreted as a sign that users believe organic content is more authentic and/or relevant than paid content.

After the analysis on the organic and sponsored indicators, we explore two independent variables, named impressions and clicks, and their influence on engagement, in both organic and sponsored contexts.

Organic impressions have a statistically significant but negative (-0.226) impact on organic engagement. This indicates that an increase in organic impressions is associated with a decrease in engagement, probably due to the fact that not all organic impressions lead to direct interactions.

Clicks are highly statistically significant with positive coefficient (0.878). Thus, an increase in organic clicks is associated with a significant increase in organic engagement, and this is consistent with the idea that clicks represent direct user engagement.

Similar to the organic model, impressions are statistically significant at 5% level, with a negative coefficient stronger than that of organic impressions. We can thus conclude that, in the sponsored context, an increase in impressions is associated with a wider decrease in engagement. This is probably due to the specific nature of sponsored impressions, which can reach less interested users.

Switching to clicks, the corresponding coefficient is very significant and positive. Therefore, any increase in sponsored clicks has a stronger effect on engagement, suggesting that sponsored clicks are particularly relevant for generating interactions.

Tab. 1: Multiple Linear Regression: Organic Model (standardized coefficients)

	Coefficient	**Std. Error**
Impressions	-0.226*	0.098
Clicks	0.878***	0.098
Adjusted R^2	0.5916	

Note: ***p<0.01, **p<0.05, *p<0.1

Tab. 2: Multiple Linear Regression: Sponsored Model (standardized coefficients)

	Coefficient	**Std. Error**
Impressions	-0.827*	0.345
Clicks	1.382***	0.345
Adjusted R^2	0.3867	

To sum up, the comparison of the sponsored and organic models reveals differences in the ways clicks and impressions impact engagement. Clicks and impressions have a noticeable impact on both models, however the sponsored model's negative impressions coefficient is more remarkable, indicating a larger decline in engagement as impressions rise. This means that not every impression results in a click or other interaction. Furthermore, engagement may be lowered by a significant number of impressions that contain views not interested users.

Clicks are crucial for increasing engagement in both scenarios, but their impact is greater in the sponsored model, highlighting the importance of user interaction in paid advertising.

Finally, it has to be remarked that these results need to be interpreted with caution as this is a first attempt to investigate the influence on engagement of clicks and impressions. In fact, the multiple linear regression models may suffer from omitted variables bias, thus further research is needed.

4.2 Google analytics

This section focuses on the analysis of secondary data collected through Google Analytics, thus looking at website traffic and user behavior. Metrics like page views, session length, and visitor geography represent some of the useful information from Google Analytics on users' engagement with a business's website.

The aim of the analysis is to demonstrate how ads influence customer perceptions and encourage engagement. The analysis compares website's traffic generated during advertising campaigns (where the advertisements featured direct links to sponsored products - Period 1), with the traffic observed after the campaigns (Period 2). The campaign analysis goes from May 2 to June 2, 2024, while the baseline website traffic goes from August 2 to September 2, 2024.

4.2.1 New users

This part of the analysis focuses on the effect of LinkedIn campaigns on user acquisition and overall website performance for both time periods. The first metric taken into account is the quantity of new users throughout each time period to see whether LinkedIn campaigns effectively increased website traffic.

Data collected on Google Analytics from the two periods of analysis show a noticeable difference in the number of new users. During Period 1, when LinkedIn ad campaigns were active, a total of 664 users were acquired, compared to only 236 in Period 2.

Moreover, the data reveals a peak in user acquisition during the first period: a maximum of 64 users on May 29th. In contrast, the second period shows a significantly lower peak of only 22 users on August 29th. These trends provide an initial understanding of the influence of LinkedIn campaigns in driving new users traffic to a company website.

4.2.2 User acquisition sources, acquisition channels, and time of engagement

User acquisition is analyzed using some key metrics: acquisition sources, acquisition channels, and time of engagement.

For sources of user acquisition during Period 1 LinkedIn was the most significant source (268 users), followed by Direct (179 users) and Google Organic (167 users). Other sources played a minor

role in overall traffic acquisition: Bing Organic (24 users), Amazon (12 users), Baidu Organic (3 users), Yahoo (2 users), and others (9 users).

In contrast, during Period 2 Direct Traffic became the main source (125 users), followed by Google Organic (95 users). Other sources displayed a smaller traffic: Baidu Organic (8 users), Bing Organic (5 users) and others (3 users). In Period 2 there were no users acquired from LinkedIn or other social media platforms.

For what concern the channels used to acquire users, since no other social media site produced traffic in Period 1, the data for organic social are attributed to LinkedIn.

Thus, the organic social channel reflects the traffic generated by LinkedIn during the LinkedIn campaigns with 268 users, followed by organic search (199 users), direct channel (179 users) and very few users from organic shopping (12 users) and referral (6 users). The organic social channel number of users suggests that LinkedIn campaigns have a big influence in attracting users.

In contrast, in Period 2 the direct channel was the most popular (125 users), followed by organic search (110 users). In addition, there was almost no activity from the referral channel (1 user) and no users at all from organic social. This again indicates a lack of social media engagement during this time period.

Switching to the duration of engagement for each channel, because organic social channel is made up of LinkedIn, with no other social media platforms, by concentrating on engagement within acquisition channels, it is possible to better understand LinkedIn involvement in user interaction and its efficacy as a way for increasing engagement.

In Period 1, organic social (represented by LinkedIn campaigns) had the longest engagement time of all channels (01:43 minutes). Thus, people from LinkedIn were more engaged and interacted with the site. In comparison, organic search had an engagement time of 00:43 minutes, while direct traffic of 00:11 minutes. Furthermore, referrals had an engagement time of 00:32 minutes, whilst other channels, such as organic shopping (00:00 minutes), show little or no activity over the period.

In Period 2, the engagement times follow a different pattern. Organic search had the longest engagement time (01:58 minutes), therefore people arrived via organic search demonstrate a significant degree of interest. Referral (00:19 minutes) display a lower level of engagement than Period 1, as well as direct channel (00:18 minutes).

To sum up, LinkedIn campaigns attracted highly engaged users in Period 1, whereas organic search is found to be the dominant source of high engagement in Period 2, thus even in the absence of LinkedIn advertising.

4.2.3 Traffic acquisition sources, acquisition channels, and time of engagement

Similarly, web traffic acquisition is analyzed considering sources, channels, and time of engagement.

Starting from traffic acquisition by source, a clear difference between Period 1 and Period 2 emerges. During Period 1 LinkedIn was the main source of traffic (304 sessions), thus being the main platform for boosting user engagement. In comparison, Google Organic traffic generated 259 sessions, and Direct Traffic 204. The other sources displayed not remarkable numbers: Bing organic (32), Amazon (12), Baidu organic (3), and Yahoo (3).

In Period 2, LinkedIn traffic dropped to zero (no running campaigns). Google Organic became the top source (171 sessions), followed by Direct traffic (131 sessions), Baidu organic (8 sessions), Bing organic (6 sessions), and Almalaurea (3 sessions). None of the number reached in Period 2 matched LinkedIn's influence in Period 1, demonstrating the key role of LinkedIn in increasing traffic during active campaign periods.

Switching to traffic acquisition by channel, 825 sessions have been found in the first period and only 327 in the second. Organic social was the main channel in Period 1, generating 304 sessions, and all were from LinkedIn campaigns. Organic search generated 296 sessions, whilst direct traffic displayed 204 sessions, showing that a significant number of users navigated directly to the website.

Organic shopping (12 sessions), referral traffic (8 sessions), and unassigned traffic (2 sessions) made little contributions.

In Period 2, organic search produced 188 sessions, direct traffic 131 sessions (thus less than in Period 1), referral traffic produced only 4 sessions, as well as unassigned traffic. Finally, organic social traffic has dropped to zero, remarking the need for LinkedIn ads to support this channel.

The analysis follows looking at the engagement time by channel in order to understand how users interact with the website depending on their traffic source and measuring LinkedIn's impact in driving not only traffic, but also meaningful user interactions.

In Period 1, organic social had an average engagement time of 01:04 minutes, indicating a reasonable amount of user interaction for sessions created by LinkedIn campaigns. Referral traffic had an engagement time of 00:51 minutes, direct traffic of 00:14 and organic search of 00:36.

This suggests that individuals entering via LinkedIn advertisements and referral links are fairly engaged with website content. Finally, organic shopping (00:00 minutes) and unassigned traffic (00:05 minutes) had low engagement.

When LinkedIn campaigns were absent (Period 2), organic search became the dominating channel (01:23 minutes), representing the highest engagement time for any channel in Period 1. This result indicates that individuals arrived via organic search were highly motivated and found the website's content relevant. Referral traffic maintained a relatively high engagement time of 01:05 minutes, whereas direct traffic and unassigned channels had shorter engagement times (00:16 minutes respectively), indicating that people entering from these sources were less inclined to engage with the website's content.

To sum up, LinkedIn has played a significant role in reaching a larger audience, accounting for the majority of visits in Period 1. The lack of LinkedIn advertising in Period 2 results in a significant drop in both traffic acquisition and users.

4.2.4 Landing Pages

The analysis of landing pages shows significant differences in user distribution and page interaction between the two periods. In Period 1, the English homepage was the most popular landing page (244 active users) and this demonstrates the importance of having a well-organized, clear and effective homepage for business use, allowing visitors to easily access key information and immediately understand the value proposition of the company. A well-structured homepage creates a positive first impression and facilitate navigation for business clients.

The rise in traffic in Period 1 can largely be connected to targeted LinkedIn ads in which specific products were advertised and each post included a direct link to the corresponding product page on the website. This confirms that technical material is central to the success of B2B websites.

In Period 2 traffic was more concentrated, with the English homepage as the most popular landing page, but with a reduced number of active users (175). Other landing pages experienced a significant drop in traffic compared to Period 1, particularly those related to specific products.

This collapse can be explained by the absence of LinkedIn campaigns in Period 2, so these technical web pages became less visible. Additionally, the distribution of visits was more limited in Period 2, with less than 10 users visiting the majority of subpages. The traffic difference between the two periods demonstrates the value of focused campaigns to guide B2B users to particular products.

Traffic to specific sponsored product pages demonstrates how LinkedIn advertising raised awareness of products related with the company. Furthermore, interest in specific pages about technical products implies that the audience considers the company as knowledgeable and committed to quality and innovation. Indeed, substantial engagement on the aforementioned landing pages demonstrates how customers link the brand with a reputation for competence and high-quality technical items.

4.2.5 Event counts

Event counts are used to determine the level of user engagement. Events are like button clicks, document downloads, and video views and provide information about user activity.

During Period 1, the total number of page views was 2,168, showing a significant volume of traffic and user exploration. User engagement, which evaluates interaction with the website's content, was also high, with 1,691 events recorded. Users were indeed actively participating on the site, as they scroll, click, and interact. Moreover, 820 sessions were begun within this time period, indicating that users are returning or that new people are engaging on a frequent basis. More specifically, 652 of these sessions are first-time visits. The amount of scroll events (580) indicates that users are interacting with the information, even if they do not necessarily click. The low click count (12) implies that may be clicks are not be appealing or clearly visible. Finally, file downloads (7) and form-starts (2) were less frequent.

In Period 2 there was a significant decrease in most event numbers. Page views fell to 903, user involvement to 709 events, number of sessions started to 323, with just 219 first-time visits recorded. This indicates a fall in campaign efficacy or the presence of factors that reduced user appeal. Scroll events also declined to 215 and the number of file downloads reduced to 4, while clicks slightly increased (13), as well as the number of form-starts (from 2 to 3), although both remained low.

Most events, including page views, user interaction, and session initiation, show a reduction in total activity between Period 1 and 2, indicating a drop in overall user interest and activity with the website. The main cause of this reduction is the lack of active campaigns on LinkedIn.

This result validates campaigns' capacity to raise brand awareness, attract new visitors, and enhance visibility. Furthermore, while event counts are more closely tied to new users, high engagement may signal the beginning of a stronger relationship with the business. The capacity to keep user interest may result in future return or loyalty behaviors.

4.2.6 Engagement metrics

Finally, engagement metrics are analyzed. They refer to three main ratios: the ratio of weekly active users (WAU) to total monthly active users (MAU), the ratio of daily active users (DAU) to total weekly active users, and users' stickiness calculated as the ratio between daily active users (DAU) and monthly active users (MAU).

In Period 1, the WAU/MAU ratio averaged 42.21%, indicating that 42.21% of monthly users accessed the website at least once each week. This value is classified as moderate/high engagement, and the website is appealing enough to keep people returning regularly, as 42.21% of all monthly users interact with the website at least once every week. In addition, the WAU/MAU ratio peaked at 62.5%, on May 2nd, at 52.7% on May 9th and at 51.4% on May 8th. These peaks means that users returned frequently.

For the DAU/WAU ratio, only 17.19% of users who visited the website at least once a week also use it every day, despite the fact that the user base interacts on a weekly basis (42.21% of WAU/MAU). This is probably because users are not required to access the website on a daily basis due to the nature of the product. On May 9th, the DAU/WAU peaked at 37.8%, and the same day a pick for the WAU/MAU ratio was also noticed.

The DAU/MAU ratio measures user engagement and return, thus how frequently daily active users interact with the total monthly active users. The average ratio for Period 1 was 6.97%. This percentage is pretty high for a B2B firm website, because roughly 7% of monthly users visit the website again every day, whilst typical value for this ratio is between 1-5%. Again, on May 9th the DAU/MAU ratio peaked to 19.9%, suggesting a strong daily interaction rate compared to the monthly user population.

Switching to the trends of these three ratios during Period 2, the first one (WAU/MAU) fell to an average of 23.44%, indicating a lower frequency of weekly activity than monthly active users. The

highest peak of WAU/MAU in period 2 occurred on August 29th (38.6%), a percentage that is much lower than the highest found in Period 1 (62.5%).

Finally, the average DAU/WAU ratio for Period 2 was 12.84%, suggesting that fewer users engaged with the site daily than they did weekly. This decrease is probably due to the absence of LinkedIn advertising efforts, with the consequence of a decrease in B2B user engagement and website return.

5. Concluding Remarks and managerial implications

The analysis provides an overview of the distribution of organic and sponsored data during the LinkedIn campaign period for three key performance indicators: impressions, clicks and engagement rate. Although sponsored content generated more impressions, the engagement rate was much higher for organic content (5%) than sponsored content (1%), suggesting that organic content might appear more authentic and/or relevant.

Multiple regression models were employed to understand the impact of clicks and impressions on the engagement rate for organic content (where clicks significantly influence engagement, while impressions have a slight negative effect) and for sponsored content (where both are significant, but with impressions having a stronger negative impact).

This confirms the idea that authenticity and strategic alignment are essential for successful digital marketing campaigns, and sponsored and organic content must complement one another.

Google Analytics analysis demonstrates that LinkedIn ads boosts user engagement and website traffic. LinkedIn's effectiveness in the B2B sector is demonstrated by the differences in website performance between Period 1 (active campaigns) and Period 2. Additionally, LinkedIn was identified as the primary driver of traffic and user acquisition. In Period 1, LinkedIn, as the only contributor to organic social traffic, resulted in a higher engagement times compared to other channels.

The most important management takeaway from this research is the importance of the use of LinkedIn to exchange content and advertise items. B2B marketers should consider a balanced strategy that incorporates both organic and sponsored content, with an emphasis on audience targeting to boost the effectiveness of paid ads. The ability to generate high-quality engagement on the website through targeted campaigns reflects the importance of the LinkedIn in communicating crucial concerns like sustainability and improving buying intention while decreasing perceived risk.

Finally, a well-designed website represents a valuable resource for information-seeking buyers, ensuring that contents are efficient and targeted to specific requirements. The synergy between social media platforms and websites improves the whole marketing strategy to maintain a strong competitive advantage in the market.

6. Limitations and future research

This analysis has limitations that should be considered when interpreting the findings.

First of all, we concentrate to LinkedIn advertising efforts, thus we do not make any comparison across platforms (e.g. Facebook, Instagram, and TikTok), which would be interesting for deepen the analysis in future research.

Furthermore, data cover a brief period of advertising activity, thus the duration of the campaigns should be increased in order to make a robustness check of the findings. The analysis is limited to a period of time (Periods 1 and 2) and this do not allow to catch the long-term benefits of LinkedIn advertisements on website's indicators. As B2B marketing strategies necessitate a long-term commitment to developing robust connections, future studies must consider a longer period of time.

In addition, generalizability of the results remains limited because the data came from customized LinkedIn ads that were directed at specific markets.

Moreover, other external factors such as market trends, competitor activity, and economic conditions are not included in the analysis.

Finally, results do not demonstrate causality, thus longitudinal data would be of great importance for future research in order to analyze lagged impacts and/or changes in behaviors over time.

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Track 11
Strategy & Governance

Promuovere l'uguaglianza di genere nelle organizzazioni complesse attraverso una governance partecipativa: risultati dell'indagine Mixed Method condotta presso l'Università degli Studi di Brescia

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Abstract

Framing of the research: L*a ricerca si colloca nel contesto degli istituti di ricerca e propone la governance partecipativa quale metodo per veicolare il cambiamento culturale nelle organizzazioni, necessario per realizzare la parità di genere.*

Purpose of the paper: *Due sono gli obiettivi principali. Il primo è dimostrare l'utilità di una governance partecipativa per favorire il cambiamento culturale verso l'uguaglianza di genere. Questo include l'utilizzo di un framework basato su tre elementi chiave: attori e ruoli, legittimazione e delega, e processo di partecipazione.*

Il secondo obiettivo è suggerire una metodologia per valutare l'introduzione di un Piano di Uguaglianza di Genere (GEP) nelle organizzazioni complesse, utilizzando interviste semistrutturate e questionari. La ricerca esplora come una cooperazione intensa top-down&bottom-up possa migliorare la capacità delle organizzazioni, tra cui le università, di integrare la prospettiva di genere.

Methodology: *La ricerca utilizza il Mixed Method Approach e sviluppa due indagini: una di carattere quantitativo, composta da questionari somministrati a docenti e personale tecnico amministrativo dell'università. La seconda di carattere qualitativo, basata su interviste semistrutturate rivolte a tutti gli interlocutori e interlocutrici, tra cui anche studenti. Per l'analisi dei risultati è stato scelto il Convergent Parallel Design, che permette di verificare se le due indagini producono risultati coerenti o divergenti.*

Results: *La valutazione complessiva ottenuta, che combina i due metodi di analisi, ha consentito di mettere in luce aspetti che con la sola analisi quantitativa, oppure qualitativa, non sarebbe stato possibile cogliere. Tale lavoro fornisce anche la base per proseguire nell'implementazione delle azioni del GEP in corso, ma soprattutto fornisce elementi necessari per costruire il successivo GEP 2025-2027.*

Research limitations: *La ricerca si basa su un solo caso studio e potrebbe essere ampliata grazie ad un confronto con altre realtà universitarie, possibilmente legate ad altri contesti istituzionali.*

Managerial implications: *L'indagine esamina l'applicazione della governance inclusiva per il cambiamento culturale nell'Università degli Studi di Brescia, attraverso strumenti come il Bilancio di Genere e il Gender Equality Plan. L'utilizzo del Convergent Parallel Design consente la raccolta simultanea di dati quantitativi e qualitativi, i cui risultati sono poi integrati nella fase finale della ricerca.*

Originality of the paper: *La presente ricerca, la prima nel suo genere, realizzata all'interno di una università, potrebbe avere un futuro sviluppo metodologico grazie all'impiego congiunto di tecniche quantitative.*

Key-words: *Governance partecipativa; Piani di Uguaglianza di Genere; Mixed Method Approach; Convergent Parallel Design*

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1. Introduzione

Nel 2015, l'Istituto Europeo per l'Uguaglianza di Genere (EIGE) ha creato e diffuso il GEAR (Gender Equality in Academia and Research), uno strumento pensato per combattere le disuguaglianze di genere all'interno delle istituzioni. Il GEAR proponeva una serie di azioni e strumenti che le università e le organizzazioni di ricerca potevano adottare per favorire il cambiamento verso la parità di genere (EIGE, 2017). Nel documento, l'EIGE sottolineava l'importanza del Piano per l'uguaglianza di genere (GEP), che nel corso degli anni è divenuto un elemento cruciale, tanto che nel 2021, con il lancio di HORIZON EUROPE, il programma di finanziamento europeo per la Ricerca, è stato reso obbligatorio per tutte le istituzioni di istruzione superiore e di ricerca presentare annualmente il Gender Equality Plan (GEP) e monitorare l'efficacia delle azioni poste in essere.

Secondo la Commissione Europea, il GEP rappresenta un insieme di azioni integrate, finalizzate a: individuare e correggere disuguaglianze e distorsioni di genere; promuovere soluzioni innovative per affrontare queste problematiche; definire obiettivi chiari e monitorare i miglioramenti attraverso indicatori adeguati. Il GEP si configura come uno strumento di pianificazione a lungo termine, mirato al miglioramento delle condizioni di vita delle persone coinvolte. Non si tratta di una semplice pianificazione, ma si propone di trasformare i processi, la cultura e le strutture organizzative, con un approccio di integrazione della prospettiva di genere. La Commissione Europea ha definito il "gender mainstreaming" come una strategia di "(ri)organizzazione, miglioramento, sviluppo e valutazione dei processi politici, in modo da includere una visione di uguaglianza di genere in tutte le politiche a ogni livello e fase" (Commissione Europea, 1996). Questo approccio, orizzontale e inclusivo, mira a riorganizzare i processi politici in modo che l'uguaglianza di genere non sia considerata un tema separato, ma un elemento centrale, applicato a tutte le politiche istituzionali, evitando di trattare le donne come una "categoria specifica".

L'analisi restituisce che affinché il GEP divenga efficace occorre che alla base della sua elaborazione ci sia un coinvolgimento reale della struttura organizzativa. Diversamente non si arriverà a un effettivo cambiamento, ed il rischio è che il processo si fermi a un piano teorico che fatica a prendere avvio, in quanto non supportato da una volontà effettiva e soprattutto da strumenti idonei all'attuazione.

In tal senso si inserisce la Governance partecipativa. Si tratta di un processo orientato ad un approccio alla gestione e alla decisione che coinvolge attivamente tutte le parti interessate della comunità nell'elaborazione delle politiche, nella pianificazione delle attività e nella presa di decisioni per l'organizzazione e che fonda il paradigma della Governance Inclusiva (Sacchetti, 2019).

La Governance Inclusiva sottolinea che per conseguire gli obiettivi strategici di un'istituzione è necessario avere sia una struttura che pratiche organizzative fondamentalmente basate sulla cultura partecipativa tra i portatori di interesse, proponendo così una visione più ampia rispetto ai metodi tradizionali di economia, che si concentrano principalmente sull'efficienza (Williamson, 1975). La letteratura ha posto in evidenza diverse esperienze di Governance Inclusiva in vari contesti e istituzioni (Sacchetti, 2019). Numerosi interventi sono stati registrati, in particolare nelle politiche di rigenerazione urbana e sociale, realizzati tramite processi di progettazione partecipata, nei quali i vari attori coinvolti hanno identificato e offerto soluzioni condivise per problemi complessi (Perkins e Zimmerman, 1995). In particolare, le istituzioni di origine cooperativa si sono distinte come le più propense ad adottare una Governance Inclusiva a livello strutturale, con stakeholders che partecipano ai consigli di amministrazione o sono presenti negli organi decisionali (Sacchetti, 2019; Pasinetti *et al.*, 2021).

Altri studi hanno esplorato la promozione della salute e la gestione dei servizi di carattere socio-sanitario, come lo studio condotto da Glenn Laverack (2012), che ha proposto un modello operativo chiamato *Parallel tracking* che integra i tradizionali processi di progettazione sanitaria con le necessità e le prospettive dei beneficiari. L'approccio distingue tra il controllo "top-down" (decisioni prese dalle istituzioni) e "bottom-up" (dove sono i beneficiari a indicare le loro esigenze).

2. Il processo di realizzazione della Governance Inclusiva: la Governance Partecipativa

La ricerca ha consentito di elaborare il prospetto seguente che promuove l'implementazione della governance inclusiva attraverso un processo di governance partecipativa che comprende tre elementi fondamentali: attori e ruoli; legittimazione e delega; processo di partecipazione (Tabella 1) (vedi Sacconi 1991; Laverack 2012; Buemi *et al.* 2015; Sacchetti e Tortia 2020; Bussu *et al.* 2022).

Tabella 1. Prospetto del processo di governance partecipativa per l'implementazione della governance inclusiva. (Elaborazione delle autrici).

Governance Partecipativa		
Attori e Ruoli	**Legittimazione e Delega**	**Processo di Partecipazione**
Promotore Direttore tecnico Facilitatore Representante degli stakeholders	Legittimazione dal "vertice" Delega mediante un atteggiamento diffuso di risoluzione dei problemi Coordinamento organizzativo	Condivisione delle informazioni Discussione costruttiva Coinvolgimento di tutti gli attori Integrazione di diversi punti di vista e soluzioni condivise

Fonte: nostra elaborazione

Per ciò che riguarda "**Attori e Ruoli**", nel processo possono essere inclusi differenti figure professionali, che caratterizzano i ruoli: il promotore/la promotrice (garante degli obiettivi), il coordinatore tecnico/la coordinatrice tecnica (responsabile dell'attuazione) e il facilitatore/la facilitatrice (terzo neutrale), oltre agli stakeholder che apportano contributi di carattere tecnico. La mappatura degli stakeholder è cruciale per il successo di un processo partecipativo, garantendo che tutte le voci rilevanti siano rappresentate. L'approccio deve essere inclusivo, analizzando attentamente il contesto e individuando gli attori da coinvolgere (Sacchetti, 2019). La partecipazione deve essere sentita da tutti i soggetti coinvolti, per risultare davvero efficace.

Per quanto riguarda "Legittimazione e Delega" gli aspetti gestionali ad esse collegati risultato essere cruciali per definire un processo di governance partecipativa. Da un lato, la legittimazione dall'alto da parte dell'organizzazione rende ufficiale il mandato (Laverack, 2012). Dall'altro lato, l'assunzione della delega per operare all'interno di un'organizzazione consente la creazione di processi partecipativi. Tali processi dovrebbero evitare un approccio di governance dall'alto verso il basso in cui i ruoli apicali sono i *decision maker* e invece spostarsi verso una capacità diffusa e condivisa di risoluzione dei problemi (Sacchetti 2019). In questo contesto, la figura delegata (ad esempio, il facilitatore/la facilitatrice) non risulta essere l'attore che deve risolvere il problema, ma è la figura delegata e legittimata che può creare le giuste condizioni organizzative per promuovere soluzioni e strategie concordate, sfruttando la co-responsabilità (Labonte 2002; Ison e Wallis 2017).

Per ultimo, ma non meno importante, il "**Processo di Partecipazione**" è l'attivazione di un processo strutturato, non spontaneo, in cui gli obiettivi e i risultati attesi sono chiaramente definiti, così come le fasi di lavoro, gli attori e i ruoli, i tempi e come avviene l'interazione (Newig *et al.* 2017). In questo modo, gli attori si ritiene possano contribuire in modo efficace.

3. La metodologia utilizzata: il Mixed method approach

Il Mixed Method Approach si basa sulla raccolta e sull'utilizzo di dati sia quantitativi che qualitativi (D'Allura e Bannò, 2022). La scelta di quale specifico Mixed Method applicare, risulta fondamentale per definire: quali dati hanno la priorità; se l'analisi deve essere concomitante o sequenziale; come mescolare le strategie. Per raccogliere, analizzare e interpretare i dati la letteratura identifica quattro disegni principali (Creswell e Plano Clark, 2011). Nella ricerca qui presentata è stato scelto il *Convergent Parallel Design*, che prevede raccolta e analisi di dati quantitativi e qualitativi, simultaneamente, mentre l'integrazione dei risultati ottenuti è prevista al termine della ricerca, nell'interpretazione generale dei dati.

Con questo metodo è possibile somministrare le stesse domande, sia in modalità qualitativa e quantitativa, a campioni differenti, con modalità di somministrazione idonee al campione (nel nostro caso sono stati scelti gli strumenti: questionario e intervista). Dopo aver raccolto entrambe le tipologie di dati separatamente, il percorso procede con la valutazione delle singole analisi (quantitativa e qualitativa).

Nell'ultimo step i dati della ricerca sono confrontati e integrati grazie alla loro interpretazione congiunta (D'Allura e Bannò, 2022). Per un'idonea interpretazione finale dei dati è necessario cercare somiglianze/convergenze e giustificare le discrepanze, individuando, se esistenti, le limitazioni dello studio.

La peculiarità del *Convergent Parallel Design* può essere data da una comprensione più ampia dei dati raccolti, oppure una ulteriore conferma dei risultati ottenuti con una delle due tipologie di analisi o, ancora, per confrontare più livelli di analisi all'interno dello stesso sistema (Picci, 2012).

Il dato in sé si presta ad essere letto secondo diverse angolazioni. La comparazione del dato numerico con le informazioni raccolte mediante un confronto dialettico fanno si che l'informazione assuma profondità e spessore. In sintesi, il metodo qualitativo rende espliciti alcuni aspetti che il dato quantitativo non rivela.

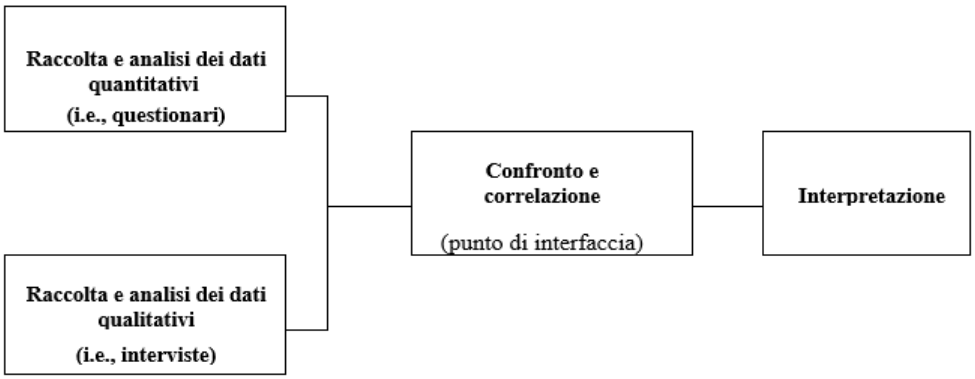

Figura 1: Design parallelo convergente. (Elaborazione degli autori da Creswell e Plano Clark, 2011)

4. Analisi empirica: Il caso del GEP dell'Università degli studi di Brescia

In linea con le politiche internazionali, tutte le istituzioni pubbliche italiane sono chiamate a pianificare strategie e misure per aumentare l'uguaglianza di genere, compresa l'introduzione del GEP. Se consideriamo specificamente il contesto accademico italiano, l'uguaglianza di genere è un tema di grande interesse anche per le università. Il caso di studio oggetto della ricerca riguarda l'Università degli Studi di Brescia. Le pari opportunità rappresentano una questione cruciale per ogni organizzazione di carattere pubblico e privato, in ambito industriale, dei servizi e della ricerca e dovrebbero apparire nei loro statuti come principio generale. In particolare, per le università, la Conferenza dei Rettori delle Università Italiane (CRUI) nel 2019 ha pubblicato le linee guida funzionali all'adozione del Bilancio di genere. Nel 2021 l'Unione Europea ha reso obbligatoria l'adozione del Gender Equality Plan (GEP) per tutti gli enti di ricerca pubblici e privati che si candidano a riceve contributi europei. Il GEP è un piano triennale e consiste nelle seguenti aree di interesse: equilibrio tra vita lavorativa e privata; ruoli politici e carriere accademiche; ricerca e insegnamento di genere; contrasto alla violenza.

L'Università di Brescia ha una valida esperienza in materia di uguaglianza di genere, GEP e bilancio di genere, e si avvale di un numero crescente di uffici e strumenti per l'uguaglianza di genere: il Comitato interno per l'uguaglianza (CUG); la Consigliera di Fiducia, titolata a perseguire forme di discriminazione diretta o indiretta, molestie sessuali, violenza fisica o psicologica e mobbing; nel novembre 2019, è stato creato il Centro di Ricerca LOG (Laboratorio Osservatorio studi di Genere), un laboratorio e osservatorio sugli studi di genere. Inoltre, in linea con il Bilancio di Genere pubblicato nel 2021, l'Ateneo ha implementato il suo primo Piano di Uguaglianza di Genere 2022-2024. Infine, l'Università degli Studi di Brescia fa parte del consorzio del Progetto "Budget-it" e guida la raccolta dati. Con un personale accademico (professori, tecnici e amministrativi) di circa mille persone, si considera l'Università di Brescia un oggetto appropriato per la nostra analisi. Il caso di studio ci consente di proporre strumenti funzionali per misurare se il metodo di governance partecipativa adottato un anno dopo l'implementazione del GEP sia efficace o se debba essere modificato per assicurarsi di arrivare alla fine del piano triennale con il raggiungimento dei risultati attesi.

4.1 Indagine quantitativa

Per l'indagine quantitativa sono stati strutturati due questionari:

1) **il questionario GEAM** - somministrato a Brescia e nelle altre 4 università partner del progetto "Budget.it" nel periodo ottobre-novembre 2023.

Esso è composto da circa 80 domande, di cui le prime 10 danno contezza del profilo anagrafico e del ruolo svolto all'interno dell'Università dalla persona rispondente. Le successive domande sono divise per Aree e contemplano più aspetti del benessere della persona che vive quotidianamente l'università.

Nel caso specifico dell'Università degli Studi di Brescia, è stato chiesto al responsabile europeo del coordinamento GEAM di inserire al suo interno una batteria di domande (i.e., SEZ 15) denominata "Metodo utilizzato: Valutazione del percorso che ha condotto l'Ateneo alla scrittura e all'approvazione del Bilancio di Genere e del GEP dell'Università degli Studi di Brescia" che ha l'obiettivo di raccogliere le opinioni dei partecipanti circa:

- la conoscenza degli strumenti Bilancio di Genere e Gender Equality Plan relativi al periodo 2022-2024
- la valutazione delle azioni in corso
- il grado di importanza che queste azioni assumono per l'Ateneo.

Di seguito i primi aspetti generali che definiscono la cornice entro cui collocare la raccolta dati. Del totale delle persone che hanno risposto al questionario dell'Università degli Studi di Brescia (262) le persone che hanno deciso di rispondere a questa batteria di domande sono state 151, pari al 57,63% del totale. Non tutte le persone hanno risposto a tutte le domande (risposte in media pari a circa il 50% del totale) e la distribuzione in percentuale è a favore delle donne (65% donne e 35% uomini).

In numeri assoluti:

- Donne: 93 (61,59%)
- Uomini: 56 (37,09%)
- Persona non binaria: 1 (0,66%)
- Persona che preferisce non dichiarare: 1 (0,66%).

Rispetto alla fascia d'età le persone si dividono in:

- Età 20-40 28 persone: 20 donne / 8 uomini
- Età 41-55 73 persone: 45 donne / 1 persona non binaria / 27 uomini
- Età 56-70 50 persone: 28 donne / 1 persona preferisce non dichiarare / 21 uomini

Del totale partecipanti hanno risposto:

- 61 persone del corpo accademico (pari al 40,4%);
- 90 persone che afferiscono al personale tecnico amministrativo (pari al 59,6%).

2) **Il questionario dedicato agli stakeholder** ha coinvolto 110 persone che rivestono o hanno rivestito nei 3 anni precedenti ruoli istituzionali all'interno dell'Ateneo, durante la scrittura e nel corso della realizzazione del Bilancio di Genere e del Gender Equality Plan. Il questionario ha richiesto la compilazione di una sessione anagrafica con alcuni dati simili al questionario precedente, anche se si è dovuto semplificare per garantire l'anonimato rispetto alla compilazione. Sono stati chiesti preliminarmente i seguenti dati:

- la fascia d'età;
- il genere;
- il ruolo suddiviso per: docente o ricercatore; Personale tecnico amministrativo; studente
- il dipartimento di afferenza: medicina; Ingegneria; Economia; Giurisprudenza.

Di seguito i primi dati generali emersi: del totale delle persone invitate a rispondere, pari a 110 (n. 69 donne e n. 41 uomini), le persone che hanno risposto al questionario sono state 49, pari al 44,54% del totale.

In numeri assoluti:

- n.33 donne (67,34 %)
- n.16 uomini (32,65%).
- Nessuna persona ha scelto di definirsi persona non binaria.

Rispetto alla fascia d'età le persone che hanno partecipato si dividono in:

- Età 20-40 7 persone, tutte donne, pari al 14,28%
- Età 41-55 16 persone: 9 donne / 7 uomini pari al 32,65%
- Età 56-70 26 persone: 19 donne / 7 uomini pari al 53,06%

Del totale partecipanti hanno risposto

- n.21 accademici
- n.28 personale tecnico amministrativo;
- nessuno studente ha deciso di partecipare all'indagine, nonostante fossero stati invitati a partecipare n. 3 studenti, rappresentanti della categoria e nominati all'interno di organi dell'Ateneo.

Per i questionari è stata utilizzata la Scala Likert 1-5 (da 1 per nulla d'accordo a 5 molto d'accordo).

Esiti dei due questionari

Emergono dalle analisi delle risposte alcuni aspetti di coerenza, tra cui:

- Una buona percentuale, pari al 20% e 22% di chi ha partecipato all'indagine Quest. 1 contempla la possibilità di partecipare alla stesura e/o alla realizzazione dei prossimi Bilancio di Genere e GEP.

Per quanto riguarda gli stakeholder Quest. 2, le risposte positive (liv 4 e 5) sono pari al 26%.

Le risposte ai due questionari mettono in luce che il tema è di interesse sia per chi vive quotidianamente l'università, sia per tutti gli interlocutori che ricoprono ruoli istituzionali all'interno dell'Ateneo.

- Dal punto di vista della valutazione delle persone che hanno in carico la realizzazione del GEP, viene espresso un parere favorevole rispetto al loro operato e alle competenze.
- Rispetto al tema delle Resistenze di carattere gerarchico emergono risposte distribuite su tutti i livelli, in particolare sul livello 3, che intercetta le preferenze del 40% delle risposte del Quest. 1 e 34% delle risposte del Quest. 2. Per quanto riguarda le resistenze di carattere organizzativo, emergono risposte che reputano non significativo questo rischio.
- Per quanto riguarda l'efficacia delle azioni emerge una coerenza delle risposte, un "cauto ottimismo", che fa convergere le risposte al livello 3 e successivi.
- Le risposte esprimono un grado di soddisfazione elevato da parte delle persone che hanno partecipato alla stesura e/o che stanno partecipando alla realizzazione delle azioni del GEP.
- Per quanto riguarda il coinvolgimento della Governance di Ateneo in entrambi i questionari emerge un risultato positivo, più positivo il Quest. 2 rispetto al Quest. 1, dovuto probabilmente all'appartenenza dei rispondenti del Quest. 2 a questa categoria.

Si segnala un ultimo aspetto emerso nelle risposte alle domande aperte.

Le università si contraddistinguono da altri enti pubblici in quanto sono enti autonomi per ciò che riguarda l'elezione della propria governance, e differiscono da altre organizzazioni di carattere pubblico o privato, in quanto al loro interno sono composte da due organigrammi di carattere gestionale con struttura gerarchica definita: il corpo docente ed il personale tecnico amministrativo.

In termini di istituzione, la cifra caratteristica dell'università è la distinzione interna di categorie e ruoli. Non si tratta soltanto di potere di carattere politico, ma di presunta conoscenza della materia, in quanto persona appartenente al corpo accademico. Esiste ed emerge dalle domande sopra citate una barriera invisibile tra personale tecnico amministrativo e personale accademico, caratterizzata da asimmetrie gerarchiche non scritte, tali per cui il tema della partecipazione al cambiamento risulta più frammentato, si fatica a sentirsi un'unica squadra. Tale dimensione si tramuta in una sorta di resistenza involontaria ai processi di cambiamento, caratteristica dell'ambiente universitario.

Si propone di seguito una tabella comparativa che consente di contrapporre i due questionari, in termini di domande simili e di punteggi ottenuti.

Tabella 2. Comparazione domande e relativi risultati presenti nei Questionari 1 e 2, espressi in %

Qu.	**Dom**	**testo domande**	**punteggio**
Qu 1	D 16 e D 18	Hai partecipato alla stesura del Bilancio di Genere o del GEP? Se hai risposto no: -Sei interessata/o a partecipare ai prossimi lavori di stesura del Bilancio di Genere? -Sei interessata/o a partecipare ai prossimi lavori di stesura del GEP?	No 80% SI 20% No 78% Si 22%
Qu 2	D 6	Il tema mi interessa, non escludo la mia candidatura alla partecipazione al prossimo GEP 2025-2027	liv 1 30% liv 2 19% liv 3 25% liv 4 14% liv 5 12%
Rispetto al Qu 1, le domande 16 e 18 hanno dato risultati molto simili. La risposta alla Domanda 6 del Qu 2 fa emergere che gli stakeholder che rivestono ruoli istituzionali sono allineati al quest 1 circa l'interesse ad un coinvolgimento/partecipazione futuri (Liv 4 e 5 pari a 26%).			
Emerge che le persone interessate a partecipare alla stesura del GEP sono circa il 22-26% (1/4 dei partecipanti)			
Qu 1	D 19	Ciò che sta accadendo è importante	liv 1 e 2 17% liv 3 33% liv 4 e 5 50%
Qu 2	D 2 e D 7	Il tema mi è parso lontano dalle tematiche di cui mi occupo Il tema non mi interessa	liv 1 e 2 43% liv 3 24% liv 4 e 5 33% liv 1 e 2 65% liv 3 12% liv 4 e 5 23%

Emerge dalla risposta alla Domanda 19 del Qu 1 una valutazione positiva rispetto a ciò che sta accadendo, e risulta coerente con le risposte alle Domande 2 e 7 che vedono risposte positive nei livelli 1 e 2.			
Emerge che per la maggioranza delle persone che hanno risposto il cambiamento in atto è importante			
Qu 2	D 20 e D 21	-Ritengo che le figure delegate a condurre la stesura e la realizzazione del GEP interpretino il ruolo in modo adeguato -Ritengo che le figure delegate a condurre la stesura e la realizzazione del GEP siano in grado di creare le condizioni organizzative adatte a promuovere soluzioni e strategie concertate, facendo leva sulla co-responsabilità	liv 1 e 2 4% liv 3 36% liv 4 e 5 60% liv 1 e 2 4% liv 3 44% liv 4 e 5 52%
Le domande indagano circa le competenze delle figure che coordinano le azioni del GEP, e hanno significato in quanto il questionario garantisce l'anonimato. Emerge una valutazione sostanzialmente positiva			
Emerge che la maggioranza delle persone che hanno risposto reputa le persone incaricate competenti			
Qu 2	D 18 e D 19	-Ritengo che la legittimazione da parte della governance e la presenza del delegato del Rettore nella stesura del GEP siano stati elementi sufficienti per rendere pubblico l'incarico e legittimare il mandato -Ritengo che la governance dell'Università sia sufficientemente coinvolta nella realizzazione delle azioni volte a ridurre la parità di genere	liv 1 e 2 33% liv 3 0 liv 4 e 5 67% liv 1 e 2 24% liv 3 32% liv 4 e 5 44%
Queste due domande del Quest 2 mostrano risposte date da due gruppi: D18 posta a coloro che hanno partecipato alla stesura /realizzaz del Gep (n.6 persone che hanno risposto), mentre la D19 a tutti gli stakeholders che hanno deciso di rispondere (n.25 persone). Emerge un dato inferiore da parte di chi non ha partecipato.			
Emerge un dato non univoco. Chi ha partecipato alla stesura del GEP ritiene la governance sufficientemente ingaggiata. Chi non ha partecipato distribuisce la propria preferenza il modo quasi equilibrato sulle tre fasce (leggermente più sbilanciato sui livelli 4-5 che non su 1-2)			
Qu 1	D 8	-Resistenze (interne e/o esterne) ostacoleranno l'attuazione del GEP	liv 1 e 2 27% liv 3 40% liv 4 e 5 33%
Qu 2	D 22 e D 23	-Ritengo che la realizzazione del GEP ad oggi in corso sia stata rallentata o frenata da resistenze di carattere gerarchico -Ritengo che la realizzazione del GEP ad oggi in corso sia stata rallentata o frenata da resistenze di carattere organizzativo	liv 1 e 2 35% liv 3 35% liv 4 e 5 30% liv 1 e 2 33% liv 3 42% liv 4 e 5 25%
Rispetto a queste domande, molto legate alla percezione delle persone che hanno risposto, c'è una distribuzione su tutti i livelli, sia per le persone che vivono quotidianamente l'università, sia per gli stakeholder che hanno ruoli istituzionali. Il dato più positivo che emerge riguarda resistenze di carattere organizzativo, che registrano un dato pari al 25% nei livelli 4 e 5 (Qu 2 D 23).			
Rispetto alle resistenze emergono risposte molto coerenti fra i due questionari, le risposte risultano distribuite su tutti i livelli, in particolare sul livello 3.			
Qu 1	D 13 D 21	-Le attività svolte sono funzionali/efficaci alla parità di genere -Il metodo utilizzato finora è stato efficace	liv 1 e 2 30% liv 3 33% liv 4 e 5 37% liv 1 e 2 30% liv 3 50% liv 4 e 5 20%
Qu 2	D da 9 a 17	Risposte di coloro che hanno partecipato alla stesura / realizzazione del GEP rispetto alla coerenza delle azioni	media sup a 4. liv 4 e 5 90%
Rispetto a queste domande emerge dal Qu 2 una valutazione molto positiva di coloro che hanno partecipato alla stesura e realizzazione del GEP. Per i partecipanti al Qu 1 D 13 e D 21 si nota una distribuzione equilibrata su tutti i livelli, segno che a distanza di circa 18 /24 mesi dall'avvio non emerge un cambiamento significativo.			
Per quanto riguarda l'efficacia delle azioni emerge un parere molto positivo da parte di chi ha partecipato alla stesura e all'attuazione, mentre per coloro che non hanno partecipato emerge un "cauto ottimismo", che fa convergere le risposte al livello 3 e successivi			
Qu 1	D 22	-La Governance di Ateneo è stata coinvolta nella misura corretta	liv 1 e 2 15% liv 3 56% liv 4 e 5 28%
Qu 2	D 19	-Ritengo che la Governance dell'Università sia sufficientemente coinvolta nella realizzazione delle azioni volte a promuovere la parità di genere	liv 1 e 2 24% liv 3 32% liv 4 e 5 44%
Le risposte alle due domande mostrano una % pari a 3 o superiore molto simile 84% Qu 1 e 76% Qu 2, anche se nei livelli 4-5 il Qu 1 è meno positivo rispetto al Quest 2 (44%)			
Rispetto al coinvolgimento della governance di ateneo emerge un risultato sostanzialmente positivo, anche se più positivo del gruppo di stakeholders rispetto alla platea più ampia.			

4.2 Analisi qualitativa: Interviste semi-strutturate

A maggio 2024 è stata avviata l'indagine qualitativa, che si è concretizzata con la predisposizione di un'intervista semi-strutturata somministrata ad alcune persone scelte in base al ruolo ricoperto all'interno dell'Università degli Studi di Brescia.

Di seguito sono state individuate le seguenti persone, reputare rappresentative di un campione significativo all'interno dell'ateneo: Direttrice Generale, con nomina avvenuta a maggio 2024, già Dirigente Area Statistica, e dipendente dell'università da circa 20 anni; Garante degli Studenti con nomina da parte del Senato accademico a novembre 2023, laurea in sociologia, ampia esperienza in tematiche di genere e docente presso un'altra università italiana; Responsabile dell'Area Risorse Umane dell'Università, già dirigente dell'Area Appalti Pubblici, e dipendente dell'università da più di 30 anni; Componente del Senato Accademico, docente da oltre 20 anni presso l'Università di Brescia; Presidente della Commissione Genere dell'università di Brescia, con nomina avvenuta a novembre 2022 da parte del precedente Rettore, insieme alle/ai componenti di questo organo istituito con l'avvio del GEP; Delegat* del Rettore ai Rapporti con il territorio, con delega anche del Rettore precedente, docente da oltre 10 anni presso l'Università di Brescia; Delegat* del Rettore alle Risorse Umane, già Presidente del CUG dell'università e docente da più di 20 anni presso lo stesso ateneo; n.3 studenti che si sono resi disponibili ad esprimere il loro parere attraverso l'intervista e che rivestono ruoli di rappresentanza all'interno dell'università. I tre studenti sono uno di genere maschile, uno di genere femminile, e uno studente che ha richiesto di intraprendere la carriera Alias e che però ha chiesto di essere identificato nell'ambito del genere maschile, per garantire l'anonimato nelle risposte. A seguire uno schema che rappresenta le caratteristiche di coloro che hanno partecipato all'indagine

Tabella 3 Composizione persone che hanno partecipato all'indagine qualitativa

cod	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
genere	donna	uomo	uomo	uomo	donna	donna	donna	donna	donna	uomo
categ	studente	studente	studente	pta	pta	docente	docente	docente	docente	docente
fascia età	20-40	20-40	20-40	56-70	41-55	56-70	56-70	41-55	56-70	56-70
ruolo	rappr stud	rappr stud	rappr stud	area RU	area Gov	membr Sen	area Gov	area Gov	area Gov	area Gov

Le domande sono state poste a seguito di una breve presentazione della ricerca, delle tematiche, e del metodo utilizzato.

La rielaborazione dei risultati è avvenuta in base alla fascia d'età, al ruolo e al genere ed ha garantito la lettura del dato per categorie di intervistati.

Alcune domande hanno richiesto la valutazione in base alla scala Likert 1-5 già utilizzata per l'indagine di carattere quantitativo, mentre alcune domande hanno richiesto agli intervistati un parere di merito.

Durante l'intervista è stato anche chiesto se le persone avessero risposto ai due questionari (oggetto di analisi quantitativa) ed è emerso che soltanto 1 persona su 10 aveva letto le email ricevute relative ai questionari ed aveva risposto ad uno di essi.

Le domande somministrate ripercorrono in sintesi i quesiti già posti ad un pubblico più ampio nel questionario GEAM e ritenuti di maggiore significato, esplicitando fin da subito gli obiettivi delle domande.

Gli obiettivi esplicitati sono stati: se gli stakeholder di ateneo non hanno partecipato; perché non lo hanno fatto. Se hanno partecipato: qual è la loro opinione circa il processo; se è stato inclusivo e ha portato ad un risultato reputato corretto.

A seguire per tutti/e alcune domande che hanno richiesto una valutazione rispetto al loro punto di osservazione.

Esiti dell'analisi qualitativa

L'indagine di carattere qualitativo è stata condotta nell'arco di circa 2 mesi.

Nonostante il tempo non breve dell'intervista - in media circa 1 ora (da 45 a 1 ora e 15 minuti) e le 20 domande, che potevano sembrare ripetitive, e che hanno comportato spesso una rilettura e una contestualizzazione, le persone intervistate si sono dimostrate desiderose di portare il proprio punto di vista. Le categorie a cui si è fatto riferimento sono state: fascia d'età; genere; ruolo svolto all'interno dell'università. Di seguito un commento relativo alle categorie.

Per quanto attiene la fascia d'età le persone più giovani (20-40 anni) sono risultate più ottimiste rispetto alla possibilità di promuovere un percorso verso la parità di genere. Emerge l'opinione di un clima sereno

interno all'università, sia tra pari, sia nei confronti dei docenti. Per quanto riguarda il genere il campione ha previsto una componente maschile (4 persone) ed una componente femminile (6 persone); le risposte ricevute non hanno riscontrato particolari differenze rispetto a questa categoria.

Nelle risposte relative alle resistenze si è invece colta una differenza rispetto al ruolo svolto all'interno dell'ateneo; in alcune domande la componente del personale tecnico amministrativo che gestisce l'ateneo ha dato risposte simili, divergenti rispetto ad altri ruoli (ad esempio gli studenti). Emerge un pensiero, soprattutto dei due studenti di genere maschile, che chiedono di portare il tema su più tavoli di discussione; di creare occasioni; dibattiti; eventi culturali che diano la possibilità di parlarne di più, in quanto non parlarne significa "dare per scontato" qualcosa che invece non è.

Si evince dall'indagine svolta che la promozione della parità di genere all'interno delle organizzazioni è tema trasversale, tocca moltissimi ambiti, ma il rischio che venga bypassato in quanto considerato non di rilievo è realistico. La possibilità di confrontarsi su tale tema con persone che sono demandate a compiere quotidianamente scelte strategiche nell'ambito del loro lavoro, e che siedono a tavoli di consultazione con ruoli decisionali, consente di acquisire pareri, che nel medio e lungo periodo diverranno strategie su cui saranno costruite le azioni del prossimo Gender Equality Plan.

La ricerca di carattere qualitativo portata a termine dimostra che la possibilità di poter discutere di queste tematiche, la collaborazione tra ruoli e ambiti differenti, la consultazione top-down e bottom-up, diventano effettivamente strumenti per favorire un auspicato aumento della conoscenza, tema affrontato nel Capitolo primo, e che soprattutto ne promuovono la sua socializzazione, affinché le persone possano beneficiare ed acquisire le competenze esperienziali di coloro che partecipano.

4.3 Comparazione dei risultati ottenuti

Di seguito viene presentata una comparazione delle due indagini, suddivise per temi principali.

La prima indagine, di natura quantitativa, si basa su questionari somministrati a diverse tipologie di interlocutori, mentre la seconda, di natura qualitativa, è costituita da interviste semistrutturate. In conclusione, l'approccio metodologico adottato non solo ha verificato che le due indagini portano a risultati concordanti, ma ha permesso di esplorare anche le ragioni delle poche differenze trovate, contribuendo a una comprensione più profonda e sfaccettata del cambiamento culturale verso l'uguaglianza di genere all'interno dell'Università degli Studi di Brescia.

A seguire i risultati comparati nel dettaglio.

Valutazione del percorso che ha portato l'Università a redazione e approvazione del GEP:

Analisi quantitativa: Valutazione molto positiva delle persone che hanno partecipato alla stesura del GEP - Qu 2 Domande da 9 a 17: il 90% ha espresso una preferenza pari a 4 o 5.

Analisi qualitativa: Valutazione molto positiva delle persone che hanno partecipato, mediante le risposte ottenute alle Domande 7a - 7b - 7c: preferenze pari a 4 e 5;

parere convergente.

Importanza del tema e al cambiamento culturale in atto:

Analisi quantitativa: nel Qu 1 Domanda 19 sono state espresse delle preferenze per il liv 4 e 5 pari al 50% e per il liv 3 pari a 33%. Nel Qu 2 Domande 2 e 7 le preferenze espresse a favore dell'interesse per il tema risultano essere pari al 65%.

Analisi qualitativa: Le domande della batteria 6 hanno indagato rispetto all'importanza del cambiamento culturale in atto. Le persone che hanno risposto, pur non avendo partecipato, hanno espresso tutti la preferenza per il liv 1 alla domanda 6e;

parere convergente.

Volontà di partecipazione alla stesura del prossimo GEP:

Analisi quantitativa: Dalle risposte date nel Qu 1 - Domande 16 e 18, nel Qu 2 - Domanda 6 emerge che 1 persona su 4 potrebbe prendere in considerazione la propria partecipazione alla stesura del prossimo GEP.

Analisi qualitativa: Rispetto agli intervistati che non hanno partecipato, l'ipotesi di partecipazione futura è contemplata da tutti coloro che hanno risposto (Domanda 6d).

Si evince dalle risposte alle due tipologie di indagine un parere convergente, più esplicito per coloro che fanno parte della governance o che sono rappresentanti di un organo istituzionale dell'università.

Grado di competenza delle figure che hanno in carico la realizzazione del GEP, interpretazione corretta del ruolo, capacità di coinvolgimento:

Analisi quantitativa: Valutazione molto positiva rispetto alle figure incaricate - Qu 2 Domande 20 e 21: preferenze espresse per i liv 4 e 5 pari a circa 55%

Analisi qualitativa: valutazioni molto positive - preferenze espresse con una media pari a 4,44 e 4,14 delle domande 9 e 10; parere convergente.

Efficacia delle azioni poste in essere e del metodo:

Analisi quantitativa: Le preferenze date durante la somministrazione del Qu 1 Domanda 13 e 21(risultati ottenuti liv 4 e 5 pari al 37%). Durante la raccolta dati del Qu 2 le domande da 9 a 17, somministrate a coloro che hanno partecipato alla stesura e alla realizzazione del GEP ha prodotto risultati molto elevati, dimostrando che chi ha collaborato ritiene che il risultato del lavoro svolto sia stato efficace.

Analisi qualitativa: Durante le interviste, emerge una valutazione molto positiva rispetto all'utilità del GEP per portare un cambiamento (risposte alla Domanda 4d); emerge una valutazione critica rispetto alle azioni effettivamente realizzate fino ad oggi (Domanda 4h, media delle risposte pari a 3,17) in quanto alcune persone sottolineano che, insieme ad azioni di formazione e di comunicazione, occorre intraprendere anche azioni di carattere strutturale, che abbiano ripercussioni di medio lungo periodo, che fruiscano della normativa già presente, che però non viene attuata. Si veda anche le risposte alla Domanda 15; parere convergente.

Coinvolgimento della governance circa la parità di genere:

Analisi quantitativa: le preferenze espresse nel Qu 1 - Domanda 22 e nel Qu 2 - Domanda 19 restituiscono dei dati più positivi dal questionario Stakeholder (liv 4 e 5 44% e liv 3 32%) mentre il Qu 1 somministrato a tutte le persone che lavorano presso l'università esprimono una percentuale pari a 56% per il liv 3 e al 28% per i liv 4 e 5.

Analisi qualitativa: Dalle interviste emerge che, alla Domanda 8 - le risposte si attestano in media a 3,33. Da questa risposta emerge un parere non del tutto positivo circa il coinvolgimento della *governance.* Alcune persone intervistate dichiarano che non c'è stato un pieno coinvolgimento. Le figure apicali hanno dato risposta positiva, dichiarando che si sentono ingaggiate in questo percorso di cambiamento, mentre due docenti ed uno studente hanno dato preferenza pari a 2, dichiarando che la loro percezione è di poco coinvolgimento; parere convergente.

Possibile presenza di resistenze di carattere gerarchico oppure organizzativo:

Analisi quantitativa: i risultati ottenuti alla Domanda 8 del Qu 1 e alle domande 22 e 23 del Qu 2 restituiscono un parere che sceglie il liv 3 (in ordine: 40%, 35% e 42%), e che distribuisce le risposte omogeneamente su tutti i livelli.

Analisi qualitativa: durante le interviste in molti hanno dato una risposta che contempla la possibilità di dover affrontare delle resistenze. Alla Domanda 4c le persone intervistate hanno risposto con una media pari a 3,63. Alle Domande 11 e 12 specifiche per gli aspetti di resistenze gerarchiche o organizzative, le persone intervistate hanno dato risposte con una media pari a 3,75 e 3,44; parere convergente.

Valutazione relativa alla costituzione di un gruppo di "agenti di cambiamento":

Analisi quantitativa: Rispetto ai questionari, questo tema è stato trattato nel Qu 2 Domande 24 e 25. Le risposte ottenute hanno restituito una media pari al 4,24, quindi molto elevata. Rispetto a come poter creare questo gruppo non sono però state fornite delle risposte utili.

Analisi qualitativa: Le risposte alla Domanda 13 esprimono da parte di tutte le persone intervistate un accordo, circa la possibilità di dare vita ad un gruppo di agenti di cambiamento, che possano creare momenti di confronto e diffondere azioni positive e propulsive del cambiamento; parere convergente.

Infografica Processo di governance partecipativa per l'implementazione della governance inclusiva (Elab. Chiara Leggerini).

5. Conclusioni

L'obiettivo della ricerca condotta è stato verificare se nell'ambito del cambiamento culturale in atto, relativo alla promozione della parità di genere all'interno di un'organizzazione, e nel nostro caso abbiamo scelto le università, la governance inclusiva possa essere lo strumento adeguato per guidare l'organizzazione ad un cambiamento di lungo periodo. Gli strumenti di cui si è dotata l'università sono il Bilancio di Genere e il Gender Equality Plan.

Il metodo utilizzato per condurre la ricerca è stato il Mixed Method Approach, ossia una raccolta e analisi dei dati sia di carattere quantitativo sia di carattere qualitativo, per poi confrontare i risultati dell'analisi dei due metodi e verificarne gli esiti rispetto a coerenza o divergenza.

Tutto ciò per giungere a definire:

- se le azioni generate dopo circa 18-24 mesi dall'avvio del GEP hanno generato dei risultati efficaci;
- se gli elementi alla base del processo di governance sono stati posti in essere: attori e ruoli coinvolti; legittimazione e processo di delega presenti; processo di partecipazione;
- se il percorso che ha portato alla redazione e all'attuazione delle azioni del GEP è coordinato da una governance in grado di valorizzare le risorse disponibili.

Per condurre la ricerca è stato scelto come caso studio l'Università degli Studi di Brescia e sono stati strutturati tre strumenti di indagine: due questionari (indagine quantitativa) e un'intervista semi-strutturata (indagine qualitativa), invitando a rispondere:

- per il primo questionario tutto il personale docente e tecnico amministrativo;
- per il secondo questionario le figure che dal punto di vista istituzionale hanno ricoperto incarichi negli ultimi tre anni (studenti / docenti / personale tecnico amministrativo);
- infine per le interviste sono stati scelti 10 stakeholder rappresentativi dell'Ateneo, con cui è stata condotta un'intervista che ha previsto alcune domande coerenti con le precedenti.

L'esito dell'analisi delle risposte delle due tipologie di indagini, comparate sulla base dei temi chiave indagati, tracciano un percorso parallelo convergente.

L'analisi restituisce un quadro sostanzialmente positivo, maturo e pronto a mettere in atto un cambiamento culturale di medio/lungo periodo. Le preferenze espresse esprimono una volontà di partecipazione, anche se manca ancora la piena attuazione di azioni di carattere strategico che rendano il cambiamento istituzionalizzato.

Emerge anche la volontà di confrontarsi su questi temi, e di analizzarne alcuni ambiti, sia all'interno che all'esterno dell'università; di invitare chi abita l'Ateneo a parlarne, ad avviare dibattiti, tutto ciò per promuovere il cambiamento e per favorire lo sviluppo del pensiero critico.

La valutazione complessiva ottenuta, che combina i due metodi di analisi, realizzati in parallelo secondo il *Convergent Parallel Design*, ha consentito di mettere in luce aspetti che con la sola analisi quantitativa, oppure qualitativa, non sarebbe stato possibile cogliere. Tale lavoro fornisce anche la base per proseguire nell'implementazione delle azioni del GEP in corso, ma soprattutto fornisce elementi necessari per costruire il prossimo GEP 2025-2027. Data la sua concettualizzazione, di carattere empirico, la ricerca si presta per essere replicata in altre università, gli strumenti costruiti sono facilmente utilizzabili in altri Atenei e/o centri di ricerca, che nello stesso periodo storico stanno affrontando le medesime sfide.

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Symbolism or substance? The alignment of ESG Strategy and ESG Pay in Italian listed companies

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Abstract

Frame of the research. *The integration of Environmental, Social, and Governance (ESG) factors into executive compensation has emerged as a key component of corporate governance, driven by regulatory pressures and investor expectations. However, the extent to which ESG-linked pay aligns with corporate sustainability strategies remains a critical issue.*

Purpose of the paper. *The research aims to assess the degree of alignment between ESG-linked remuneration (ESG pay) and corporate sustainability strategies (ESG Strategy), identifying whether these compensation mechanisms effectively drive sustainable business practices or not.*

Methodology. *The study examines a sample of FTSE MIB-listed companies from 2022 to 2024, analyzing annual reports, sustainability reports, and remuneration policies. A novel alignment indicator is introduced, quantifying the coherence between ESG KPIs in ESG pay and ESG Strategy. The analysis also includes sectoral comparisons and a classification of firms based on their ESG pay-strategy alignment.*

Results. *Findings reveal significant heterogeneity in ESG pay-ESG strategy alignment across firms. The study identifies four clusters: Sustainability Leaders, Followers, Careless, and Apathetic. Notably, some firms allocate substantial ESG-linked remuneration without meaningful strategic integration, raising concerns about greenwashing.*

Research limitations. *This study focuses on Italian publicly listed firms, which may limit its applicability to different regulatory and institutional settings. Moreover, as the analysis relies on publicly available corporate disclosures, the qualitative nature of ESG reporting could introduce interpretative biases.*

Managerial implications. *Companies should refine their ESG KPIs to ensure alignment with long-term corporate goals and avoid superficial compliance.*

Originality of the paper. *This study introduces the first indicator to measure the alignment between ESG Pay and ESG Strategy, moving beyond binary classifications. This indicator serves as a benchmark for research and investment analysis, enhancing governance alignment in sustainability-driven compensation.*

Key words: *executive compensation, corporate sustainability, ESG strategy, governance alignment, greenwashing.*

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1. Introduction

The integration of Environmental, Social, and Governance (ESG) factors into executive compensation plans has emerged as a significant corporate governance trend, driven by increasing regulatory pressure, growing investor demands, and the shift towards responsible capitalism (Lu, 2023; Cucari *et al*., 2023; Soana, 2024; Harvard Law School Forum on Corporate Governance, 2025).

The growing attention to ESG issues reflects a shift in corporate governance towards a more inclusive approach, moving beyond a sole focus on shareholder value to consider the long-term impacts of corporate decisions on society and the environment (Aguilera *et al*., 2021; Bebchuk and Tallarita, 2022; Flammer *et al*., 2019). This shift is particularly evident in executive compensation (Edmans *et al*., 2012), where ESG-linked pay has emerged as a tool to incentivize corporate leaders to align their actions with broader sustainability goals (Hossain *et al*., 2023; Yin, 2024; Dell'Erba and Gomtsyan, 2024).

Traditionally, executive compensation has been tied to financial metrics such as profit margins, return on investment, and shareholder returns (Tosi *et al*., 2000). However, there is a growing recognition that sustainable long-term growth cannot be achieved by focusing solely on financial outcomes (Ferrarini and Ungureanu, 2024; Edmans *et al*., 2023). As such, an increasing number of firms have begun incorporating non-financial metrics into their executive pay packages. According to WTW's 2025 report, 81% of global companies now incorporate at least one ESG metric into their executive incentive plans, reflecting a moderate increase from 79% in 2024. Europe continues to lead in this area, with 94% of companies integrating ESG metrics into their executive compensation programs, followed by North America and the Asia-Pacific region at 76% and 74%, respectively.

This growing focus on ESG-linked pay highlights the importance of alignment, defined as the fit relationship between interconnected components or systems, such as corporate strategy and executive incentives (Aljebrini *et al*., 2025). Indeed, ESG metrics are intended to drive executives towards achieving objectives that contribute to both corporate success and societal well-being (Zumente and Bistrova, 2021). However, according to Homroy *et al*. (2023), ESG targets align with shareholder interests when they enhance financial performance or provide non-financial utility. Corporate boards may adopt ESG-linked compensation either to maximize shareholder wealth or to meet investor preferences for sustainability, even in the absence of direct financial gains. Therefore, the integration of ESG objectives into remuneration policies is not without its challenges (Walker, 2022; de Beaufort, 2024).

The primary difficulty lies in defining clear, measurable, and meaningful ESG metrics that align with the company's broader sustainability goals. While some firms have incorporated ESG metrics into their executive compensation frameworks, the risk of "greenwashing" remains. In many instances, firms adopt ESG targets primarily as a signaling tool to enhance their public image, without making substantial changes to their practices or strategies. This symbolic approach to ESG integration can undermine the effectiveness of the pay-for-performance model, as the incentives may not be genuinely aligned with the long-term strategic objectives of the business. It reflects a practice where companies create the appearance of linking executive rewards to ESG performance, while in reality, compensation is not meaningfully tied to substantive ESG improvements (Lu, 2023).

One of the driving factors behind the increased adoption of ESG-linked pay is the growing regulatory pressure on companies to adopt sustainable practices. In the European Union, for example, the Corporate Sustainability Reporting Directive (CSRD) has mandated that firms disclose detailed information regarding their ESG practices, including their strategies, risks, and outcomes. This shift towards greater transparency is aimed at mitigating risks such as greenwashing and ensuring that companies are held accountable for their ESG claims. Furthermore, institutional investors, particularly large asset managers and pension funds, are increasingly demanding that companies adopt ESG metrics in their executive compensation structures. These investors view the integration of ESG factors into pay policies not only as a means of aligning executive incentives with long-term

corporate goals but also as a way to improve the overall sustainability and financial performance of the companies they invest in.

Despite the growing adoption of ESG-linked pay, there is still much debate over its effectiveness (Zeng *et al*., 2023). Research shows that while ESG incentives are often designed to align executive behaviour with long-term sustainability goals, these incentives are not always structured in a way that leads to tangible results. On the one hand, the lack of standardised ESG metrics and the subjective nature of many ESG targets make it difficult to determine whether such measures actually drive meaningful organisational change. On the other hand, it is widely recognised that companies do not always view the adoption of ESG practices as a driver of management performance or related economic outcomes. This raises important questions about the true alignment between ESG Pay and ESG strategies.

Therefore, the research questions arise: *Is compensation linked to ESG parameters truly aligned with the company's ESG strategy, or are there misalignments that could lead to undesirable outcomes?* Or in other words, *how well is the direction of an ESG goal aligned with corporate sustainability strategy?*

The literature on ESG-linked compensation has highlighted various issues, such as the tendency for companies to adopt symbolic ESG targets that have minimal impact on actual corporate practices (Lu, 2023). Studies have also pointed out that ESG-linked pay can sometimes create a disconnect between what companies claim in their reports and what they actually implement. This "window-dressing" approach to ESG integration has been criticized for failing to produce tangible results, thereby undermining the credibility of ESG-linked remuneration policies (Cohen *et al*., 2023). In some cases, a mismatch between ESG strategy and ESG pay can mask opportunistic behaviour by executives, whose pay tends to be driven by contingencies and dynamics that are not always reflected in strategic planning. In other cases, the same misalignment may reveal significant omissions or negligence on the part of the board or independent directors who, in setting remuneration levels, have not thoroughly considered or adhered to the objectives set during the strategic planning process.

However, there is also evidence to suggest that well-designed ESG-linked remuneration structures can lead to improved ESG performance, particularly when they are integrated with the company's overall strategy and linked to long-term financial outcomes (Spierings, 2022).The key challenge, therefore, is to ensure that the adoption of ESG objectives in executive pay is not just a compliance exercise, but part of a genuine strategy to address social, environmental and governance issues (Ganu *et al*., 2020).

Given this context, the primary goal of this paper is to explore the alignment between ESG Pay and ESG Strategy in the context of Italian listed companies in recent years (2022-2024). The study explores the question of whether the incorporation of ESG targets within executive compensation packages genuinely reflects a company's overarching sustainability strategy, or if these policies are merely a superficial response to external pressures.

By analyzing the integration of ESG targets into executive pay and assessing the effectiveness of these incentives in driving sustainable outcomes, this study aims to provide insights into the real impact of ESG-linked pay on corporate sustainability.

To the best of our knowledge, this paper is the first to focus specifically on the alignment between ESG Pay and ESG Strategy, an area that has been largely overlooked in existing research. While many studies have explored the adoption of ESG-linked pay and its impact on firm performance (Cohen *et al*., 2023; Lee *et al*., 2024), few have investigated whether these compensation structures truly align with a company's overall ESG strategy (Homroy *et al*., 2023; Soana, 2024). By addressing this gap, our paper offers a unique contribution, providing insights into how ESG-linked compensation can be a more effective tool for driving sustainability and improving corporate governance. It also highlights the risks of poorly designed ESG pay structures, such as greenwashing and failing to achieve real sustainability goals. In this way, this study makes a significant contribution to the literature on corporate governance and ESG-linked remuneration by introducing the first structured alignment indicator between ESG Pay and ESG Strategy. Unlike previous research that

primarily categorizes ESG-linked compensation in binary terms-either present or absent-this paper develops a ESG Strategic Incentive Alignment Index (ESG-SIAI) that systematically evaluates the coherence between ESG incentives and corporate sustainability commitments. By classifying firms into Sustainability Leaders, Followers, Careless, and Apathetic, the study not only highlights the heterogeneity in ESG pay adoption but also provides a structured methodology to distinguish substantive ESG incentives from symbolic compliance.

2. Theoretical background and literature review

2.1 Regulatory and Investor influences on ESG-linked Pay

The increasing adoption of ESG-linked pay reflects a broader transformation in corporate governance, driven by both regulatory frameworks and growing investor demands (Gomtsian, 2024; Dell'Erba and Gomtsyan, 2024).

Regulatory bodies, such as the European Union and the U.S. Securities and Exchange Commission, have played pivotal roles in shaping this shift. Through regulations like the Corporate Sustainability Reporting Directive (CSRD), the EU has set an ambitious agenda for corporate transparency, requiring firms to disclose detailed information about their environmental, social, and governance (ESG) practices. These regulations go beyond mandating sustainability reporting; they also establish a direct link between ESG performance and executive compensation. By aligning pay incentives with long-term sustainability objectives, these frameworks aim to mitigate greenwashing and ensure genuine corporate commitment to ESG goals (Lu, 2023). In parallel with these regulatory developments, institutional investors have become increasingly influential in pushing for ESG-linked pay as a means to align executive incentives with long-term shareholder value (Marsh, 2022). A 2025 Debevoise & Plimpton LLP report shows that 77.2% of S&P 500 companies now include ESG metrics in compensation plans. Additionally, shareholder support for ESG-related pay proposals rose to 38% in 2024, up from 32% in 2023, reflecting stronger investor demands for ESG alignment (Hicks *et al*., 2025).

Institutional investors like BlackRock, Allianz Global Investors, and Cevian Capital are using their voting power to demand greater transparency and accountability from companies, particularly regarding how executive pay relates to ESG metrics. Hazarika *et al*. (2023) highlight that this shift is not merely a reaction to external pressures but a strategic move by investors to ensure that companies remain sustainable over time. Institutional investors view ESG performance as increasingly tied to long-term financial performance, especially as issues such as climate change and social inequality present growing risks to corporate stability. By advocating for ESG-linked compensation, these investors aim to influence companies to adopt more sustainable practices, directly linking executive performance to measurable, impactful ESG outcomes.

However, the effectiveness of regulatory pressure and investor demands depends on how companies respond to these requirements. Dell'Erba and Gomtsyan (2024) argue that while regulatory frameworks are pushing for ESG integration, companies still face significant challenges in aligning ESG metrics with their core business strategies. Without careful selection of ESG indicators that are relevant to a company's operations, there is a risk that executive pay schemes could become little more than a symbolic gesture, failing to produce meaningful changes. As such, it is essential that both regulatory frameworks and investor engagement go beyond pushing for transparency and demand genuine, measurable progress in ESG performance, with clear standards and accountability mechanisms to avoid superficial compliance.

2.2 ESG and Executive Compensation: internal and external forces

The growing integration of ESG-linked compensation into executive pay structures represents a fundamental shift in how companies incentivize their leadership. Traditionally, executive pay has been linked to financial metrics such as profits, shareholder returns, and market performance (Rappaport, 1999; Bhatia *et al*., 2024).

However, as companies increasingly recognize the long-term value of sustainability, ESG-linked pay has emerged as an essential tool for aligning executive incentives with long-term corporate responsibility. Hazarika *et al*. (2023) underscore that ESG-linked pay is designed to motivate executives to balance financial success with the company's broader environmental, social, and governance objectives. By incorporating ESG targets into executive compensation, companies aim to drive leadership decisions that contribute to both financial growth and sustainable development, ensuring that corporate leaders are incentivized to pursue goals that benefit not only shareholders but also other stakeholders, including employees, communities, and the environment.

The push for ESG-linked executive pay comes not only from external pressures but also from corporate boards seeking to lead on sustainability and enhance their firm's ESG reputation. With the growing integration of ESG metrics into executive compensation plans, boards are increasingly responsible for ensuring sustainable value creation through performance-based incentives (Frydman and Saks, 2010). For instance, previous studies have demonstrated that female directors tend to promote the adoption of absolute and short-term ESG objectives by their firms (Le and Ngo, 2024). Firms with more gender-diverse boards are more likely to evaluate executives based on absolute ESG performance metrics. More generally, board structures play a crucial role in shaping executive compensation (Guthrie *et al*., 2012). Independent boards, chairpersons, and compensation committees are expected to enhance oversight, ensuring that CEO pay reflects firm performance and shareholder interests (see for example Ozerturk, 2005; Capezio *et al*., 2011). Meanwhile, ownership structure influences the degree of accountability; firms with concentrated ownership or activist investors may face greater pressure to enforce meaningful ESG pay structures, while dispersed ownership could enable greater executive discretion (Gillan *et al*., 2021). As regulatory bodies and institutional investors push for stronger ESG pay frameworks, internal governance mechanisms must evolve to ensure transparency, credibility, and alignment between executive incentives and long-term ESG performance (Glass Lewis, 2024).

Externally, institutional investors play a key role in aligning executive pay with ESG goals through engagement, voting, and investment strategies. Large asset managers, like BlackRock, Vanguard, and State Street, actively push for ESG-linked pay to enhance corporate accountability (Cohen *et al*., 2022). Some investors vote against executive pay packages lacking ESG targets (Mooney, 2021; Klasa, 2022), arguing it strengthens firms' sustainability commitments. However, ESG pay structures remain controversial. Investors prefer quantifiable financial metrics over ESG targets, which they see as opaque and prone to manipulation (MacNeil and Esser, 2022). ESG-focused investors may also face conflicts between financial returns and sustainability goals, leading to mixed results (Gibson *et al*., 2022). Despite these challenges, institutional investor pressure has accelerated ESG-linked compensation adoption, particularly in firms with dispersed ownership (Dyck *et al*., 2019).

The decision to incorporate ESG metrics into executive compensation is often motivated by a desire to manage long-term risks that could affect both the financial performance and reputation of the company. Lu (2023) argues that ESG-based remuneration is especially relevant in sectors where sustainability is intrinsically tied to the long-term viability of the business, such as energy, technology, and manufacturing. For example, energy companies that tie executive bonuses to the achievement of carbon reduction goals or renewable energy adoption incentivize their leaders to pursue long-term investments in green technologies. Similarly, companies in the technology sector may tie executive compensation to data privacy and ethical AI development, pushing leaders to focus on corporate governance that aligns with societal values.

2.3 Challenges and Limitations in the use of ESG-linked Pay: Alignment or Misalignment?

The integration of ESG-linked pay in corporate compensation structures has highlighted critical challenges, particularly in aligning ESG metrics with a company's core strategic sustainability objectives. As the pressure from regulators and institutional investors continues to grow, companies are incorporating ESG targets into executive compensation, believing that these metrics will incentivize leadership to pursue long-term sustainability goals. However, a critical issue is whether these metrics are genuinely aligned with the company's long-term strategy or whether they are merely a response to external pressures, such as the need for regulatory compliance or to satisfy investor demands.

This potential misalignment is a cause for concern, as it risks transforming ESG-linked compensation into a token gesture - an exercise in public relations rather than a meaningful tool to drive corporate change. As Hazarika *et al*. (2023) point out, when ESG metrics are not carefully chosen or tailored to the company's specific challenges, they can fail to generate the intended impact on executive behavior and organizational outcomes. Specifically, based on the findings of Lu (2023), it is possible to suggest that such mechanisms often suffer from structural flaws that undermine their impact. A key concern is the incompleteness of ESG performance metrics. Companies often rely on a limited set of indicators, often no more than two per category, which limits the ability to holistically assess sustainability performance. This narrow scope incentivises executives to prioritise specific, measurable aspects that directly influence their compensation, potentially at the expense of broader ESG considerations. In addition, the targets associated with ESG pay tend to be insufficiently challenging. Rather than setting targets that require substantial progress, many companies opt for targets that simply maintain the status quo.

Another critical issue is the susceptibility of ESG metrics to manipulation. Certain indicators, such as ESG ratings and certifications, rely on self-reported data, making them vulnerable to strategic bias. The potential for abuse of discretion further complicates the credibility of ESG-based pay. Remuneration committees, either influenced by senior management or motivated by retention concerns, may use their authority to set ambiguous or overly favourable ESG targets. This practice manifests itself in various ways, including the selection of easily achievable targets, the omission of negative performance outcomes, and the awarding of bonuses in the absence of substantive progress (Lu, 2023).

The challenge of measuring ESG performance underscores the lack of standardised and reliable metrics to assess whether executive pay is effectively driving sustainable change. Hazarika *et al*. (2023) and Lu (2023) stress the need for a more granular understanding of how executive pay structures linked to ESG metrics can contribute to transformational change within organisations.

For example, companies may set targets, such as reducing waste or increasing diversity, that look good on paper but do not contribute significantly to long-term sustainability. Without sufficient transparency in how these metrics are measured and reported, greenwashing becomes a risk, leading to misaligned expectations among investors and stakeholders. Some authors emphasize that transparency in reporting ESG performance is essential to combat greenwashing (Lagasio, 2024).

ESG-linked pay structures need to be open and transparent, with clearly defined metrics that are rigorously measured. Only through such transparency will investors and regulators be able to assess whether companies are making real progress towards sustainability goals, rather than merely engaging in symbolic actions to enhance corporate image. Dell'Erba and Gomtsyan (2024) argue that the very subjectivity of ESG metrics complicates their inclusion in executive pay, with companies often relying on broad, aggregated measures that fail to differentiate between genuine progress and superficial achievements. For example, focusing solely on carbon emissions or diversity goals as quantitative benchmarks can obscure more complex, qualitative issues, such as improving corporate governance or embedding sustainability into the company's core business model. This issue highlights the importance of ensuring that ESG-linked pay is not only well-aligned with financial and sustainability objectives, but also genuinely reflective of the company's long-term priorities.

Moreover, the short-term vs long-term debate is at the heart of the conversation around ESG-linked pay. While some ESG metrics may lead to short-term wins, such as meeting diversity quotas or cutting emissions by a specific percentage, these goals may not necessarily lead to more profound, lasting changes in how a company operates in the long run. Hazarika *et al*. (2023) caution that when ESG-linked pay focuses too heavily on short-term results, it risks incentivizing executives to prioritize immediate, visible outcomes over the more complex, often delayed transformations needed for sustainable corporate practices. As Lu (2023) argues, this focus on short-term goals can encourage executives to make decisions that generate quick results but fail to lay the groundwork for long-term sustainability. This tension between short-term achievements and long-term objectives reinforces the need for careful alignment between executive incentives and the company's long-term strategy.

Given these complexities, it becomes clear that examining the alignment between ESG-linked pay and company strategy is not just an academic exercise but a critical component in understanding whether these compensation schemes can drive real organizational change. Dell'Erba and Gomtsyan (2024) suggest that without such alignment, ESG-linked compensation could become little more than a compliance mechanism or a public relations tool, rather than a genuine lever for transformation. The misalignment between executive incentives and long-term ESG goals could distort corporate decision-making, leading executives to focus on easy-to-achieve metrics or superficial changes rather than fostering deeper, more impactful shifts in organizational behavior. Thus, investigating the alignment of ESG-linked pay with corporate strategy becomes essential in understanding how executive compensation can either contribute to or undermine corporate sustainability in the long term.

3. Methodology

3.1 Sample selection

The sample for this study consists of companies from the FTSE MIB Index over the 2022-2024 period, covering the largest publicly listed firms on the Borsa Italiana across selected clusters (see Table 1). This selection ensures a comprehensive analysis of the integration of ESG-linked pay within Italy's most influential corporations. Given their market significance, these companies are subject to stringent ESG reporting requirements, making them ideal for studying the alignment between sustainability goals and executive compensation structures. The dataset includes a total of 119 firm-year observations over the three-year period, with companies distributed across multiple industry clusters based on business characteristics and ESG materiality considerations. For the 2024 fiscal year, the analysis includes 39 of the 40 companies in the FTSE MIB Index. Initially, 40 companies were considered; however, the sample was reduced to 39 after excluding ERG due to the lack of publicly available information on its remuneration policy for the 2024-2026 period. To ensure the greatest possible business homogeneity, the companies were grouped into five macro-sector clusters (tab. 1), reflecting both business characteristics and material ESG topics: Consumer Discretionary; Energy & Utilities; Financials; Healthcare; Industrials & Technology.

Table 1: Sample Selection

COMPANY	**Classification Borsa Italiana ("SUPER SECTOR")**	**Reclassification by business type**
Brunello Cucinelli, Moncler	Consumer Products & Services	Consumer Discretionary
Campari	Food & Tobacco	
Ferrari, Pirelli & C., Stellantis	Automobiles & Components	
Amplifon, DiaSorin, Recordati	Healthcare	Healthcare
Interpump Group, Iveco Group, Leonardo, Nexi, Prysmian	Industrial Products & Services	Industrials & Technology
STMicroelectronics	Technology	
INWIT, Telecom Italia	Telecommunications	
Azimut, Banca Mediolanum, Mediobanca	Financial Services	Financials
Banca Popolare di Sondrio, Banca Monte dei Paschi di Siena, Banco BPM, BPER Banca, Fineco Bank, Intesa Sanpaolo, UniCredit	Banks	
Generali assicurazioni, Poste Italiane, Unipol	Insurance	
A2A, Enel, Hera, Italgas, Terna	Public Services	Energy & Utilities
Eni, Saipem, Snam, Tenaris	Energy	

Source: our elaboration

3.2 Variables

The ESG strategy variables are manually collected from annual reports, sustainability reports, and strategic plans of the companies in the sample. The focus is on identifying ESG KPIs aligned with each company's long-term sustainability objectives, categorized into three pillars:

- Environmental: Targets related to carbon emissions, energy efficiency, waste management, water conservation, and sustainable sourcing, assessing the company's environmental impact.
- Social: Metrics on employee welfare, diversity and inclusion, equity, community engagement, and customer satisfaction, reflecting social responsibility and stakeholder relations.
- Governance: Indicators covering corporate governance, board diversity, anti-corruption measures, transparency, and shareholder engagement, ensuring integrity and accountability.

The study evaluates the specificity and measurability of these KPIs, with a particular emphasis on the clarity of target definition, quantifiability, and time-bound nature.The extent to which these ESG goals are strategically embedded in the company's long-term objectives is a pivotal factor in assessing their alignment with the executive compensation structure.

The ESG-linked pay variables have been extracted from executive compensation disclosures, specifically remuneration reports and proxy statements. The analysis focused on the proportion of variable compensation tied to ESG KPIs in both Short-Term Incentives (STI) and Long-Term Incentives (LTI). The key variables include:

- The percentage of executive incentives (or variable compensation) tied to ESG performance, which will allow an assessment of how much the ESG metrics influence executive incentives. Therefore, the analysis focuses on how incentivized CEOs are to achieve ESG goals, regardless of the total compensation amount.
- The weight of each ESG metrics in variable compensation plans, broken down by macro-area (environmental, social and governance) which reflects how much emphasis is placed on achieving ESG-related goals;
- The measurability and clarity of the ESG KPIs used in these compensation plans, focusing on whether the metrics are clearly defined and linked to measurable, actionable outcomes. This will help assess the robustness and rigor of the ESG-linked pay system.

The analysis excluded fixed components of compensation, such as base salaries, as they are unrelated to performance. Only performance-based compensation, which directly links ESG objectives to executive incentives, was considered in this study.

3.3 Alignment Indicator

A key contribution of this study is the development of an alignment indicator - *ESG Strategic Incentive Alignment Index* (ESG-SIAI) - understood as the degree of coherence and adaptation between interconnected elements (Kathuria *et al*., 2007). Specifically, this indicator quantifies the alignment between a company's ESG strategy (ESG Strategy) and its ESG-linked pay structure (ESG Pay).

Consistent with previous efforts to construct corporate governance indices (e.g., Chen *et al*., 2007; Mohy-ud-Din *et al*., 2023) or measure the compensation complexities (Albuquerque *et al*., 2024), our index measures how effectively the ESG goals outlined in the corporate strategy are reflected in the executive compensation plan, with a particular focus on ESG KPIs. If there is a misalignment between a company's strategic ESG objectives and its compensation mechanisms, the organization should recognize the need for adaptive systems to enhance overall effectiveness.

This means that companies must ensure that their incentive structures evolve in response to strategic goals, reinforcing the integration of ESG principles into executive decision-making and corporate governance.

To enhance the accuracy of this measure, a corrective factor has been introduced. This factor adjusts the alignment indicator downward in cases where the ESG KPIs are vague, unquantifiable, or lack SMART criteria (Specific, Measurable, Achievable, Relevant, Time-bound). This ensures that only meaningful, actionable, and measurable ESG goals contribute to the alignment score, enhancing the reliability of the measure and ensuring it reflects real strategic alignment rather than superficial compliance with ESG concepts. By applying this corrective factor, the alignment indicator provides a more robust and precise measurement of how well companies align their ESG strategy with executive incentives, offering deeper insights into the effectiveness of ESG-linked pay in driving long-term sustainability.

The ESG-SIAI is calculated using the following formula:

$$ESG - SIAI = \frac{\sum_{i=1}^{n} Ai * wi}{N} * C$$

Where:

A_i= is the presence of a specific ESG KPI in the executive and compensation plan included in the segment [0,1]. A_i = 1, if the ESG KPI i is present in both the executive compensation plan and the strategic ESG plan, otherwise A_i=0.

w_i = weight assigned to ESG KPI in the incentive scheme.

N = total number of ESG KPIs in the company's strategic plan

C (Corrective Factor) = a score between 0 and 1, reducing the alignment score if ESG KPIs lack SMART criteria (Specific, Measurable, Achievable, Relevant, Time-bound)

The numerator of our formula is basically the number of ESG KPIs included in both the executive compensation plan and the company's strategic ESG plan, meanwhile the denominator is the total number of ESG KPIs outlined in the company's strategic plan. Therefore, the ESG-SIAI captures how effectively a company translates its strategic ESG priorities into executive compensation. Therefore, when ESG-SIAI = 1, there is perfect alignment. This means that every ESG KPI defined in the company's strategic plan is fully embedded in the executive compensation structure, ensuring that leadership incentives are directly tied to clear, measurable sustainability objectives. If 0 < ESG-SIAI < 1, the alignment is partial. Some ESG KPIs are incorporated into the pay structure, but others

may be absent or not well-defined. The score reflects both the relative importance of each KPI and a corrective adjustment if the goals are vague or fail to meet SMART criteria. The closer the score is to 1, the stronger the integration between ESG strategy and executive incentives. An ESG-SIAI of 0 indicates no alignment, meaning that the company's strategic ESG priorities are entirely disconnected from its executive pay framework.

3.4 Data Analysis

This study employs a descriptive methodology to analyze the distribution and key characteristics of ESG metrics within corporate sustainability strategies and executive compensation plans. The research aims to assess the degree of integration between ESG-linked remuneration and corporate sustainability objectives, identifying patterns of alignment and potential discrepancies across firms.

A key aspect of this analysis is the concept of alignment, which is commonly associated with fitness, consistency, and coherence between different strategic components. In our context, alignment refers to the extent to which ESG-linked compensation is designed to support and reinforce a company's sustainability commitments. To quantify this alignment, we adopt a fitness-based approach, where the alignment score is determined by the proportion of ESG-related remuneration objectives that are directly synchronized with strategic ESG priorities. In its simplest form, alignment can be measured as the ratio of synchronous ESG performance targets (those explicitly tied to strategic sustainability goals) to the total number of ESG-related compensation elements. The analysis focuses on two key elements to enhance this assessment:

- Frequency of ESG Metrics: This aspect examines how many companies within the sample have incorporated ESG metrics into their executive compensation plans and identifies which specific ESG KPIs are most commonly used. By analyzing the frequency of various ESG factors-such as environmental, social, or governance targets-the study uncovers trends and patterns in ESG adoption. This helps highlight which ESG objectives are most prevalent and how they are positioned relative to other performance indicators within compensation schemes;
- Prevalence of ESG Metrics in Executive Compensation: Beyond their mere presence, the study evaluates the weight of ESG-linked incentives within the overall executive compensation structure. By assessing how much of executive remuneration is tied to ESG objectives, the research determines the prominence of ESG pay in corporate policies. This provides insights into how firms financially incentivize sustainability targets and the level of commitment made to rewarding executive performance in achieving ESG goals

Using these insights, the study constructed a matrix-based representation, categorizing companies based on both the weight of ESG metrics in executive pay and their alignment with corporate sustainability strategies. This visual framework enables a comparative analysis of companies, positioning them along a spectrum from high alignment and substantial ESG weight in pay to low alignment and minimal inclusion of ESG incentives. This approach helps identify gaps in the integration of sustainability goals into executive incentives, offering a structured basis to compare how different sectors and industries incorporate ESG into compensation structures.

4. Results

4.1 ESG Pay vs. ESG Strategy: Alignment and trends at issuer level

The alignment between ESG pay and ESG strategy varies significantly across firms, requiring a structured approach to evaluate its effectiveness. To achieve this, the analysis employs a two-dimensional matrix, which categorizes companies based on two critical factors: i) Degree of Alignment: This metric quantifies how well a company integrates ESG objectives into executive remuneration, reflecting the extent to which ESG KPIs in the corporate strategy are embedded in

variable pay structures. The average alignment score across the analyzed firms is 54% in 2024, 58% in 2023 and 57% in 2022; ii) ESG weight in Target Variable Remuneration: This dimension measures the percentage of variable pay linked to ESG criteria, assuming full target achievement. The average weight of ESG metrics in incentive plans stands at 18%, slightly below the 20% best practice threshold commonly referenced in corporate governance studies (WTW, 2023). This remains unchanged from 2023 and slightly lower than 19% in 2022.

By mapping firms along these two dimensions, the study identifies four distinct corporate profiles that illustrate the varying degrees of ESG pay-strategy alignment:

- The "Sustainability Leaders" represent the best-in-class companies within the analyzed sample. These firms exhibit a strong alignment between executive remuneration and corporate strategy, with a high weighting of ESG metrics in variable compensation structures. Concretely the CEOs are effectively rewarded and incentivized based on the company's overarching sustainability goals, fostering a virtuous cycle of transparency and coherence. This alignment is not only evident in remuneration practices but is also reflected in corporate reporting, ensuring consistency between strategic objectives and executive incentives
- The "Apathetic" include companies that, despite market developments, allocate an ESG weight in variable remuneration plans below the industry benchmark of 18%. This misalignment between ESG pay and ESG strategy suggests a lack of managerial commitment or even indifference toward sustainability. This also results in situations where these firms tend to adopt ESG strategies that are primarily descriptive rather than operationally driven, failing to integrate sustainability into core business objectives. As a result, they lag significantly behind in ESG implementation and present considerable room for improvement
- The "Followers" are companies that demonstrate a high degree of alignment between ESG strategy and ESG-related remuneration components. However, the ESG-linked portion of executive pay remains marginal in the overall compensation structure. These firms have a clear strategic framework for integrating sustainability into executive incentives, yet the limited financial weighting of ESG objectives within total remuneration reduces their effectiveness in driving sustainable performance at the leadership level.
- The "Careless" refer to companies that assign an ESG weight in variable remuneration plans yet the ESG KPIs utilized are not aligned with the firm's strategic plan. This misalignment may stem from informational deficiencies or inefficiencies in board-level decision-making processes, indicating a lack of coherence between incentives and corporate strategy. This dynamic can be interpreted in two contrasting ways. On one hand, it signals an increasing emphasis on ESG considerations, albeit with substantial room for improvement in clarity and strategic integration. On the other hand, it raises the risk of misrepresentation, projecting an image of strong sustainability commitment without a substantiated strategic foundation, thereby increasing the risk of ESG-washing perception in the market.

The distribution of firms across these four quadrants has evolved over time as shown in figure 1, 2, and 3.

Figure 1: ESG pay - strategy alignment in 2022

2022

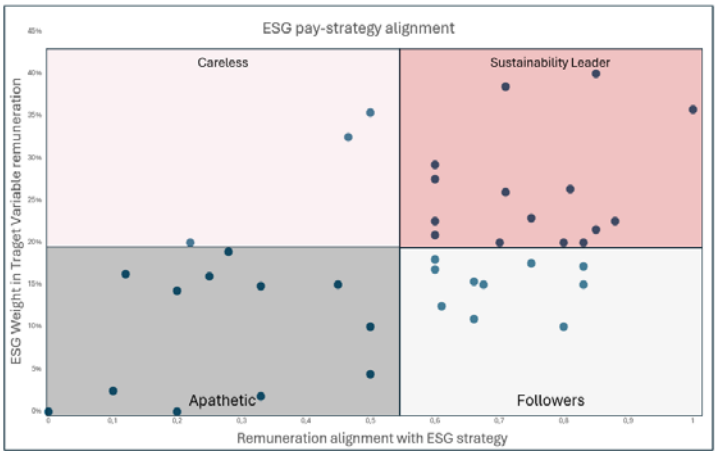


Figure 2: ESG pay - strategy alignment in 2023

2023

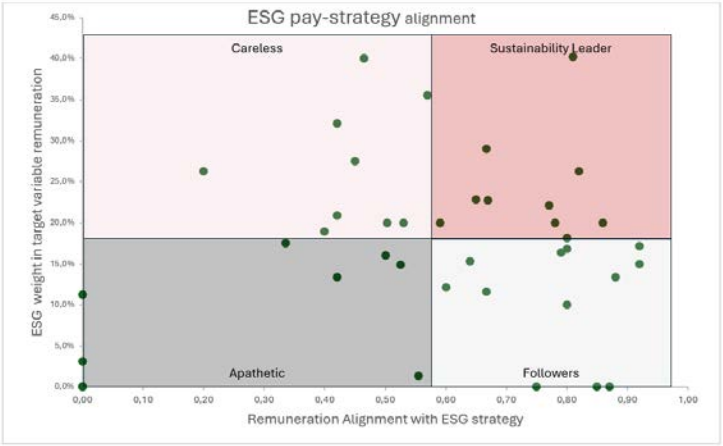
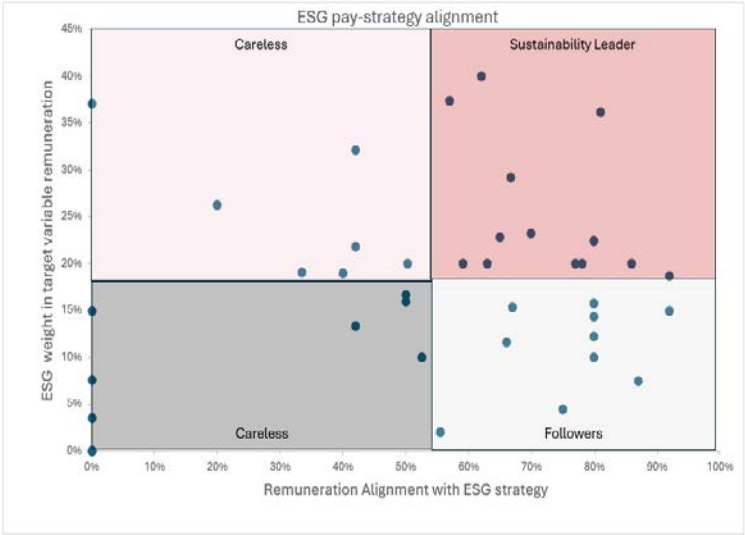


Figure 3: ESG pay - strategy alignment in 2024

2024



In 2022, firms were concentrated in the “Apathetic” and “Careless” quadrants, indicating weak ESG integration into executive pay structures. The “Sustainability Leaders” quadrant had a limited

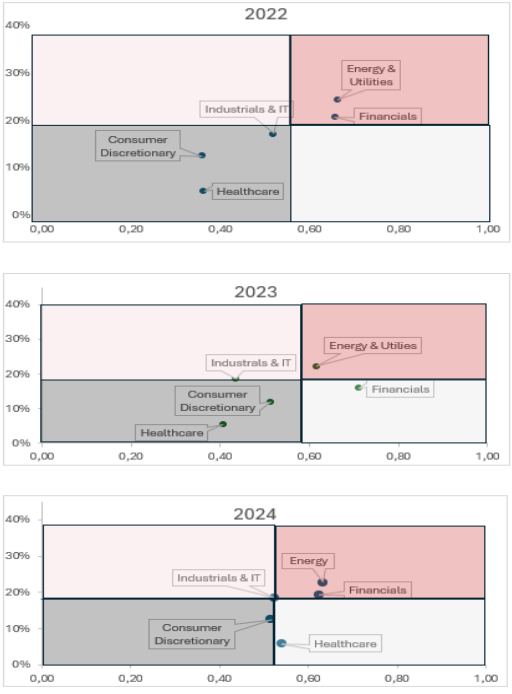
presence, suggesting that few firms fully aligned remuneration with ESG strategy. The "Followers" quadrant was sparsely populated, reflecting a slow transition toward ESG-driven compensation. By 2023, the distribution began shifting. The "Careless" quadrant remained substantial, signaling persistent misalignment between ESG metrics and remuneration. However, the "Sustainability Leaders" group expanded slightly, indicating a growing number of firms incorporating ESG targets into executive incentives. The "Apathetic" segment showed minor contraction, suggesting some firms were moving toward alignment. The "Followers" category exhibited modest growth, reflecting incremental adoption of ESG-based pay structures. In 2024, ESG integration became more pronounced. The "Sustainability Leaders" quadrant further expanded, showing increased alignment between ESG strategy and executive compensation. The "Careless" segment remained significant, highlighting firms that integrate ESG metrics but lack strategic alignment. The Apathetic quadrant slightly declined, suggesting some firms are progressing toward structured ESG incentives. The "Followers" category saw further expansion, reinforcing the gradual shift toward ESG pay integration. A notable trend is the increase in companies concentrated around the 0x (low pay alignment) and 0y (low ESG metric weighting) axes. This suggests that while ESG considerations are often included in incentive plans, they may not have a meaningful financial impact.

In summary, the trend from 2022 to 2024 suggests a progressive but uneven adoption of ESG-linked incentives. The Sustainability Leaders quadrant has grown, demonstrating a subset of companies that are embedding ESG considerations into executive pay. The Careless category remains, reflecting continued inconsistencies in ESG pay alignment. The decline in Apathetic companies suggests increased awareness, while the growth in the Followers segment indicates a shift towards incremental rather than radical ESG adoption.

4.2 *ESG Pay vs. ESG Strategy: Alignment and trends at sector level*

The comparative analysis of ESG-linked remuneration across FTSE MIB firms from 2022 to 2024 highlights sectoral shifts in both alignment with ESG strategy and the weight of ESG metrics in target variable remuneration. Over the three years, a general improvement in remuneration alignment is observed, with most sectors shifting rightward, while ESG weight in compensation structures remains relatively stable (Figure 4).

Figure 4: Evolution of ESG alignment throughout 2022-2024 at sector level



The Energy & Utilities macro-sector ranks at the top, likely due to a combination of high regulatory pressure, stakeholder expectations, and the strategic relevance of ESG factors within the industry. Companies in this sector operate in an environment heavily influenced by stringent environmental regulations, decarbonization mandates, and increasing investor focus on the energy transition. As a result, they have stronger incentives to integrate ESG factors into their strategic and incentive plans, aligning remuneration policies with clear and measurable sustainability objectives. Conversely, Consumer Discretionary and Healthcare record the lowest scores, falling into the "Apathetic" quadrant (lower left), characterized by a weak integration between ESG strategy and incentive plans. In some cases, this misalignment may reflect an early-stage approach to sustainability, while in others, it could indicate a communication strategy more focused on reputation than on actual ESG commitment. The risk of greenwashing in these sectors is an aspect that warrants further empirical analysis.

5. Discussion

The findings of this study reveal a complex and variegated set of characteristics in the relationship between ESG pay and ESG strategy, highlighting how companies take different approaches, ranging from "substance" and strategic integration to "symbolism" or misaligned implementation.

This variability underscores how ESG-linked remuneration can serve either as a real governance tool or as a symbolic mechanism used to enhance corporate reputation without delivering substantive change.

Our study demonstrated that a symbolic ESG-based remuneration strategy is a myopic strategy (Lu, 2023) that often reflects a deliberate use of impression management (Esposito De Falco and Vagnani, 2010) rather than a genuine commitment to sustainability (McGuire, 1997). The incorporation of ESG metrics into executive compensation by firms can signal alignment with stakeholder expectations and regulatory trends, reinforcing their reputation as responsible corporate actors. However, when these metrics are not meaningfully linked to corporate strategy, ESG-linked remuneration risks becoming a superficial mechanism designed to create an illusion of sustainability engagement, rather than driving substantive ESG improvements.

Therefore, the introduction of our index offers a novel empirical tool for assessing whether ESG-linked remuneration effectively drives sustainable business practices, providing a benchmark for both academic research and investor decision-making. This new alignment index represents a significant advancement in the academic debate on corporate governance and ESG compensation, moving beyond a binary assessment of ESG incentives to offer a quantitative and structured evaluation of their coherence with corporate strategy.

Our findings demonstrate that firms fall into four distinct clusters-Sustainability Leaders, Followers, Careless, and Apathetic-each representing a different degree of ESG Pay-ESG Strategy alignment. Specifically: i) the *Sustainability Leaders* integrate ESG incentives coherently into executive compensation structures, ensuring clear, measurable objectives that align with corporate strategy. This scenario may indicate a strong alignment in board attitudes and decision-making processes across various committees and the shareholders' meeting. The coherence between ESG-linked compensation and ESG strategy, along with the appropriate weighting of ESG parameters in remuneration systems, suggests two key implications. First, it reflects decision-making processes that are well-integrated with the company's operational priorities. Second, it highlights a strategic awareness that ensures executive compensation mechanisms are effectively aligned with long-term sustainability objectives; ii) *Followers*, although formally committed to ESG-linked pay, assign minimal weight to sustainability metrics, limiting the effectiveness of these incentives in shaping executive behavior. While these companies exhibit a certain level of consistency in board decision-making, ensuring alignment between strategy and implementation within an ESG framework, their approach remains predominantly reactive. Rather than proactively driving ESG integration, they

adopt a wait-and-see strategy, following established industry trends and adjusting their policies in response to market dynamics and external pressures; iii) The most concerning cases arise among Careless companies, where ESG-based pay holds significant weight in compensation plans but is weakly integrated with strategic priorities, raising risks of greenwashing. Here, ESG remuneration could be used more as a reputational tool than a driver of real change, inflating sustainability credentials without meaningful governance improvements. This misalignment could be attributed to several governance challenges. One potential factor is board structure, particularly the role of independent directors and the effectiveness of oversight mechanisms. If independent board members engage only superficially or if remuneration committees operate in a fragmented manner, ESG incentives may become symbolic rather than strategically meaningful. In such cases, ESG-linked pay might serve more as a compliance tool than as a driver of real corporate change. Another possible explanation is investor oversight. While shareholders increasingly influence executive compensation through mechanisms like "say-on-pay" votes (Cucari, 2019), their engagement in evaluating the depth and credibility of ESG-linked incentives may vary. If investors focus primarily on the presence of ESG metrics rather than their strategic alignment, weak governance practices could persist. These factors, individually or in combination, may contribute to the ineffective integration of ESG-linked pay, highlighting the need for stronger board accountability, more transparent ESG compensation frameworks, and greater investor diligence in scrutinizing the link between executive incentives and long-term sustainability goals; iv) The Apathetic group, which assigns minimal importance to ESG pay, reflects a governance approach where sustainability remains peripheral. This misalignment suggests that while some firms use ESG-linked pay to drive real change, others treat it as a discretionary tool for impression management, boosting ESG credentials without meaningful governance shifts (Lu, 2023; García-Sánchez and Araújo-Bernardo, 2020). In many cases, board apathy further reinforces this pattern, showing indifference toward integrating ESG strategies into remuneration systems.

Without rigorous alignment between ESG pay and ESG strategy, symbolic ESG-linked remuneration risks undermining its own credibility, reinforcing short-term impression management tactics rather than fostering long-term value creation. Therefore, ensuring transparent, performance-based ESG incentives is essential to prevent ESG pay from being leveraged as a reputational tool rather than a genuine mechanism for sustainable corporate

Sectoral disparities further reinforce the notion that ESG-based remuneration is often more symbolic than substantive, with firms in different industries facing varying levels of regulatory pressure, investor scrutiny, and strategic necessity in their ESG integration. Energy & Utilities emerges as the most aligned sector, likely due to strict environmental regulations, decarbonization mandates, and growing market expectations for sustainability commitments. Firms operating in this industry have stronger incentives to embed ESG objectives into their strategic frameworks and executive pay structures, ensuring that sustainability-linked incentives drive measurable performance outcomes. The combination of regulatory oversight, structured ESG KPIs, and increasing stakeholder expectations makes the adoption of ESG-based remuneration more credible in this sector.

Conversely, Consumer Discretionary and Healthcare sectors exhibit the lowest levels of alignment, falling into the Apathetic and Careless categories, where ESG commitments remain fragmented and inconsistently integrated into compensation frameworks. In these sectors, multiple factors may contribute to the weak alignment between ESG strategy and executive compensation. The dominance of business models focused on short-term value creation can reduce the emphasis on long-term sustainability objectives. Additionally, industry-specific structures, such as extended development cycles or regulatory constraints, may hinder the establishment of measurable and strategically aligned ESG targets. In Consumer Discretionary, the lack of integration between ESG and variable remuneration may stem from a fragmented implementation of ESG strategies, with objectives often vaguely defined or lacking clear quantitative indicators. Many firms in this sector struggle with defining standardized ESG KPIs, making it easier for executives to be rewarded based on broad sustainability commitments rather than tangible outcomes. In the healthcare sector, the

challenges associated with ESG-linked remuneration may be influenced by ownership structures that prioritize short-term financial performance over long-term sustainability goals. Firms with a strong focus on immediate value maximization may be less inclined to integrate ESG considerations into executive pay, treating sustainability as a secondary concern. Additionally, governance structures-particularly those with limited board independence-could contribute to weaker enforcement of ESG performance criteria. Remuneration committees may face difficulties in designing and implementing robust sustainability-linked incentives, either due to a lack of expertise or resistance to shifting traditional compensation models. Furthermore, ineffective communication between the shareholders' meeting and the board may weaken strategic alignment (Esposito De Falco *et al*., 2018), leading to fragmented decision-making on ESG pay structures. In certain instances, the board itself may demonstrate a passive or opportunistic approach, either through neglecting the integration of ESG metrics due to a lack of clear accountability or through deliberate deprioritisation to maintain flexibility in executive compensation. These factors, individually or in combination, could result in ESG-linked remuneration being more symbolic than substantive, limiting its potential to drive meaningful corporate sustainability initiatives.

However, further research is needed to evaluate the relative impact of these factors on alignment between ESG Pay and ESG Strategy in order to avoid the risk that ESG-linked pay is leveraged primarily for reputational purposes rather than as a genuine mechanism for change.

The role of the board and remuneration committee emerges as a critical factor in determining whether ESG pay serves as a driver of real sustainability performance or merely as an impression management tool. The remuneration committee represents a pivotal governance mechanism in determining the alignment between ESG-linked remuneration and corporate sustainability commitments; however, its effectiveness is contingent on its independence and oversight capacity, which vary across firms (Hwang *et al*., 2009). Empirical evidence indicates that when social ties between executives and compensation committee members are strong, oversight weakens, increasing the likelihood that ESG pay serves as a symbolic compliance tool rather than a performance-driven incentive (Pan *et al*., 2020). In such contexts, there is a risk that ESG-linked compensation may become decoupled from actual sustainability performance, thereby enabling executives to benefit from ESG incentives irrespective of meaningful progress. A related governance issue is pay-for-luck asymmetry, where executive compensation is influenced more by external market conditions than by managerial actions (Campbell and Thompson, 2015; Lublin, 2010).While independent governance structures are expected to mitigate this imbalance, empirical evidence suggests that executives with strong influence over friendly compensation committees are more likely to secure reward structures (Garvey and Milbourn, 2006) and this could have an impact on alignment between ESG pay and sustainability outcomes.

Beyond the committee level, the board's structure and ownership concentration are critical in shaping the effectiveness of remuneration for ESG matters. In firms where executive influence over the board is strong, remuneration for ESG matters tends to be discretionary and performance-insensitive, serving optics rather than accountability. This risk is heightened in firms with concentrated ownership or strong managerial control, where remuneration committees may lack the autonomy to enforce rigorous, externally validated ESG performance criteria.

The efficacy of regulatory frameworks, such as the CSRD, in integrating ESG metrics into executive compensation is contingent on enforcement and the extent of discretion retained by firms in defining ESG performance. The absence of standardized performance benchmarks and external validation in ESG-linked pay structures poses a risk of their becoming mere reputational tools rather than genuine accountability mechanisms.

6. Conclusions

Executive compensation remains a critical component of corporate governance, influencing leadership retention, corporate reputation, financial crisis and broader societal perceptions of capitalism (Edmans *et al*., 2023; Albuquerque *et al*., 2024; Hill *et al*., 2016; Kerber, 2016; Beecher-Monas, 2011). Regulatory interventions and evolving investor expectations have further intensified scrutiny, particularly in relation to the integration of ESG considerations into compensation structures. This study contributes to the literature by examining the degree of alignment between ESG-linked remuneration and corporate sustainability strategies, addressing a key gap in corporate governance research.

While ESG-linked pay has emerged as a mechanism to incentivize sustainable business practices, its integration into corporate strategy remains inconsistent. The development of a novel alignment indicator provides a structured and quantitative framework for assessing the coherence between ESG incentives and firms' sustainability commitments, offering a more robust basis for evaluating the effectiveness of ESG-driven compensation models.

The findings reveal that the integration of ESG Pay-ESG Strategy remains an evolving and highly heterogeneous process, with significant differences across firms and industries. The analysis identifies four distinct clusters: Sustainability Leaders, Followers, Careless, and Apathetic. The latter three clusters represent varying degrees of coherence between ESG-linked pay and corporate sustainability objectives. Sustainability Leaders demonstrate a structured and transparent governance model, ensuring that ESG-linked remuneration serves as a genuine driver of sustainable transformation. In contrast, Careless and Apathetic firms reveal the prevalence of symbolic ESG pay, where sustainability-linked compensation exists without meaningful alignment with corporate strategic priorities. This suggests that, in some cases, ESG pay functions more as a reputational tool than as a mechanism for real sustainability improvements, raising concerns about greenwashing and impression management.

This study offers several theoretical, empirical, and policy implications, contributing to the ongoing debate on ESG-linked remuneration, corporate governance, and sustainable business practices.

From a theoretical perspective, this study advances the debate on ESG incentives in corporate governance by introducing the ESG Strategic Incentive Alignment Index, which goes beyond traditional binary classifications of ESG-related pay. By distinguishing between substantive and symbolic ESG pay, the research contributes to theories of corporate legitimacy and impression management by demonstrating how ESG pay can serve as a signalling tool rather than a true driver of sustainability goals. This structured approach adds to the literature by providing a systematic framework for assessing the credibility of ESG pay in promoting long-term sustainability commitments. This study contributes to the advancement of Agency Theory and Managerial Power Theory by investigating the extent to which remuneration linked to ESG objectives is aligned with corporate sustainability objectives. It introduces a structured framework for the assessment of this alignment.The ESG Pay-Strategy Alignment Indicator developed in this study offers a quantitative measure of the extent to which ESG-linked incentives are genuinely tied to sustainability performance rather than shaped by discretionary executive influence. From an Agency Theory perspective, the indicator serves as a diagnostic tool to evaluate whether ESG pay structures effectively mitigate agency conflicts by ensuring that outcome-based incentives drive substantive sustainability commitments rather than symbolic compliance.Within the Managerial Power Theory framework, the indicator functions as a proxy for board effectiveness, assessing whether independent oversight mechanisms are sufficient to prevent ESG pay from being leveraged as a reputational strategy rather than an instrument of corporate governance.

The findings of this study provide a robust analytical framework for investors, policymakers, and corporate governance bodies, facilitating a more rigorous assessment of the alignment between executive compensation and corporate sustainability strategies. In particular, institutional investors,

notably pension funds, should adopt structured evaluation methodologies to systematically measure ESG pay and ESG strategy coherence, ensuring that sustainability-linked remuneration serves as a catalyst for tangible progress rather than a mere compliance exercise. Drawing on the Frenchsif model (Frenchsif, 2025), which employs sector-specific methodologies to evaluate the credibility of Say on Climate votes, a systematic application of our indicator would enable investors to elevate ESG-linked remuneration from a procedural formality to an effective governance mechanism, ensuring that executive incentives are quantifiably aligned with credible and ambitious corporate climate strategies, while reinforcing shareholder engagement as a key driver of corporate sustainability.

From a policy perspective, the findings underscore the need for greater standardization and regulatory oversight in ESG-linked remuneration practices. The results indicate that in less regulated sectors, companies enjoy greater discretion in defining ESG targets and measuring executive performance, increasing the risk of misalignment and ineffective incentives. Regulatory bodies should consider establishing clearer guidelines on ESG-linked remuneration structures, ensuring that sustainability incentives are tied to standardized, measurable, and externally verifiable criteria. The CSRD represent steps in this direction, but further refinements are needed to reduce discretion in ESG pay design and enhance transparency. Policymakers should also encourage the adoption of independent third-party ESG assessments in executive remuneration decisions to limit the risk of self-reported, non-standardized ESG metrics. As a market control mechanism, strengthening shareholder oversight could further enhance accountability. A need is the redefinition of the role of “Say on Climate” votes, which, despite early momentum, have seen declining acceptance (MSCI, 2024). In order to enhance the efficacy of the “Say on Climate” initiative, it is imperative to establish a direct correlation with the remuneration of executives. This would serve to transform the “Say on Climate” into a governance mechanism that ensures the provision of financial incentives is directed towards achieving substantive progress in the realm of sustainability. Despite the “Say on Climate” enabling investors to exercise their democratic right by voting on corporate climate transition plans, its influence is waning (Allianz, 2024). The fragmented adoption across Europe, with a preponderance of resolutions in France and the UK, impedes comparability and investor influence, thereby diminishing its efficacy as a mechanism for holding companies accountable. The implementation of our indicator has the potential to enhance transparency and accountability by integrating ESG pay with climate strategies, ensuring that commitments are quantifiable and result-oriented. The introduction of a more clearly defined and methodically structured instrument to evaluate the credibility of remuneration linked to ESG would, it is hypothesised, reinvigorate the “Say on Climate”, thus engendering heightened investor engagement and, by consequence, the restoration of the Say on Climate’s relevance as a pivotal mechanism for corporate climate accountability.

Despite its contributions, this study has certain limitations that offer opportunities for future research. First, the analysis is based on a specific sample of publicly listed Italian companies, which may restrict the generalizability of the findings. Future research could extend the application of the alignment indicator to international contexts, assessing whether the observed patterns hold across different institutional environments, corporate governance models, ownership structures, and sustainability regulatory frameworks. Conducting comparative analyses across countries with varying degrees of ESG regulation and enforcement could offer deeper insights into the contextual factors shaping the alignment and uncover potential regional disparities.

Additionally, the data collection process relied on manual extraction from corporate documents such as remuneration policies and strategic plans. In some cases, the generic formulation of ESG targets and the lack of detailed disclosures on performance metrics necessitated a degree of subjective interpretation by the authors, introducing a potential interpretative bias. Furthermore, the absence of standardized ESG key performance indicators posed challenges for cross-company and cross-sector comparisons, particularly in industries where ESG practices are less mature or inconsistently reported. Future research could benefit from leveraging standardized ESG databases, third-party sustainability ratings, or machine-learning-based text analysis to enhance data reliability and comparability.

Finally, this study evaluates ESG-linked remuneration by analysing individual ESG KPI on an equal footing, without considering the relative priority or weighting of different sustainability objectives within a firm's strategy. This uniform treatment of KPIs may not fully capture the strategic emphasis placed on specific ESG goals, potentially limiting the assessment of how ESG pay aligns with a company's broader sustainability agenda. To enhance the robustness of the study, future research could incorporate factors that influence the selection and prioritization of ESG indicators. Examining board composition, ownership structure, and firm-specific characteristics could provide insights into how governance mechanisms shape the choice of ESG metrics used in executive compensation. Furthermore, analysing whether certain ownership models - such as family-owned businesses, institutional investor-led firms, or state-controlled enterprises - assign different weights to ESG indicators could further clarify the strategic motivations behind ESG pay structures. Moreover, integrating contextual variables such as industry-specific ESG risks, regulatory environments, and shareholder expectations could offer a more nuanced understanding of how firms determine which sustainability objectives to emphasise in executive remuneration. This approach would provide a more comprehensive framework for assessing the effectiveness of ESG-linked pay in driving meaningful sustainability outcomes.

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The Innovation Effect: Friend, Foe, or Force in Corporate Governance?

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Abstract

Frame of the research. *In an era of rapid technological progress, firms must adapt to an evolving corporate landscape where innovation presents both opportunities and challenges. Traditional corporate governance aims to ensure accountability and enhance performance, but its effectiveness may depend on a firm's innovation intensity.*

Purpose of the paper. *This study explores how governance mechanisms function across firms with different R&D intensity levels, analysing the moderating role of innovation in the governance-performance relationship and identifying which features are most impactful in high- versus low-innovation environments.*

Methodology. *A quantitative research design is employed, utilizing panel data regression models on a dataset of 4213 firm-year observations from 484 publicly traded US firms over a 10-year period.*

Results. *Innovation significantly moderates the governance-performance link. Board independence and gender diversity have stronger positive effects in high-innovation firms, suggesting that independent, diverse boards enhance decision-making in complex environments. Conversely, board-specific skills do not exhibit the expected amplification, indicating that adaptability may be more valuable than technical depth in rapidly evolving contexts.*

Research limitations. *The focus on large S&P 500 firms may limit generalizability to smaller or emerging-market firms. Alternative innovation and performance measures were not included.*

Managerial implications. *High-innovation firms should prioritize board independence and diversity as strategic governance levers.*

Originality of the paper. *The study advances governance research by showing that effectiveness varies by innovation intensity, challenging one-size-fits-all models and questioning assumptions such as the universal importance of CEO duality. It calls for more context-sensitive governance frameworks in innovation-driven settings.*

Key words: *Board of directors; firm performance; Innovation; R&D Intensity; Corporate Governance*

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1. Introduction

By 2022, the top 50 most innovative companies globally account for 40% of global corporate Research and Development (R&D) expenditure. These firms allocate a substantially higher share of their revenue to R&D compared to their industry peers (Buntz, 2024; Nindl *et al.*, 2023). The advent of new technologies and the ongoing digital revolution are not only transforming industries (Fenwick and Vermeulen, 2019), but also re-defining how firms are organized, invest, and operate (Chen and Srinivasan, 2024). These shifts exert profound implications for corporate governance, which plays a central role in shaping strategic decision-making, managerial accountability, and resource allocation. One of the most immediate and significant consequences of technological advancements is the redistribution of competencies and decision-making authority within corporations (Picciau, 2021). While some innovations merely require managers to develop new skills and tools, others fundamentally alter power dynamics within firms, potentially influencing financial performance and competitive positioning. Consequently, one of the challenges for companies today is to identify those mechanisms that enable them to 'boost' not only economic performance, but also innovation. Innovation today is seen as an "evolving and dynamic process linking the firm's innovation capacity to its corporate governance quality" (Bobillo *et al.*, 2018, p. 722). Despite extensive research on the corporate governance-performance nexus (Merendino and Melville, 2019; Kumar and Zattoni, 2013), the moderating role of innovation[5] in this relationship has received limited attention. Specifically, what has yet to emerge in the literature is a structured model of the various corporate governance factors that allow for the identification of potential synergies between performance-innovation and corporate governance. This research examines the impact of board-related corporate governance mechanisms (e.g., board gender diversity, board independence, board skills) on firm performance, exploring the role of innovation as a moderating factor in this relationship.

Innovation-intensive industries face rapid change and uncertainty, requiring agile governance and sustained R&D investment. Less innovative sectors prioritize efficiency. Uniform governance models may underperform across contexts. Financial slack-excess resources-supports long-term innovation by easing short-term pressure (Nohria and Gulati, 1996; Renzi, 2012), enhancing strategic flexibility. Less indebted firms with greater financial flexibility should therefore be better positioned to absorb the risks associated with innovation, invest in new technologies and sustain competitive advantages over time. Therefore, understanding the interplay between financial flexibility and debt, governance mechanisms and innovation becomes crucial for developing effective business strategies.

Building on these premises, this study seeks to fill the research gap by investigating how corporate governance mechanisms influence firm performance and how this relationship is moderated by innovation intensity. Specifically, we aim to address the following research questions:

RQ1: Do traditional corporate governance mechanisms operate differently in firms with varying levels of innovation intensity?

RQ2: Are existing governance frameworks sufficiently adaptive to support firms operating at the frontier of innovation, or do they impose constraints that hinder long-term growth?

To answer these questions, we employ a quantitative research design utilizing panel data regression models. The analysis is based on a dataset of 4,213 firm-year observations spanning 484 firms over a 10-year period, classified according to the OECD taxonomy of R&D intensity. Our findings provide empirical evidence that innovation plays a crucial moderating role, amplifying the

[5] Since this study uses the term innovation interchangeably with R&D intensity, it is important to clarify the conceptual basis for this choice. The literature has consistently demonstrated that R&D intensity serves as a strong proxy for innovation output, given its direct influence on firms' ability to generate new products, processes, and technological advancements (Griliches, 1990). Although innovation can manifest in multiple forms, R&D expenditures are widely accepted as a measurable indicator of a firm's commitment to innovation, particularly in technology-driven industries.

impact of governance mechanisms such as board independence and gender diversity on firm performance. These findings provide empirical support for the argument that governance mechanisms operate differently depending on a firm's technological orientation, offering critical insights for scholars, policymakers, and corporate decision-makers alike.

Our findings contribute to the academic literature by offering novel insights into the moderating role of innovation in governance-performance dynamics, thereby enriching existing theoretical frameworks and suggesting avenues for future research. For practitioners and institutional actors, the findings underscore the strategic importance of evaluating governance structures effects in fostering firm performance through the lens of innovation dynamics.

The remainder of the paper is structured as follows: Section 2 reviews the literature and hypotheses, Section 3 details the methodology, Section 4 presents results, followed by discussion and conclusions.

2. Literature review and hypothesis development

2.1 Board independence and firm performance

The relationship between board independence and firm performance has sparked a broad debate in the academic literature, yielding mixed results: on the one hand, some studies have highlighted a positive link between a higher number of independent board members and firm performance (Choi *et al.*, 2007; Black *et al.*, 2006); on the other hand, other studies have found no significant relationship (Brown and Caylor, 2006) or even reported a negative effect (Bhagat and Black, 2001). Some scholars (Uribe-Bohorquez *et al.*, 2018) found that greater board independence is associated with enhanced firm performance; others have reported contrasting findings. For example, Vintilă and Păunescu (2016) identified a negative relationship between the number of independent directors and ROA, arguing that an excessively independent governance structure could limit a firm's ability to maximize asset returns. Vishwakarma and Kumar (2015) emphasized the importance of board independence in the IT sector, highlighting its positive impact on firm performance. This finding suggests that the sectoral context may play a key role in determining the effectiveness of independent governance. According to the Resource Dependence Theory (Pfeffer and Salancik, 1978), firms rely on external resources to survive and compete, and independent directors can provide access to critical knowledge, networks, and strategic insights.

We posit that the impact of board independence on ROA may vary depending on the industry in which the firm operates: high-innovation and low-innovation firms may respond differently to the presence of independent directors due to their distinct operational and strategic dynamics. This leads to our hypothesis:

H1: Board independence has a differential effect on firm performance depending on the industry (high-innovation vs. low-innovation).

2.2 Board Skills and firm performance

The Dynamic Capabilities Theory (Teece *et al.*, 1997) posits that firms operating in environments characterized by rapid technological change achieve competitive advantage by continuously developing and adapting their technological, organizational, and managerial processes. The ability to identify new opportunities and efficiently integrate external knowledge is fundamental for wealth creation in such dynamic settings. Skills and expertise of board members play a crucial role in fostering innovation and guiding strategic decision-making, as they contribute to the development of firm-specific knowledge assets and complementary resources that enhance organizational adaptability.

Several studies have highlighted how the advanced academic background of board members can positively influence firm performance. Swift (2018), analyzing a database of corporate boards in the chemical industry, found that board members holding a PhD tend to serve on multiple boards within the same sector. This interconnection effect improves R&D effectiveness and fosters the diffusion of innovation. This phenomenon, referred to as the "knowledge highway", enables firms to access new technologies more rapidly and develop more effective innovation strategies, which, in the long run, may translate into higher profitability. Saggese and Sarto (2024) examined the impact of directors' educational level, technological background, and financial expertise on firm performance, finding that both general and firm-specific human capital within the board positively influence financial indicators and innovation.

However, the effect of board skills on firm performance may vary depending on the industry in which a company operates. According to Iyer *et al.* (2020), high-tech firms exhibit a significantly different board composition compared to low-tech firms and tend to adopt a more cautious approach in managing capital structure. Specifically, high-tech firms benefit more from the presence of directors with advanced education, as they contribute to the development of more effective innovation and R&D strategies (Helmers *et al.*, 2017). Conversely, low-tech firms tend to rely more on well-connected board members rather than on higher individual educational attainment. This leads to our hypothesis:

H2: The positive effect of board skills on firm performance is stronger in high-innovation firms than in low-innovation firms.

2.3 Ceo-Duality and firm performance

The relationship between CEO duality and firm performance has been extensively analyzed through the lenses of agency theory (Jensen and Meckling, 1976) and stewardship theory (Davis *et al.*, 1997). From an agency theory perspective, CEO duality is considered a weakness in corporate governance, as it exacerbates conflicts of interest between executives and shareholders, reduces board independence, and weakens oversight effectiveness (Krause *et al.*, 2014). CEOs holding both positions may consolidate their power by appointing board members who are less likely to challenge strategic decisions, thereby undermining the board's monitoring role (Fan *et al.*, 2007). Empirical studies confirm these concerns, showing that CEO duality is associated with inefficient resource allocation and reduced monitoring effectiveness, ultimately leading to negative firm performance outcomes (Krause, 2017).

CEO duality can negatively affect firm performance through overconfidence, as powerful CEOs may overestimate their decisions and take unadvised risks (Pollock *et al.*, 2002). Krause *et al.* (2014) found that separating CEO and board chair roles improves performance in struggling firms. Conversely, stewardship theory highlights potential benefits of CEO duality, such as stronger leadership, faster decision-making, and better communication (Donaldson and Davis, 1991). Unified leadership may reduce agency costs and enhance strategic clarity (Ballinger and Marcel, 2010). In stable or knowledge-based sectors, it can improve vision and execution (Quigley and Hambrick, 2012; Tang, 2017).

However, recent literature highlights that the relationship between CEO duality and firm performance is not uniform and largely depends on contextual factors, including industry characteristics. In high-innovation firms, CEO duality may hinder innovation capacity and organizational flexibility, restricting board involvement in strategic decision-making and slowing the firm's adaptation to market changes, ultimately leading to lower firm performance (Kijkasiwat *et al.*, 2024). Conversely, in low-innovation firms, characterized by a more stable operating environment, a consolidated leadership structure may enhance managerial efficiency and ensure greater strategic coherence, potentially resulting in improved firm performance. This leads to our hypothesis:

H3: In high-innovation firms, CEO duality has a negative impact on firm performance, whereas in low-innovation firms, its impact may be positive.

2.4 Board size and firm performance

While some studies argue that larger boards enhance performance due to greater diversity of expertise and strategic knowledge (e.g., De Andrés and Rodríguez, 2011); others have found a negative impact of board size on financial performance, suggesting that excessively large boards may generate inefficiencies that reduce profitability (Vintilă and Păunescu, 2016).

Lipton and Lorsch (1992) suggest that smaller boards ensure better coordination and strategic responsiveness, reducing agency problems and positively influencing firm performance. Cheng (2008) provides empirical evidence that firms with larger boards exhibit lower variability in corporate performance. Yet, Yan *et al.* (2021) confirm a negative correlation between board size and firm performance, with this effect being more pronounced in high-tech firms.

The existing literature highlights a complex relationship between board size and firm performance, with sector-specific variations. Some studies even suggest a non-linear relationship between board size and firm performance, with an optimal range that varies across industries (Coles *et al.*, 2008). In firms where innovation and strategic flexibility are crucial, larger boards may hinder decision-making processes and hinder market adaptability, negatively affecting financial performance. In contrast, in low-innovation firms larger boards may be beneficial. This leads to the following hypothesis:

H4: The negative impact of board size on firm performance is stronger in high-innovation firms than in low-innovation firms.

2.5 Board Compensation and firm performance

The role of board compensation has been often considered a key mechanism for aligning the interests of managers and shareholders (Esposito De Falco, 2024). According to Jensen and Meckling (1976), compensation packages are designed to incentivize board members to adopt strategies that enhance firm value and improve corporate performance. However, the relationship between board compensation and firm performance can also be examined through alternative theoretical lenses. According to the Managerial Power Theory, executives may exert significant influence over their own compensation, leveraging structural, ownership, and prestige-based power (Bebchuk and Fried, 2006) to secure higher pay that does not necessarily align with firm performance. Conversely, Tournament Theory (Lazear and Rosen, 1981) views executive compensation as an incentive structure where large pay differentials between hierarchical levels serve to motivate internal competition, potentially enhancing performance (Eriksson, 1999).

Some studies support that board compensation positively influences firm performance. Lin *et al.* (2011) found that executive compensation effectively mitigates agency problems in high-innovation firms, where performance is a key determinant of compensation structures. Main *et al.* (1996) found a dynamic relationship between past compensation and corporate performance, suggesting that compensation policies are performance-driven. Moreover, prior research has identified a positive association between board compensation and firm performance (Müller *et al.*, 2014; Handa, 2018).

Other studies challenge this relationship. Asmar *et al.* (2024) found that board compensation negatively impacts firm performance, while Roudaki (2018) reported no significant relationship between the two variables.

Given the mixed empirical findings on board compensation and firm performance, it is essential to explore contextual factors that may moderate this relationship. This leads to the following hypothesis:

H5: The impact of board compensation on firm performance varies according to the innovation intensity of the industry, with a stronger effect in high-innovation firms compared to low-innovation firms.

2.6 Board gender diversity and firm performance

From the perspective of Resource Dependence Theory (Hillman and Dalziel, 2003), corporate boards serve a crucial function in providing firms with critical resources, including legitimacy, expertise, and strategic guidance, which can enhance their ability to navigate complex environments (Boyd, 1990). In this context, gender-diverse boards may strengthen resource access and decision-making by incorporating varied perspectives and experiences. Women serving on corporate boards can enhance managerial effectiveness by improving meeting preparedness, introducing diverse perspectives, and demonstrating distinct leadership capabilities compared to their male counterparts (Adams and Ferreira, 2009). Several studies (Brahma *et al.*, 2021) provide evidence of a positive correlation between board gender diversity and firm performance. Focusing on innovation-driven industries, Simionescu *et al.* (2021) provided empirical evidence of the positive influence of female board members on firm performance. These results align with the findings of Dezsö and Ross (2012), who observed that a higher proportion of women in senior management positions leads to enhanced company performance. Additionally, Del Carmen Triana *et al.* (2019) stated that gender diversity fosters strategic change, ultimately improving corporate performance.

However, some studies contradict these findings. Almarayeh (2021) examined firms in Jordan - a market with different institutional and cultural characteristics compared to developed economies - found no significant impact of board gender diversity on financial performance. This suggests that industry and contextual factors may moderate the relationship between gender diversity and firm outcomes. This leads to the following hypothesis:

H6: The impact of board gender diversity on financial performance varies according to the innovation level of the industry, with a more significant effect in high-innovation firms compared to low-innovation firms.

2.7 Level of R&D intensity within an industry as Moderator in the relation between CGM and FP

The technological level of an industry represents a critical factor influencing the relationship between governance mechanisms and firm performance. Firms operating in high-innovation industries significantly differ from those in medium- and low-innovation ones in terms of competitiveness determinants and their ability to appropriate the benefits of innovation (Safón, 2009). High-tech firms are characterized by high research and development intensity, rapid technological evolution, and the constant need for innovation to maintain a competitive advantage. The literature highlights that, in high-tech industries, corporate reputation is strongly linked to innovation capability, making governance systems that support continuous R&D investments and foster entrepreneurial initiatives essential (Safón, 2009). Furthermore, high-innovation firms benefit from technological spillovers generated by other companies in the sector, enhancing their ability to absorb and integrate new knowledge into their technological portfolio (Kessler, 2003).

In low-tech sectors, competitiveness depends on resource optimization and operational efficiency, not innovation. The importance of R&D and the ability to appropriate innovation outcomes thus vary depending on the industry's technological level, with a more pronounced impact in high-tech sectors compared to low-tech ones (Kafouros, 2005). Kafouros (2005) found that R&D had a substantial impact on productivity growth in high-tech firms, whereas its contribution in low-tech sectors was negligible. A valuable framework for this analysis is the taxonomy of economic activities based on R&D intensity proposed by the OECD, which classifies industries into five categories: high, medium-high, medium, medium-low, and low R&D intensity. According to this taxonomy, firms operating in

high R&D-intensity sectors (e.g., pharmaceuticals, aerospace, IT) require governance strategies that promote innovation and knowledge management, whereas in low R&D-intensity sectors (e.g., textiles, wood, food processing), governance strategies are more focused on operational efficiency and cost reduction (Galindo-Rueda and Verger, 2016).

Based on these considerations, we propose the following hypothesis:

H7: The impact of corporate governance mechanisms on firm performance varies according to the innovation level of the industry, with a more significant effect in high-innovation firms than in low-innovation firms.

3. Methodology

3.1 Research design and sample

This study employs a quantitative research design, utilizing panel data regression to investigate the influence of corporate governance mechanisms on firm performance, with a specific focus on the moderating role of innovation. The dataset comprises firms listed in the S&P 500 index, with financial and governance-related data sourced from Refinitiv over a 10-year period (2014-2024).

3.2 Variables and measurements

3.2.1 The dependent variable

Return on Assets (ROA): ROA serves as a primary measure of firm performance, capturing profitability relative to total assets. In the present study we adopted a one-year lag structure, in order to align governance attributes in year t with firm performance in year t+1, addressing simultaneity concerns and reinforcing causal inference. ROA is preferred over alternative profitability metrics, such as Return on Equity (ROE) or Return on Invested Capital (ROIC), due to its ability to provide a more comprehensive and unbiased assessment of a firm's operational efficiency. Unlike ROE, which is highly sensitive to a firm's capital structure, ROA accounts for the total assets employed in generating earnings, thus offering a measure that is independent of financing decisions. Firms with higher leverage may report elevated ROE levels despite weak operational performance, as debt magnifies equity returns (Moghadam and Jafari, 2015). This leverage-induced distortion makes ROE a less reliable indicator of true firm profitability, particularly in industries with heterogeneous financial structures (De Wet and Du Toit, 2007). ROA also facilitates greater comparability across firms, making it especially suitable for studies involving cross-sectoral analyses. Since the level of financial leverage varies significantly between industries, ROE can be misleading when comparing firms operating in different economic sectors (Fairfield and Yohn, 2001). In contrast, ROA normalizes firm performance based on total asset utilization, providing a consistent benchmark for evaluating managerial efficiency regardless of a firm's financing strategy (Yousaf and Dey, 2022). This feature is particularly relevant in studies focusing on corporate governance and innovation, where the objective is to examine how structural and managerial characteristics influence firm performance, independent of capital structure decisions.

3.2.2 Independent variables

CEO Chairman Duality: a binary variable indicating whether the CEO concurrently serves as the board chair (1 = duality; 0 = separation). CEO duality has been linked to agency conflicts and governance efficacy (Krause *et al.*, 2014).

Board Specific Skills: the proportion of board members with industry-specific expertise, reflecting the board's strategic advisory capacity in complex environments (Saggese and Sarto, 2024).

Board Size: the total number of board members, included due to its debated role in governance effectiveness (Coles *et al.*, 2008).

Board Compensation per Member: normalized board compensation, computed as total board compensation divided by board size, mitigating distortions from firm-level variations in board structure (Main *et al.*, 1996).

Independent Board Members: the percentage of independent directors, included to assess their impact on monitoring efficacy and managerial oversight (Black *et al.*, 2006).

Board Gender Diversity: the percentage of female board members, reflecting diversity's influence on decision-making quality and firm outcomes (Adams and Ferreira, 2009).

3.2.3 Control variables

Number of Employees: a proxy for firm size, in recognition of the fact that governance structures and resource allocation vary with firm scale (Cheng, 2008).

Debt-to-Equity Ratio: a measure of financial leverage, included due to its potential implications for risk exposure and corporate governance (Rajan and Zingales, 1995)

3.2.4 Moderating variable

Innovation: a categorical variable ranging from 0 (low R&D intensity) to 4 (high R&D intensity), derived from OECD classifications and The Refinitiv Business Classification (TRBC) industry categorizations.

All the variables involved in the model are summarised in Table 1.

Tab. 1: Variables

	Variable	Tipe	Measurement	Reference
Dependent Variable	Return on Assets (ROA)	Continuous	Net income / Total assets (one-year lag)	Hillman and Dalziel (2003)
Independent Variables	CEO Chairman Duality	Binary (0/1)	1 = CEO is also board chair; 0 = otherwise	Jensen and Meckling (1976)
	Board Specific Skills	Continuous (%)	% of board members with industry-specific expertise	Saggese and Sarto (2024)
	Board Size	Continuous	Total number of board members	Coles *et al.* (2008)
	Board Compensation per Member	Continuous ($)	Total board compensation / Board size	Main *et al.* (1996)
	Independent Board Members	Continuous (%)	% of independent directors	Black *et al.* (2006)
	Board Gender Diversity	Continuous (%)	% of female board members	Adams and Ferreira (2009)
Control Variables	Number of Employees	Continuous	Total number of employees	Cheng (2008)
	Debt-to-Equity Ratio	Continuous (%)	Total debt / Total equity	Rajan and Zingales (1995)
Moderating Variable	Innovation	Categorical	Scale from 0 (low R&D intensity) to 4 (high)	OECD, TRBC classifications

Source: Authors' elaboration

3.3 Model specification

Given the longitudinal nature of the data, a Hausman test (Hausman, 1978) was performed to determine the appropriate model specification. The test yielded a p-value of 0.5829, indicating that the random effects model is preferable, as it does not suffer from endogeneity concerns associated with fixed effects estimation. Nevertheless, robustness checks were conducted using a fixed effects model to assess the stability of coefficient estimates. To detect potential issues with multicollinearity, a Variance Inflation Factor (VIF) test was conducted, revealing that all independent variables had VIF values close to 1, indicating no multicollinearity concerns. Additionally, a Breusch-Pagan test

for heteroscedasticity yielded a significant p-value ($p < 0.001$), suggesting the presence of heteroscedasticity. To account for this, clustered standard errors at the firm level were employed in the final regression model, as they correct for both heteroskedasticity and serial correlation, ensuring more reliable inference (Cameron and Miller, 2015). Endogeneity concerns were further assessed through an instrumental variable (IV) approach using lagged values of governance variables as instruments. The IV regression results were consistent with the main findings.

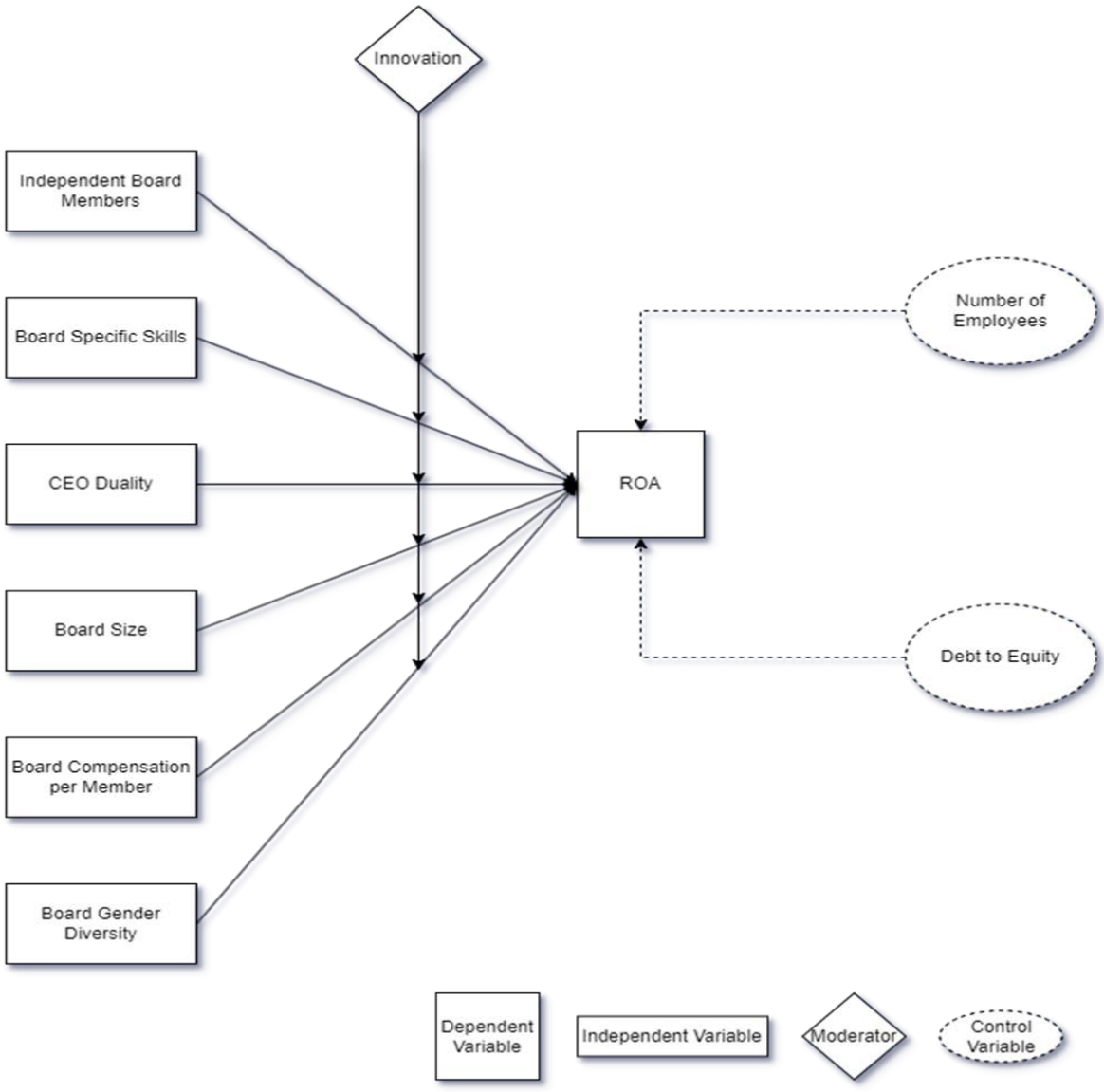
The empirical model is specified as follows:

$$\begin{aligned} ROA_{\{it+1\}} = {} & \beta_0 + \beta_1 CEO\ Duality_{\{it\}} + \beta_2 Innovation_{\{it\}} + \beta_3 Board\ Skills_{\{it\}} \\ & + \beta_4 Board\ Size_{\{it\}} + \beta_5 Board\ Compensation\ per\ Member_{\{it\}} \\ & + \beta_6 Independent\ Board\ Members_{\{it\}} + \beta_7 Board\ Gender\ Diversity_{\{it\}} \\ & + \beta_8 Employees_{\{it\}} + \beta_9 Debt - to - Equity_{\{it\}} \\ & + \sum \beta_k \left(Innovation_{\{it\}} * Governance_{\{it\}} \right) + \epsilon_{\{it\}} \end{aligned}$$

i indexes firms, t denotes years, and epsilon represent the idiosyncratic error term.

Figure 1 summarizes the proposed model.

Fig. 1: Proposed model



Source: Authors' elaboration

3.4 Data Collection

The dataset was constructed using firm-level data retrieved from Refinitiv, a widely recognized financial database. The sample consists of all firms included in the S&P 500 index during the study period (2014-2024). The dependent variable (ROA) was collected for 10 years (2015-2024), while governance-related and financial data were collected for 11 years (2014-2024) for independent and control variables, to accommodate the one-year lag structure.

3.5 Data Processing and Standardisation

To ensure data reliability and consistency, firms with missing observations on key variables were excluded, yielding an unbalanced panel dataset of 4,213 firm-year observations across 484 firms (T = 1-10). Recognizing industry heterogeneity, firms were classified using TRBC and mapped to the OECD taxonomy of R&D intensity. This process facilitated the construction of the "Innovation" variable, a categorical measure ranging from 0 (low R&D intensity) to 4 (high R&D intensity), distinguishing between high-innovation and low-innovation firms and enabling the examination of sectoral differences in corporate governance dynamics.

Independent and control variables were lagged by one year to mitigate simultaneity bias and strengthen causal inference. All continuous independent and control variables were standardized using the scale() function in R. Standardization enhances comparability, reduces heteroscedasticity, and facilitates coefficient interpretation (Gelman, 2008).

4. Results

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics for the variables included in the analysis. The mean Return on Assets (ROA) is 8.13%, with a standard deviation of 6.82%, indicating moderate variability in firm performance across the sample. The median ROA is 6.89%, suggesting a relatively symmetrical distribution around the mean.

Regarding corporate governance characteristics, CEO duality is present in 51% of firm-year observations, highlighting that a significant portion of firms have their CEO also serving as board chair. The proportion of board members with industry-specific expertise (Board Specific Skills) averages 56.71%, with a relatively low standard deviation of 17.96%, indicating moderate variation across firms. On average, 84.46% of board members are declared independent by the firms, with some firms exhibiting almost full board independence (95.24%) and others as low as 33.33%. Gender diversity on boards remains limited, with female representation averaging 25.23% and ranging from 0% to 66.67%.

The average board size consists of 11 members, but there is substantial variation, with some firms having as few as four board members and others reaching as many as 30. Board member compensation exhibits significant dispersion, with a mean value of $352905.70 per member but a highly skewed distribution (SD = $3317051.70), reflecting outliers where some firms allocate extremely high compensation packages.

Firm size, measured by the number of employees, is highly heterogeneous. The mean number of employees is 53857, but with a median of 18889 and a maximum of 2.3 million, the data suggest a right-skewed distribution, capturing firms of vastly different scales. Financial leverage, proxied by the debt-to-equity ratio, averages 2.05% but varies significantly across firms (SD = 12.97%), with some firms having no debt and others reaching 422.10%.

The innovation intensity classification follows the OECD taxonomy, with an average value of 1.6 on a scale from 0 (Low) to 4 (High). The distribution indicates that firms are more concentrated in

the lower and middle levels of innovation intensity, as reflected in the median value of 1 and a standard deviation of 1.62

Tab. 2: Descriptive statistics of the sample

	vars	n	mean	sd	median	trimmed	mad	min	max	range	skew	kurtosis	se
ROA	1	4213	8.13	6.82	6.89	7.47	5.66	-33.45	76.25	109.7	1.06	5.94	0.11
CEO_Chairman_Duality	2	4213	0.51	0.5	1	0.51	0	0	1	1	-0.04	-2	0.01
Board_Specific_Skills	3	4213	56.71	17.96	56.25	56.68	18.53	0	100	100	-0.05	-0.06	0.28
Board_Size	4	4213	11.08	2.22	11	11.01	1.48	4	30	26	0.93	4.87	0.03
Board_Compensation_per_Member	5	4213	352904.69	3317051.7	267511.33	268261.23	59591.97	1293.75	214424890.9	214423597.1	63.8	4114.58	51104.19
Independent_Board_Members	6	4213	84.46	8.88	87.5	85.92	6.18	33.33	95.24	61.9	-1.62	3.14	0.14
Board_Gender_Diversity	7	4213	25.23	10.12	25	25.01	10.11	0	66.67	66.67	0.23	0.29	0.16
Number_of_Employees	8	4213	53857.06	137958.63	18889	30194.6	21333.13	10	2300000	2299990	11.1	160.8	2125.46
Debt_to_Equity	9	4213	2.05	12.97	0.79	0.93	0.62	0	422.1	422.1	25.1	733.78	0.2
Innovation	10	4213	1.6	1.62	1	1.49	1.48	0	4	4	0.34	-1.57	0.02

Source: Authors' elaboration

4.2 Correlation Analysis

To assess potential collinearity issues, Table 3 presents the correlation matrix. As expected, Innovation exhibits a positive correlation with ROA ($r = 0.37$, $p < 0.01$), suggesting that firms in more R&D-intensive sectors tend to have higher profitability. Board Size is negatively correlated with ROA ($r = -0.19$, $p < 0.01$), potentially indicating inefficiencies associated with larger boards. CEO Duality shows a weak negative correlation with ROA ($r = -0.07$), consistent with agency theory arguments that separating CEO and chair roles enhances governance effectiveness. The correlation between Board Compensation per Member and ROA is close to zero ($r = 0.006$), suggesting no simple linear relationship.

To further examine multicollinearity, Variance Inflation Factor (VIF) tests were conducted. All VIF values are way below the commonly accepted thresholds (Gujarati and Porter, 2009), indicating that multicollinearity is not a concern in the regression model.

Tab. 3: Correlation matrix

	ROA	CEO_Chairman_Duality	Board_Specific_Skills	Board_Size	Board_Compensation_per_Member	Independent_Board_Members	Board_Gender_Diversity	Number_of_Employees	Debt_to_Equity	Innovation
ROA	1	-0.067760223	0.039938374	-0.1900848	0.006810832	-0.05650031	0.008931988	-0.013734064	0.006140993	0.371314895
CEO_Chairman_Duality	-0.067760223	1	-0.088880185	0.120555	0.011254469	0.15206652	0.048473507	0.015810798	0.005688808	-0.007237936
Board_Specific_Skills	0.039938374	-0.088880185	1	-0.1670817	-0.018828456	-0.11322656	0.003420673	-0.07243864	-0.018635887	0.008583491
Board_Size	-0.190084801	0.120555001	-0.167081698	1	-0.013451018	0.09996549	0.080009399	0.132257403	-0.027264658	-0.200631432
Board_Compensation_per_Member	0.006810832	0.011254469	-0.018828456	-0.01345102	1	-0.03687678	-0.003087857	-0.002851759	-0.002955741	0.021201547
Independent_Board_Members	-0.056500313	0.152066525	-0.113226558	0.09996549	-0.036876775	1	0.23664856	-0.037402268	-0.027580587	0.049727059
Board_Gender_Diversity	0.008931988	0.048473507	0.003420673	0.0800094	-0.003087857	0.23664856	1	0.101492724	-0.010541971	-0.047411967
Number_of_Employees	-0.013734064	0.015810798	-0.07243864	0.1322574	-0.002851759	-0.03740227	0.101492724	1	0.008357064	-0.059886254
Debt_to_Equity	0.006140993	0.005688808	-0.018635887	-0.02726466	-0.002955741	-0.02758059	-0.010541971	0.008357064	1	0.012512284
Innovation	0.371314895	-0.007237936	0.008583491	-0.20063143	0.021201547	0.04972706	-0.047411967	-0.059886254	0.012512284	1

Source: Authors' elaboration

4.3 Regression and Moderation Analyses

The main regression model, estimated using random effects panel regression, is summarised in Table 4. The Hausman test confirmed the appropriateness of the random effects specification ($p = 0.5829$). Innovation has a strong and significant positive effect on ROA ($\beta = 2.35$, $p < 0.001$), reinforcing the notion that firms with greater R&D intensity tend to perform better. Among

governance variables, Board Gender Diversity is positively associated with ROA (β = 0.44, p < 0.001), suggesting that gender-diverse boards contribute to firm performance. Notably, Board Size exerts a significant negative effect on ROA (β = -0.34, p < 0.01), indicating that larger boards may hinder decision-making efficiency. The direct relationships between the remaining independent variables and ROA are not significant, with the exception of Board Specific Skills, which approximates the commonly accepted range of significance (p = 0.08).

Tab. 4: Random effects panel regression summary

Oneway (individual) effect Random Effect Model (Swamy-Arora's transformation)					
Call:					
plm(formula = ROA ~ CEO_Chairman_Duality * Innovation + Board_Specific_Skills * Innovation + Board_Size * Innovation + Board_Compensation_per_Member * Innovation + Independent_Board_Members * Innovation + Board_Gender_Diversity * Innovation + Number_of_Employees + Debt_to_Equity, data = pdata, model = "random")					
Unbalanced Panel: n = 484, T = 1-10, N = 4213					
Effects:					
	var	std.dev	share		
idiosyncratic	16.417	4.052	0.424		
individual	22.343	4.727	0.576		
theta:					
Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.3492	0.7253	0.7384	0.7245	0.7384	0.7384
Residuals:					
Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-41.643	-1.585	-0.501	-0.025	1.229	66.008
Coefficients:					
Variable	Estimate	Std.	Error	z-value	Pr(>|z|)
(Intercept)	8.317.961	0.228906	363.379	< 2.2e-16	***
CEO_Chairman_Duality	-0.09309	0.105563	-0.8818	0.377871	
Innovation	2.347.963	0.228684	102.673	< 2.2e-16	***
Board_Specific_Skills	0.163206	0.093231	17.506	0.080022	.
Board_Size	-0.34239	0.116596	-29.365	0.003319	**
Board_Compensation_per_Member	0.102057	0.550218	0.1855	0.852848	
Independent_Board_Members	0.048358	0.114033	0.4241	0.671516	
Board_Gender_Diversity	0.441804	0.088688	49.815	6.31E-04	***
Number_of_Employees	0.095243	0.186383	0.511	0.609344	
Debt_to_Equity	-0.02421	0.070477	-0.3434	0.731266	
CEO_Chairman_Duality:Innovation	0.028236	0.108495	0.2602	0.794674	
Innovation:Board_Specific_Skills	0.142095	0.092637	15.339	0.125057	
Innovation:Board_Size	0.130396	0.116377	11.205	0.262519	
Innovation:Board_Compensation_per_Member	-0.26947	0.632493	-0.426	0.670075	
Innovation:Independent_Board_Members	0.301539	0.113621	26.539	0.007957	**
Innovation:Board_Gender_Diversity	0.41276	0.086583	47.672	1.87E-03	***
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					
Total Sum of Squares	74397				
Residual Sum of Squares	70140				
R-Squared	0.057462				
Adj. R-Squared	0.054093				
Chisq	200.05 on 15 DF				
p-value	< 2.22e-16				

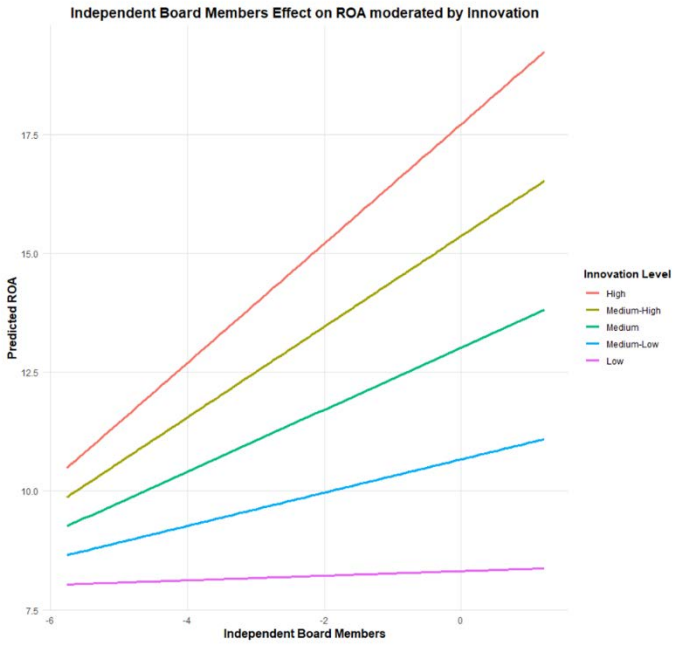
Source: Authors' elaboration

The interaction terms provide further insights into the moderating role of innovation. Specifically, the interaction between Innovation and Independent Board Members is positive and significant (β = 0.30, p < 0.05), indicating that a higher board independence is particularly valuable in high-innovation environments. Similarly, the interaction between Innovation and Board Gender Diversity is significant and positive (β = 0.41, p < 0.001), suggesting that gender diversity on boards has an amplified positive effect in firms with higher levels of innovation. The interactions of Innovation with the remaining independent variables (CEO Duality, Board Specific Skills, Board Size, Board Compensation per Member) are not significant.

A Wald test (Marshall, 2007) was conducted to assess the joint significance of the interaction terms, yielding a highly significant result (χ^2 = 44.86, p < 0.001), confirming that Innovation moderates the effects of governance variables on firm performance. To visualize these effects,

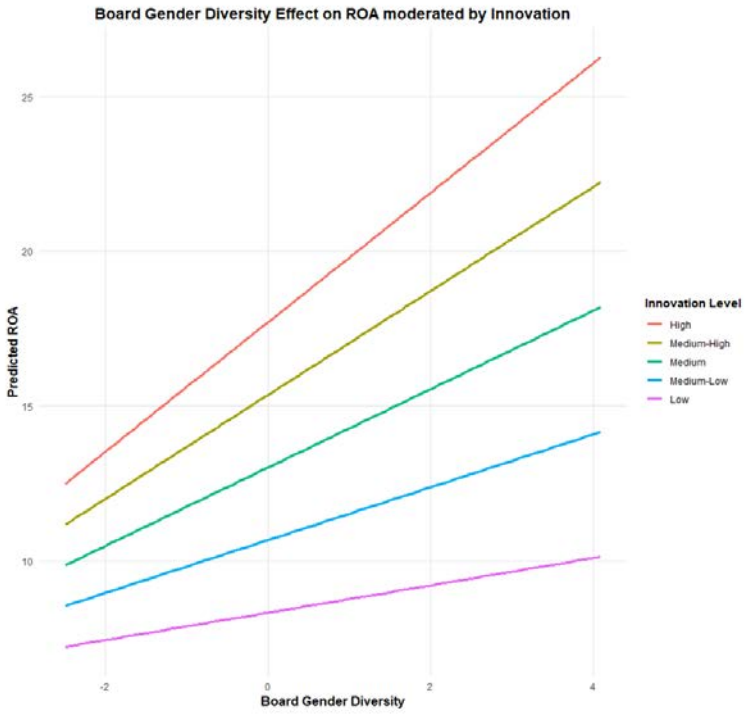
interaction plots were generated. Figure 2 illustrates the moderating role of Innovation in the relationship between Independent Board Members and ROA. The positive slope of the interaction suggests that in highly innovative firms, a higher percentage of independent directors contributes more positively to performance compared to firms with low innovation intensity. A similar pattern emerges for Board Gender Diversity (Figure 3): Board Gender Diversity has a stronger positive effect on ROA in firms with higher Innovation intensity, further supporting the moderating role of Innovation in corporate governance effectiveness.

Fig. 2: Innovation moderating Independent Board Members effect on ROA



Source: Authors' elaboration

Fig. 3: Innovation moderating Board Gender Diversity effect on ROA



Source: Authors' elaboration

4.4 Robustness Checks

To ensure the robustness of the findings, alternative model specifications were tested. A fixed effects model, though methodologically inferior due to the Hausman test results, was estimated for comparison. The adjusted R^2 of the fixed effects model was negative (-0.107), suggesting that random effects provide a better fit for the data. Additionally, an instrumental variables (IV) regression was conducted using lagged values of governance variables as instruments (Wooldridge, 2010). The IV estimates were consistent with the main results, with Board Size remaining significantly negative ($\beta = -1.30$, $p < 0.001$), further supporting the inefficiency hypothesis of larger boards. Finally, a clustered standard errors approach was applied to account for potential within-group correlation (Petersen, 2009), yielding similar coefficient estimates but with adjusted standard errors. The significance levels of key variables, particularly Innovation and its interactions, remained robust under these alternative specifications.

5. Discussion

In an increasingly technological, digitized, data-centric, and dehumanized world, companies must continuously adapt their strategies to remain competitive in markets characterized by rapid innovation and increasing complexity. In this context, corporate governance plays a key role, influencing not only operational efficiency and the ability to generate economic and financial results, but also the ability to invest in research and development, manage risk, and take advantage of emerging opportunities. This paper has not only limited analysed the relationship between traditional corporate governance mechanisms (particularly those closely related to the composition and characteristics of the BoD) and corporate performance but has also sought to understand how and to what extent R&D intensity moderates this relationship, highlighting how governance structures can have different effects depending on the innovation environment in which the firm operates.

Our analysis provides partial support for H1, which proposed that board independence would have a differential effect on firm performance depending on industry innovation intensity. The significant positive interaction between innovation and independent board members suggests that board independence becomes increasingly valuable as innovation intensity rises. This finding aligns with Resource Dependence Theory (Pfeffer and Salancik, 1978), indicating that independent directors in high-innovation contexts may serve as crucial boundary spanners, facilitating access to external knowledge networks and resources essential for innovation-driven growth. The enhanced effectiveness of independent directors in high-innovation firms may be attributed to several mechanisms. First, independent directors often bring diverse industry experiences and professional networks that can be particularly valuable in rapidly evolving technological landscapes. Second, their external perspective may help challenge established thinking patterns and promote innovative strategies, which is especially critical in R&D-intensive sectors. Third, independent directors' objectivity may be particularly valuable in evaluating risky R&D investments and monitoring their execution, helping to balance innovation pursuits with prudent resource allocation.

Our analysis found only marginal support for H2 (Board Specific Skills main effect: $\beta = 0.163$, $p < 0.08$), suggesting a trend toward positive influence of board expertise on firm performance. However, the interaction with innovation intensity was not significant, challenging the hypothesis that the value of board skills would be amplified in high-innovation contexts. This finding presents an interesting paradox: while specialized expertise appears beneficial overall, its value does not necessarily increase with technological complexity as previously theorized. Such unexpected results might be explained through the lens of knowledge diversity theory (Walrave *et al.*, 2024). In high-innovation contexts, the rapid pace of technological change may make specific technical expertise less valuable than broader strategic capabilities and adaptive thinking. The ability to integrate diverse

knowledge sources and navigate uncertainty might be more critical than deep domain expertise, which could potentially become outdated in fast-evolving technological landscapes.

Our findings do not support H3, which predicted that CEO duality would have a negative impact on firm performance in high-innovation firms and a positive impact in low-innovation firms. The results, however, indicate that CEO duality is not significantly associated with firm performance in the main model. This finding aligns with prior mixed evidence in the literature, where some studies suggest that CEO duality leads to excessive managerial power and weakens oversight while others argue that combining these roles fosters stronger leadership and more efficient decision-making (Brickley *et al.*, 1997). The non-significant interaction between CEO duality and innovation suggests that the performance implications of combining the CEO and board chair roles may be more nuanced than previously theorized. This result challenges both agency theory predictions about the detrimental effects of CEO duality and stewardship theory arguments about its benefits (Davis *et al.*, 1997; Jensen and Meckling, 1976). The absence of a significant relationship might be explained through an institutional theory lens. In highly institutionalized contexts like the S&P 500, firms may have developed sophisticated internal mechanisms and external monitoring systems that effectively mitigate potential agency problems regardless of leadership structure. Furthermore, the increasing sophistication of board processes and the strengthening of lead independent director roles may have reduced the practical significance of formal CEO-chair separation.

H4 is confirmed: larger board size negatively impacts firm performance, supporting agency theory on coordination inefficiencies (Vintilă and Păunescu, 2016; Yan *et al.*, 2021). The interaction with innovation is not significant, suggesting that board size's drawbacks-slower decision-making and bureaucratic delays-persist even in high-innovation firms. This challenges the view that innovation context moderates the board size effect and indicates that smaller, more agile boards may be beneficial regardless of a firm's innovation intensity. This result presents an interesting contradiction to studies suggesting industry-specific optimal board sizes (Coles *et al.*, 2008). The consistent negative effect across innovation levels may indicate that the coordination costs of larger boards outweigh potential benefits of diverse expertise, even in complex technological environments. This finding has important implications for board structure decisions, suggesting that maintaining smaller, more agile boards might be universally beneficial rather than context dependent. Hence, despite the potential need for greater expertise in R&D-intensive firms, the drawbacks of excessive board size remain predominant.

H5 posited that in high-innovation firms, a higher board compensation per member would be positively associated with firm performance by incentivizing better oversight and decision-making. However, we found no significant relationship between board compensation and firm performance, either directly or when moderated by innovation intensity. This challenges traditional agency theory assumptions about the motivational effects of compensation and raises important questions about the effectiveness of financial incentives in complex technological environments. This finding is in fact in line with studies that question the effectiveness of board compensation as a governance tool, especially when compensation structures do not align with long-term firm performance (Core *et al.*, 1999). Furthermore, the absence of a compensation effect might be understood through motivation crowding theory (Frey and Jegen, 2001). In knowledge-intensive contexts, intrinsic motivation and professional reputation may be more powerful drivers of director behavior than financial incentives. Finally, the standardization of board compensation practices among S&P 500 firms may have reduced its discriminatory power as a governance mechanism.

H6 proposed that greater board gender diversity would be positively associated with higher firm performance, reflecting enhanced decision-making diversity and stakeholder representation. Our findings strongly support H6, revealing a significant direct effect on firm performance and also positive interaction between board gender diversity and innovation.

Gender-diverse boards enhance performance by bringing varied perspectives to strategic decisions (Adams and Ferreira, 2009; Brahma *et al.*, 2021), strengthening board monitoring through greater independence (Del Carmen Triana *et al.*, 2019), and fostering inclusive dynamics that improve information flow and deliberation (Dezsö and Ross, 2012; Simionescu *et al.*, 2021).

This result extends beyond previous studies that found general positive effects of gender diversity (Brahma *et al.*, 2021) by demonstrating that such benefits are amplified in high-innovation contexts. The stronger positive effect of gender diversity in innovation-intensive firms suggests that diverse boards may be particularly effective at navigating complex technological environments and fostering innovative thinking. This may be true for several reasons. First, innovation often requires creative problem-solving and the ability to consider multiple approaches simultaneously - capabilities that diverse boards are better equipped to provide. Second, high-innovation contexts often involve greater uncertainty and complexity, making thorough deliberation and risk assessment, characteristics often associated with gender-diverse boards, especially crucial. Third, innovation-driven firms typically need to understand and respond to diverse market needs and stakeholder expectations, a task that may be better accomplished by boards with diverse demographic composition.

Our findings support H7, showing that corporate governance mechanisms have stronger effects in high-innovation firms. Board independence and gender diversity are especially impactful. These results confirm that governance effectiveness depends on innovation intensity, reinforcing a contingency theory where governance must align with a firm's technological and strategic complexity.

The stronger impact of governance mechanisms in high-innovation firms may be explained through several theoretical lenses: i) Information Processing Perspective: high-innovation environments generate more complex information processing and knowledge management demands, making effective governance structures more critical for firm success, as suggested by Guldiken and Darendeli's (2016) study of board characteristics and firm innovation; ii) Resource Dependence Theory: innovation-intensive firms have greater need for external resources and knowledge, making governance mechanisms that facilitate resource acquisition and knowledge transfer more valuable (Hillman *et al.*, 2009); iii) Risk Management Framework: the higher uncertainty in innovation-intensive environments makes effective governance and board involvement more crucial for managing risks and evaluating strategic opportunities (Xu, 2024).

5.2 Implications for Theory Development

Our findings contribute to corporate governance and management theories in several important ways.

First, they challenge the universality of traditional Agency Theory prescriptions, suggesting that governance mechanisms operate differently depending on innovation context.

Second, they extend and refine Resource Dependence Theory by demonstrating that board expertise does not always amplify firm performance in high-innovation settings and that the value of external resources and diverse perspectives increases with innovation intensity.

Third, they contrast with the Dynamic Capabilities view that specialized knowledge is always a competitive advantage, indicating that strategic adaptability may be more critical in fast-changing industries.

Fourth, results on CEO duality question both Agency and Stewardship perspectives, suggesting that its impact is highly contingent on contextual factors.

Fifth, they contribute to the emerging literature on board diversity by providing evidence that board gender diversity's benefits are contingent on innovation context.

Finally, they suggest a need to move beyond simple linear relationships in governance research toward more complex, context-dependent theoretical models.

5.3 Implications for Practice

Our findings offer several practical implications for corporate leaders, board members, policymakers and institutional investors.

First, boards of directors in high-innovation companies should prioritise independence and gender diversity, as these characteristics show amplified positive effects on performance in innovation-intensive competitive arenas. Firms should focus on appointing independent directors with diverse perspectives and backgrounds that can enhance strategic decision-making in complex technology-led scenarios.

Second, our results regarding board size suggest that companies should carefully consider the efficiency costs of larger boards, regardless of their innovation intensity. Organizations should strive to maintain smaller, more agile boards while ensuring adequate expertise coverage. This might involve creating specialized board committees or establishing advisory panels rather than expanding the main board.

Third, the non-significant relationship between board compensation and performance, even in high-innovation contexts, suggests that firms should reconsider their director compensation strategies. Rather than focusing primarily on financial incentives, companies might benefit from emphasizing other factors that motivate directors' engagement, such as opportunities for professional development and meaningful involvement in strategic decisions.

Finally, the differential effects of governance mechanisms across sectors with different innovation intensity suggest that corporate governance codes and regulations might benefit from more nuanced, industry-specific guidelines rather than one-size-fits-all approaches. Furthermore, institutional investors may benefit from incorporating governance-innovation alignment metrics into their investment evaluation frameworks: this approach could help them identify firms with governance structures best suited to sustain long-term growth in technology-driven industries.

6. Conclusion

This paper studies the moderating role of Innovation in the relationship between corporate governance mechanisms and firm performance, by using the empirical data of U.S. listed companies constituting the S&P 500 index from 2014 to 2024.

Our findings demonstrate that the effectiveness of governance mechanisms varies significantly with innovation intensity, with particularly strong effects for board independence and gender diversity in high-innovation firms. These results challenge the notion of universal best practices in corporate governance and suggest the need for more contextualized approaches.

This study unavoidably presents some limitations, which reveal opportunities for future research. First, our sample is limited to S&P 500 firms, which are predominantly large, well-established companies. This may limit the generalizability of our findings to smaller firms or companies in emerging markets, where governance mechanisms might operate differently. Second, we employed ROA as a proxy of firms' performance, but some governance mechanisms might change their influence with respect to other financial indicators, such as Tobin's Q. Third, while we use R&D intensity as a proxy for innovation, this measure may not capture all aspects of technological advancement and innovation capability.

Future research could extend this work by examining additional innovation and performance metrics, investigating smaller firms and emerging markets, and exploring the dynamic evolution of governance mechanisms as firms' innovation intensity changes over time.

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Track 12
Supply Chain Management, Logistics & Operations

Bridging Micro to Meso: Effect of Team Tenure on Dispersion of Individual Proactivity

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Abstract

***Frame of the research**: Drawing on Multilevel Theory (Kozlowski and Klein, 2000), we argue that proactivity in the workplace might not emerge following a convergent pattern. After reviewing the relevant extant literature, we notice that team proactivity is often conceptualized as a compositional phenomenon. A composition approach presupposes that over time, individual elemental contribution tends to converge, meaning that team members tend to resemble each other's.*

***Purpose of the research**: We argue that proactivity can follow compilational (divergent) emergence in which nuanced and complex interactions shape proactivity emergence.*

***Methodology**: To support our reasoning, we conducted an empirical study using survey data coming from 54 working teams nested into 13 manufacturing firms.*

***Results** suggest that the more employees work together, the higher the within-team divergence, meaning that proactivity does not always emerge convergently.*

***Research limitations**: Limitations are mainly three. Sample size related to the Italian companies belonging to manufacturing industry. Moreover, only two proactive behaviors are considered.*

***Managerial implications**: Teams with highly proactive employees can emerge as poorly proactive teams. We suggest adopting a context-specific and contingent approach to composing working teams.*

***Originality of the paper**: Results openly contrast extant literature, which posits a convergent emergence pattern. This paper represents one of the few attempts to unpack an emerged phenomenon analyzing its emergence.*

Key words: *Proactive behaviors; Multilevel Theory (MLT); Multilevel Emergence; Team Proactive Behaviors*

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1. Introduction

Proactivity emerged as one of the most interesting topics in behavioral operations and applied psychology research, with most studies focusing on individual levels. It is defined as self-starting, future-oriented behavior to bring about change (Parker and Collins, 2010) to improve the status quo (Parker *et al.*, 2006; Griffin *et al.*, 2007; Cai *et al.*, 2018). Individual proactive behaviors (IPBs) in the workplace usually consist of behaviors such as feedback seeking (Ashford *et al.*, 2003), information seeking (Morrison, 1993), taking charge (Morrison and Phelps, 1999), voicing (LePine and Van Dyne, 1998; Van Dyne and LePine, 1998). Proactive workers are more inclined to get to the root causes of emerging problems, generate creative ideas, take charge of the workplace improvement process, and voice their ideas (Parker and Collins, 2010; Vough *et al.*, 2017). Because of this tendency, employees who display such behavior tend to solve operational problems and prevent their reoccurrence, spot opportunities for improvement, and actively start improvement processes (Galeazzo and Furlan, 2021; Choo *et al.*, 2007; Furlan *et al.*, 2019; Parker *et al.*, 2006). Albeit much effort is devoted to studying IPB, much fewer studies on proactivity deal with proactivity at the team level, i.e., team proactive behaviors (TPB). This is surprising since, as the literature on operational excellence and lean management shows, most of improvements resulting from proactive initiatives are the results of a team effort. TPB can be defined as a team's proclivity to engage in self-started, future-focused behavior aiming to change and improve the environment in which it operates (Williams *et al.*, 2010).

In this paper, we draw on the multilevel theory (MLT) to explore TPB emergence (Kozlowski and Klein, 2000). Kozlowski and Klein (2000, p.55) define an emergent phenomenon as "[phenomenon is emergent] when it originates in the cognition, affect, behaviors, or other characteristics of individuals, is amplified by their interactions, and manifests as a higher-level, collective phenomenon''. In the MLT, it is theorized that organizational constructs emerge across levels following different patterns. In the extreme cases of perfect isomorphism or discontinuity, they either follow a compositional (convergent) or compilational (divergent) emergence process. In a compositional emergence, due to the elemental isomorphism of lower-level manifestations, higher-level phenomena are yielded by the convergent emergence of their lower-level constituents. For example, a compositional construct can be operationalized through an average of individual contributions, given that the higher-level construct emerges from a convergent dynamic. On the other hand, a compilation emergence based on elemental discontinuity, results in a higher-level construct, functionally similar to lower-level manifestations but structurally different. Therefore, units' configurations and composition yield a higher-level construct, which encompasses a divergence of individual contributions over time.

Following the MLT, unit-level constructs can be divided into three categories: global, shared, and configural proprieties. Global proprieties (e.g., group size or unit function) are mainly descriptive constructs that do not originate at the individual level. Shared and configural proprieties originate in people's perceptions, beliefs, and behaviors. They originate at the individual level, and after an emerging process, they manifest themselves at the unit level. Shared constructs are based on compositional emergence, in which individual elemental contributions are isomorphic, equally contributing to yield unit-level phenomena via individual contributions convergence. Configural constructs, based on compilational emergence, capture unit configuration or differences in individuals' characteristics within a unit. Their manifestation does not rely on isomorphism but rather on non-linear, complex, and divergent patterns of emergence. A configural construct consists of a functionally equivalent but structurally different phenomenon than its lower-level constituents. As an example of the differences between shared and configural proprieties, we depict two different conceptualizations of team knowledge. If team knowledge is conceptualized as shared unit propriety (compositional emergence), it will be operationalized as the amount of knowledge shared between unit members. On the other hand, if team knowledge is conceptualized as configural propriety, it will consist of the complementary knowledge that unit members possess. In both cases, team construct

(team knowledge) yields the same functionality to its lower-level constituents, but what differs is the construct structure. In shared propriety, team construct (e.g., average) maintains the same structure of individual elemental contributions. In the configural conceptualization, what matters is team configurations, given that is more important for a team to have a broad and complementary array of knowledge rather than the same knowledge shared between members. This example highlights why a configural propriety consists of a functionally equivalent but structurally different construct than its lower-level constituents.

Albeit TPBs and IPBs share some conceptual overlaps such as future-oriented and improving aiming behaviors, there are some caveats in conceiving TPB. We conceptualize team proactivity as a team configural property (Kozlowski and Klein, 2000) as it originates from individual perceptions, cognition, and behaviors, and individual elemental contributions do not coalesce convergently. Twemlow *et al.* (2023) and Williams *et al.* (2010) noted that TPB emerges from complex and asymmetric dynamics between individuals, rather than the convergence of individuals' behavior. The study challenges the traditional conceptualization of TPB, which posits a convergent emergence (i.e., composition emergence). In sum, extant literature explicitly (or implicitly) assumes that over time, TPB emerges as a result of team members' IPB convergence. On the contrary, the compilational view of proactivity assumes that the context (people, interactions, and environment) influences each individual decision to be proactive in a complex and non-symmetric way, not leading to a convergency over time. In other words, we challenge the idea that through within-team interactions, TPB emerges convergently (e.g., average) from individual elemental contributions (e.g., Williams *et al.*, 2010). We argue that in building theories around TPB, scholars must adopt a contingent approach by clearly stating the processes and dynamics characterizing the compositional emergence.

To challenge the compositional view of the IPB aggregation process, we first analyze the extant literature to evaluate the state of the art on TPB conceptualization. Then, we present an empirical study based on 310 members working in 54 teams nested into 13 firms. Results show that for both measures of IPB we employ, there is no convergence over time as hypothesized by a compositional emergence, confirming that TPB cannot always be conceptualized as compositional. All in all, our study brings arguments towards a compilation form of proactivity emergence within groups.

We contribute to the literature in three ways. First, we highlight the relevance of team dynamics and configuration in proactivity emergence by unpacking proactivity emergence, traditionally treated as a convergent phenomenon. Shedding light on the processes occurring during the emergence phase can help to better understand when teams are proactive. Positing a priori convergence emergence overlooks the role the context in shaping TPB emergence. A compositional research design can be too deterministic and normative if researchers fail to justify the contingent characteristics that validate a convergent approach. For example, proactive behaviors can be counterproductive in highly routinary tasks (Harris and Kirkman, 2017). By recognizing the role of individuals, the role of team configuration, and the context, we advise a more contingent approach to proactivity conceptualization.

Second, we contribute to the methodology of the literature on proactivity by warning researchers to adopt measures of TPB that inherently assume a compositional emergence. When conducting multilevel research, the authors should specify the emergence pattern (compilation vs composition) that they assume and describe how their research setting affects the emergence pattern. Therefore, operationalizations of TPB have to be justified in light of the research design. Since TPB emerges from individuals' perceptions, behaviors, and cognition, we advise not using ratings given by external evaluators since they cannot know the feelings and perceptions of each team member. External measures may have the advantage of being more objective and providing an overall evaluation of TPB without any assumption on the emergence type. However, it raises a measurement problem. In studying emerging phenomena, higher-level constructs must be operationalized starting from the level at which they originate. In the case of TPB, its operationalization should always start from the individual level (Klein *et al.*, 1994).

Third, focusing on two measures of IPBs (i.e., Proactive Problem Solving and Proactive Idea Implementation), this study shows how the emergence of two proactivity measures can have different emergence patterns over time. Parker *et al.* (2010), despite recognizing the merit of a phenomenon-oriented approach to proactivity (see Parker and Collins, 2010; Cai *et al.*, 2018), call for a holistic conceptualization of proactivity, focusing on the overlaps of the different proactive behaviors (e.g., employee adopts an anticipation behavior and proactively acts to reach a future state to improve the self-environment, Grant and Ashford, 2008). While those conceptual overlaps may be beneficial in studying IPBs, they might hinder understanding the emergence dynamics of different proactive behaviors. Recognizing the different paths IPB can take to emerge as a team construct is relevant to fully understanding proactivity emergence in the workplace. Going beyond a convergent aggregation of TPB can open a deeper understanding of team emergence dynamics, the effect of its antecedents (e.g., job design), and a refined analysis of the outcome (e.g., team performance).

2. Multilevel Theory

During the past century, the relationship between lower-level and higher-level entities in physical and social systems has been a central focus of inquiry across disciplines, including psychology and sociology (Corning, 2002; Sawyer, 2001). The complex relationship between different levels' entities has led organizational science to adopt a hierarchical perspective delineating organizations into micro, meso, and macro levels. An organization is characterized by two types of processes: top-down, in which higher-level phenomena influence and shape lower-level dynamics, i.e., cross-level effects, and bottom-up emergence, where interactions among lower-level entities emerge into higher-level phenomena over time. Multilevel Theory (Kozlowski and Klein, 2000) has addressed previous theoretical and operational limitations, enabling both qualitative and quantitative researchers to empirically investigate organizations' entities' interactions and relationships (Kozlowski and Klein, 2000). MLT conceptualization of hierarchical systems has improved measurement frameworks (Bliese, 2000; Chan, 1998) and statistical modeling (Bryk and Raudenbush, 1992) that study how organizational systems evolve.

Kozlowski and Klein (2000), focusing on bottom-up processes, postulate that a higher-level phenomenon can follow an array of different emerging patterns. The type of emerging pattern depends on the nature of the process, ranging from convergent (compositional) to divergent (compilational) processes. In the emergence process, temporal dynamics play a central role since the convergent/divergent emergence takes time to unfold. Higher-level phenomena tend to have slower dynamics affecting and shaping their emergence than individual constructs. Therefore, to investigate emergent phenomena, a particular focus must be on temporality so that interactions can occur and shape the emergence. Since multilevel emergence is a dynamic process, higher-level phenomena can change over time so that emergence can shift from a divergent compilation to a converged composition (Kozlowski *et al.*, 2013).

In a compositional emergence, individual elemental contributions equally participate in the emergence of the higher-level phenomenon (shared unit property). A shared team propriety yields the same content and construct validity between two different levels of an organization (Kozlowski and Chao, 2012; Kozlowski and Klein, 2000). Usually, individual contributions are characterized by uniformity, homogeneity, and stability over time. On the other hand, a compilational emergence (configural propriety) acknowledges the potential emergence of team-level constructs from a nuanced interaction of individual elements, wherein the contributions of team members to the collective entity may manifest dissimilarities (Stewart *et al.*, 2005). In other words, the compilation approach presupposes that each contribution to the higher-level phenomenon exhibits dissimilarity in terms of type and magnitude, and the dynamics of interactions are characterized by irregularity and dispersion (Kozlowski and Klein, 2000). A configural construct originates from a divergent coalescence of individual elemental contributions (Kozlowski and Chao, 2012). Since lower-level components of a

configural construct do not emerge convergently, a configural phenomenon is functionally equivalent but structurally different across levels. Being structurally different means that despite sharing the same functionality across the levels, the representation across levels cannot be the same. Configural constructs' operationalization depends on the compilational emergence they follow. For example, a configural construct can be operationalized via minimum elemental contributions or within-team variance if the emergence is a minimum emergence or variability-based emergence (Kozlowski and Chao, 2012).

Other than the two pure forms of emergence, composition, and compilation, Kozlowski and Klein (2000) theorized other types of emergences characterized by different elemental contributions, interaction processes, and combination rules (e.g., pooled constrained emergence or variance emergence). The importance of a nuanced understanding of within-organization emerging phenomena is testified by a recent stream of literature dealing with team dynamics, showing that the emergence of collective phenomena is often asymmetrical, complex, and contingent on the team configuration and context. In particular, scholars have recently demonstrated that conflict (Shah *et al.*, 2021), trust (Costa *et al.*, 2018), and resiliency (Gucciardi *et al.*, 2018) present complex dynamics at the team level.

Shah *et al.* (2021) analyze the depth of team conflicts, unpacking a phenomenon usually studied at the team or group level by disaggregating it into its fundamental components and evaluating the dynamics of individual, dyadic, subgroup, and whole team conflicts. Their findings support the view that the construct of team conflicts differs from the mere sum of members' conflicts since every team member does not experience the conflict equally. This is because not everyone reacts similarly when facing the same situation, and different individuals can play different roles in a conflict (i.e., instigator, respondent, or observer). Conflicts can be generated by events triggering different individual reactions. Conflicts can involve different people at different points in time and have different evolution trajectories over time (i.e., they can be contagious and include other people, be sustained by the same team members, or be solved and disappear over time). The nature and evolution of such conflicts have different impacts on team performance. For example, dyadic conflicts usually benefit team performance, while intragroup disputes are typically detrimental.

Costa *et al.* (2018) criticize the traditional view of team trust, considering the isomorphic aggregation of dyadic trust between team members. They suggest deeply investigating the multilevel emergence of team trust due to the interplay between members and the result of "trust asymmetries" in several repetitive interactions among team members. To operationalize trust as the average of each team member's score of trust, a certain level of within-team agreement must be displayed. If the within-agreement is low, researchers have to hypothesize other kinds of emergence of trust.

Finally, Gucciardi *et al.* (2018) analyze the aggregation of resilience from individual to working team. Team resilience differs from the sum of individual resiliencies as a dynamic concept that emerges over time due to the interplay of the interaction of personal, contextual, and team-level factors. A group of resilient members facing an adverse situation can emerge as poorly resilient since each member can cope with the problem by adopting self-servant resilient behaviors, which could not be the optimal solution for the team as a unit. In those instances, a divergent representation of resilience emergence can better describe the occurring phenomenon.

In light of these studies, enriching previous knowledge by shifting the preexisting conceptualization of the studied constructs, we first analyze relevant literature on TPB and then propose a novel approach.

3. Literature Review in TPB

3.1 Overview of the literature on TPB

Using Scopus database as our information source, we searched for articles with the words "team proactivity" or "team proactiveness" in the title, abstract, or keyword sections. Subsequently, we restrict our sample by including only papers already published in peer-reviewed journals and written in English, limiting the subject area to Business, Management and Accounting, Social Sciences, and Psychology. We select a sample of 114 documents. Finally, after reading the remaining papers, we retain the ones in which TPB has been empirically operationalized (Williams *et al.*, 2010; Griffin *et al.*, 2007). We end up with a final sample of 29 papers.

Table 1 summarizes the results of the analysis. In the table, we highlight the measures used to gauge team proactivity, the type of the study (longitudinal vs cross-sectional), the year of publication, and the type of hypothesed emergence (either explicitly or implicitly). Even though we do not use any filter to limit the time frame of our research, it can be noted that early research on proactivity at a team level can be dated back to the 2000s. This is not a puzzling result since some of the most influential papers on IPB have been published a few years before (e.g., Parker *et al.*, 2006; Griffin *et al.*, 2007; Parker and Collins, 2010). Since most of the research is survey-based, we indicate in the second column of the paper whether the scale used in the surveys was introduced in the paper or developed by others. All papers acknowledge the existence of different potential biases affecting the empirical setting and results, i.e., common method variance and social desirability bias (Podsakoff *et al.*, 2003; Spector, 2006). To mitigate those biases, researchers adopted a mix of countermeasures, such as using different respondents or external valuation (e.g., a team evaluated by its leader). Finally, it is worth mentioning that the original items introduced by the papers were adapted to suit each research design's needs (e.g., adapt individual scale items to the team level), so there is some heterogeneity in measurements even among papers that adopt the same scale.

The most used scale of our sample comes from Griffin *et al.* (2007), which has been adopted by 10 of our sample's papers. Griffin *et al.* (2007) conceptualize proactivity on three levels: individual, team, and organization. They argue that the difference between TPB and IPB relies on the intention to change and improve not only the single situation but also the intention to improve the way the team works. They operationalize the construct of TPB using three different components capturing whether team members:

- suggest ways to make their work unit more effective;
- develop new and improved methods to help their work unit perform better;
- improve the way their work unit does things.

Regarding the data gathering process, papers of our sample collect data on TPB via a self-reporting response (e.g., Brosi *et al.*, 2018) or an external rate usually made by the team leader (e.g., Tsai *et al.*, 2017). Similar to Griffin *et al.* (2007) TPB, Hirschfeld *et al.* (2008) developed a scale to evaluate team-oriented proactivity aiming "to represent a general form of motivation to be an influential team player" (Hirschfeld *et al.*, 2008; p.388). An example of Hirschfeld *et al.* (2008)'s scale is: "In the past 5 years, how often have you suggested to a coworker that he or she should try a different way to solve a problem".

The second most used scale is the proactive personality developed by Bateman and Crant (1993), which was adopted by 4 papers of our sample. This measure was designed to evaluate the individual proactive personality and to conceptualize a dispositional trait different from the predominant "Big Five" model. This scale has the merit of being the first major effort to conceptualize proactivity as a personal disposition (i.e. relatively stable personal behavior), recognizing the role of proactive behaviors in altering and improving the external environment. The authors themselves recognize the scale can be affected by common method variance due to its self-reported nature, and despite the potential cons of this measure, it has been widely used and adapted in empirical research. For example, a shortened 10-item version of this scale has been proposed by Seibert *et al.* (1999). This

version has the merit of maintaining good explanatory power and being more condensed. Erkutlu (2012) proposes an even more synthesized 7-item scale as a derivation and adaptation from Bateman and Crant's (1993) scale, aiming to evaluate team proactivity. An item example of this scale is "Our team can spot a good opportunity long before others can." Despite extant literature extensively adopt Bateman and Crant's (1993) scale of proactive personality to measure proactivity, it might lead to a construct misspecification. Given its dispositional perspective of proactivity, the scale confounds items aiming to measure proactive behaviors with items measuring proactive personality, one of its antecedents. This is not surprising since most influential publications on proactivity (Parker, 1998; Parker *et al.*, 2006; Griffin *et al.*, 2007) were published a decade after this paper. These papers shed light on this construct, clearly defining what it means to be proactive in the workplace (Parker and Collins, 2010). Along with the conceptual refinement brought by those papers, more refined measurements about TPB are required, aiming only at evaluating the actual behavior and not confounding it with its antecedents. The same logic can be applied to the derived scale from the original Bateman and Crant's (1993) 17-item scale (i.e., Seibert *et al.*, 1999; Erkutlu, 2012).

The remaining studies used different individual scales, all adapted to the team context. Morrison and Phelps's (1999) scale has been adopted (and adapted at the team level) by two papers to capture the tendency of adopting "taking charge" behavior within a team. An example of this scale is: "This person often tries to adopt improved procedures for doing his or her job." Similarly, other scales originally aimed to assess IPB or one of its components have been adapted to the team level to capture TPB. Another manipulation has been operated by Wu and Wang (2015) on Baer and Frese's (2003) scale of "climate for initiative" items. They adopted a scale originally thought to grasp the self-reported initiative change. An example of the adapted Wu and Want (2015)'s scale is "People in my team actively attack problems."

Regarding the type of respondents, Williams *et al.* (2010) provide a scale of measurement tailored directly to gather data on TPB at the team level. An example of an item is "the whole team uses their initiative to make the most of opportunities and is proactive to deal with problems."

Carraro *et al.* (2024), based on the notion that team homogeneity displays a curvilinear relationship with team outcomes (Barry and Stewart, 1997), represent TPB using a compilation measure of TPB, weighted proactive problem-solving. This measure, obtained as a weighted average of individual scores of proactive problem-solving (Parker *et al.*, 2006), allows the representation of team configurations by differentiating individual elemental contributions.

Lanaj *et al.* (2013) provide an interesting perspective on proactivity evaluation. Studying a US Air Force computer simulation, the authors assess TPB by counting the number of strategic missions each unit sends out throughout the simulation. This measure is objective and quantitative, but it lacks generalizability since it is contingent on the specific research setting.

Three papers of our sample are qualitative studies that do not use measurement scales. These papers have the merit of using interviews or direct observations to evaluate and describe proactivity in each context. Although qualitative studies may be very time-consuming, they allow researchers to investigate an emergent process's dynamic (Kozlowski *et al.*, 2013), allowing them to observe and give sense to the group dynamics shaping the phenomenon's emergence (Twemlow *et al.*, 2023).

Although some effort has been made to overcome the limitations of a compositional view of TPB emergence, the most common approach to synthesizing proactivity remains inherently compositional. The review is focused on the operationalization used by extant literature on TPB since a construct representation is a direct consequence of its conceptualization. TPB measures are usually built using the average of individual elemental contributions or factor analysis from Likert-scale questions. In the case of TPB represented via average of team members' IPB, the assumption is of convergence over time to the average level of individual proactivity. In the case of factor analysis on a survey-based question, the measure will synthesize the common variance among the items to represent the latent construct., implicitly assuming a converged emergence of proactivity. The conceptual assumption of such operationalizations is that IPBs are isomorphic and equally contribute to TPB's emergence. This approach is coherent with "the more, the better" view of proactivity since if a highly

proactive individual is added to a team (or replacing a low proactive team member), individual elemental contributions would coalesce to a higher level over time. Thus, teams composed of highly proactive individuals are characterized by high level of TPB.

We argue that the methods adopted by previous quantitative studies are not always adequate for two main reasons. First, in some instances, TPB is evaluated by adapting IPB scales. By adapting individual items to the team, researchers are committing an ecological fallacy (Klein *et al.*, 1994; Kozlowski and Klein, 2000; Bliese, 2000; Bliese *et al.*, 2007). Irrespective of whether TPB is conceptualized as shared team propriety or as a configural propriety, the level of analysis should always match the level at which it originates (Kozlowski and Klein, 2000; Bliese, 2000). Finally, some scales do not clearly distinguish the real subject of what they should capture. By confounding the actual construct with one or more antecedents, the scales suffer from conceptual inconsistency, i.e., mixing proactive behavior with proactive personality or emotional state.

The literature review highlights how the extant literature predominantly considers and operationalizes TPB as a composition variable without questioning its emergence dynamics. The next section is devoted to challenging this predominant view.

Tab. 1: Summary of Literature Review Papers

Title	**TPB Measure**	**Method**	**Data Source**	**Emergence**	**Year**
Transmitting affective job insecurity (AJI) within teams: Layoff effects of AJI convergence on intrateam power struggles and team outcomes.	Griffin *et al.*, 2007	Cross-sectional	Team Leader	/	2023
A process model of peer reactions to team member proactivity.	Qualitative Study	Longitudinal	Direct Observation	Nonconvergent	2023
Why and when job insecurity hinders employees' taking charge behavior: The role of flexibility and work-based self-esteem.	Morrison and Phelps, 1999	Longitudinal	Team Leader	/	2023
Is leader proactivity enough: Importance of leader competency in shaping team role breadth efficacy and proactive performance.	Williams *et al.*, 2010	Longitudinal	Team Leader	/	2023
Job Resources and Strengths Use in Relation to Employee Performance: A Contextualized View.	Griffin *et al.*, 2007	Cross-sectional	Self-reported	Convergent	2022
Choosing the right (HR) metrics: digital data for capturing team proactivity and determinants of content validity.	Qualitative Study	Cross-sectional	Interviews	/	2022
Inter-physician variability in strategies linked to treatment limitations after severe traumatic brain injury; proactivity or wait-and-see.	Qualitative Study	Cross-sectional	Interviews	Convergent	2021
Can proactivity translate to creativity? Examinations at individual and team levels.	Seibert *et al.*, 1999	Cross-sectional	Self-reported	Convergent	2021
TTaPeers, proactivity, and problem-solving: A multilevel study of team impacts on stress appraisals of problem-solving demands.	Parker and Collins, 2010 (problem-solving)	Cross-sectional	Team Leader	/	2020
Modeling knowledge sharing and team performance in technology industry: the main and moderating effects of happiness.	Griffin *et al.*, 2007	Cross-sectional	Self-reported	Convergent	2020
Linking team-member exchange differentiation to team creativity.	Erkutlu 2013	Longitudinal	Self-reported	Convergent	2020
Multiple Team Membership and Empowerment Spillover Effects: Can Empowerment Processes Cross Team Boundaries?	Griffin *et al.*, 2007	Cross-sectional	Self-reported	Convergent	2019
Do we work hard or are we just great? The effects of organizational pride due to effort and ability on proactive behavior.	Griffin *et al.*, 2007 – employees n. of ideas	Cross-sectional	Self-reported	Convergent	2018
Is Self-Leadership Just Self-Regulation? Exploring Construct Validity with HEXACO and Self-Regulatory Traits.	Griffin *et al.*, 2007	Cross-sectional	Self-reported	Convergent	2018
Being excellent: predicting team performance, proactivity, and proficiency in technology industries.	Griffin *et al.*, 2007	Cross-sectional	Team Leader	/	2017
Explaining benefits of employee proactive personality: The role of engagement, team proactivity composition and perceived organizational support.	Bateman and Crant,1993	Cross-sectional	Self-reported	Nonconvergent	2017
Leaned teamwork fattens workplace innovation: the relationship between task complexity, team learning and team proactivity.	Morrison and Phelps, 1999	Longitudinal	Team Leader	/	2016
The influence of proactive socialization behaviors and team socialization on individual performance in the team.	Griffin *et al.*, 2007	Cross-sectional	Self-reported	Convergent	2016
How transformational leadership shapes team proactivity: the mediating role of positive affective tone and the moderating role of team task variety.	Baer and Frese, 2003	Longitudinal	Self-reported	Convergent	2015
Participative work design in lean production A strategy for dissolving the paradox between standardized work and team proactivity by stimulating team learning?	Morrison and Phelps, 1999	Cross-sectional	Self-reported	Convergent	2015

Team Proactivity as a Linking Mechanism between Team Creative Efficacy, Transformational Leadership, and Risk-Taking Norms and Team Creative Performance.	Bateman and Crant, 1993	Cross-sectional	Self-reported	Convergent	2014
The double-edged sword of decentralized planning in multiteam systems.	Objective Measure	Cross-sectional	Observed	Convergent	2013
The impact of team empowerment on proactivity. The moderating roles of leader's emotional intelligence and proactive personality.	Bateman and Crant, 1993	Cross-sectional	Team Leader	/	2012
The impact of organizational culture on the relationship between shared leadership and team proactivity.	Bateman and Crant, 1993	Cross-sectional	Team Leader	/	2012
Self-leadership and team members' work role performance.	Griffin *et al.*, 2007	Cross-sectional	Team Leader	/	2012
Consequences of autonomous and team-oriented forms of dispositional proactivity for demonstrating advancement potential.	Team-oriented proactivity Hirschfeld *et al.* (2008)	Cross-sectional	Self-reported	Convergent	2011
Proactively performing teams: The role of work design, transformational leadership, and team composition.	Williams *et al.* (2010)	Cross-sectional	Team Leader	/	2010
A new model of work role performance: Positive behavior in uncertain and interdependent contexts	Griffin *et al.* (2007)	Cross-sectional	Self-reported	Convergent	2007
Unlocking team performance: How shared mental models drive proactive problem-solving.	Weighted PPS	Cross-sectional	Self-reported	Divergent	2024

Source: our elaboration

3.2 TPB: beyond a compositional perspective

As shown in the previous section, most of the literature on proactivity implicitly assumes that TPBs emerge convergently. Thus, the effect of interactions is posited to lead to collaboration and imitation between team members, who will tend to resemble each other through interactions over time. Focusing on the process regulating TPB emergence, Williams *et al.* (2010) and Twemlow *et al.* (2023) noted that proactivity could follow a non-convergent pattern. For example, members might behave proactively but fail to coordinate, thus generating a non-proactive team.

Despite much of the extant literature focusing on the positive aspects of IPBs, it's important to acknowledge that proactivity also carries a "dark side.". Bolino *et al.* (2010) offer a good synthesis of the negative impact that IPBs can have on peers. In brief, proactivity can strain a low-proactive employee in a context in which IPBs are pushed and strongly supported by superiors.

Focusing on the process shaping proactivity emergence, some recent papers argue that the "the more, the better" approach is unsuitable for examining proactivity. Emich *et al.* (2024) found that the average level of team proactivity negatively correlates with performance. Only when it is evaluated synergically with consciousness, the general ability to create structure and organizations in processes positively influences team performance. Consciousness serves as a proactivity coordination mechanism as it is noted that proactive efforts are not always beneficial when not considering task and strategic-related elements of the situation (Parker *et al.*, 2019) or when situational demand is not well assessed (Chan, 2006). Emich *et al.* (2024) further explore team proactivity composition by evaluating different configurations (averaging, dispersion, maximum scores), highlighting the need for a nuanced conceptualization of team proactivity configuration to better understand which context is suitable for fostering proactivity.

In a similar vein, Zhang *et al.* (2021) found that there is a curvilinear relationship between the mean level of team proactivity and team performance. Drawing on dominance complementarity theory (Carson, 1969), they found that teams exhibiting variability in proactivity have better performance than their counterparts. Authors argue that having few individuals proposing proactive ideas can lead the low proactive teammates to act as implementers. On the other hand, when a team is composed of all proactive employees, there could be a willingness to dominate teammates to implement their ideas and less tendency to hear and collaborate with peers. Finally, Zhang and colleagues argue that having too many dominant (proactive) individuals can hinder team dynamics and hamper team coordination.

Twemlow *et al.* (2023) noted that peers' reactions to proactive behaviors are not always positive. Studying the dynamics of an agile team, Twemlow *et al.* (2023) highlight how there must be a mutual understanding of goal setting and goal striving for an IPB to emerge as a TPB. IPBs can spark

teammates' negative reactions, such as criticizing the proactive effort or even criticizing the proactive individuals themselves. Without peers' support, IPBs rarely emerge as TPBs. This qualitative study is one of the first attempts to analyze the emergence dynamics of team proactivity. The results of this paper alone would challenge the traditional compositional view of TPBs due to team dynamics hindering the emergence of a proactive initiative.

The mixed evidence of the effect of team member proactivity is beneficial (e.g. Williams *et al.*, 2010) or detrimental (e.g., Zhang *et al.*, 2021) to organizations, paired with testimonies of the nonlinear effect of team member proactivity configuration, requires a refined inquiry on the suitability of convergence emergence pattern to describe such complex phenomenon. Much of the extant literature posits a convergent emergence of TPB without a proper justification and analysis of the process leading to such convergence. Positing a compositional emergence means that the more team members work together, the more they become similar.

In the next section, we present a study challenging the TPB compositional emergence by evaluating the effect of team tenure on within-team proactivity dispersion. As Kozlowski and Klein (2000) argue, if a compositional emergence holds, team tenure should have a negative effect on within-team dispersion since the convergence that unfolds over time tend to reduce individual differences. The more the members work together and the more they interact, the more they become "alike" in terms of proactive behaviors thus reducing the within-team IPBs dispersion. On the other hand, if team tenure exhibits a positive effect on IPBs dispersion at the team level, it would bring arguments towards a compilational TPB emergence. Interactions among members lead individuals to diverge over time thus increasing the within-team IPBs dispersion.

4. Empirical Analysis

Drawing on multilevel theory, we propose an empirical study that challenges the predominant compositional view of TPB. Temporal dimension plays a central role in emergent phenomena. In a compositional emergence, the more individuals within a unit interact, the more a phenomenon emerges as the convergence of individual contributions (Kozlowski *et al.*, 2013; Bliese, 2000; Kozlowski and Klein, 2000). On the other hand, in a compilational emergence, temporal dynamics shape an emergence as within-team divergence.

Team tenure, as a proxy of time in proactivity emergence, has a twofold effect. First, as noted by Fay and Frese (2001, p. 104): "To be able to take initiative, one needs a good and thorough understanding of what one's work is, that is, one needs job-relevant knowledge, skills, and cognitive ability. Otherwise, one is less able to identify aspects of work that need to be improved, to analyze problems, and to develop solutions to them." Therefore, to "make things happen," employees must have a clear understanding of what is expected by their task and what can be improved. Second, working together in a team develops norms and values shaping future interaction. Given their process-oriented nature, emergent phenomena need time for micro-dynamics to occur and shape the emergence pattern. Since interactions and dynamics influence others' behavior and environment, the nature of emergence can vary significantly.

To evaluate the micro determinants of TPB, we have to clarify the domain of the study (micro vs meso) in our research design. On the one hand, by generalizing findings that hold at an aggregate level to its components, we would commit an ecological fallacy (James, 1982), being that correlations of aggregate data often overestimate the lower-level relationship (Klein and Kozlowski, 2000; Robinson, 1950). On the other hand, by generalizing relationships existing at an individual level to an aggregate (team) level, we would commit an atomistic fallacy. Relationships at the micro level do not ensure homologous relationships at the meso level (Klein and Kozlowski, 2000). Unit-level relationships can differ in magnitude or even have an opposite direction (Ostroff, 1993). To overcome those issues, we evaluate the emergence pattern of proactivity by looking at the within-team proactivity dispersion.

4.1 Research method

We collected survey-based data on shop-floor employees of 13 manufacturing firms from late September 2020 to September 2021. The sample is composed of 381 respondents divided into 54 teams. Since the scope is to evaluate the emergence of TPB, the target for this research has been working teams characterized by high stability. Most of team members have at least one year of tenure within the team, so team dynamics should have already manifested. Finally, all teams have a low level of staff turnover. We follow the definition of team provided by Salas *et al.* (1992, p. 4): "a distinguishable set of two or more people who interact, dynamically, interdependently, and adaptively toward a common and valued goal/objective/mission, who have each been assigned specific roles or functions to perform, and who have a limited lifespan of membership." Given the high interdependencies that working in the same team in manufacturing firms underlies, we infer that in those settings, proactivity is multilevel, originating by individuals and manifesting at the team level. Therefore, we found this sample suitable for testing proactivity emergence.

The surveys were administered exclusively in Italian. Following established protocols for translation-back-translation procedures to minimize cross-cultural bias (Brislin, 1980), rigorous measures were implemented throughout the process. A dual-questionnaire administration strategy was employed to address potential issues associated with common method bias in self-reported data (MacKenzie and Podsakoff, 2012; Podsakoff *et al.*, 2003). Specifically, one questionnaire focusing on individual-level constructs was administered to shop floor employees, while a different questionnaire addressing team-level constructs was distributed to their respective leaders. To enhance the reliability and integrity of the collected data, team members were gathered in a single setting, where an interviewer distributed the questionnaire. This method aimed to provide support when necessary, creating an environment of security and comfort for respondents (de Leeuw *et al.*, 2008). Furthermore, this approach ensured the anonymity of the questionnaires and precluded direct managerial access to the collected information, thereby mitigating potential social desirability bias.

Employing a multilevel approach is essential to avoid issues of level misspecification (Klein *et al.*, 1994). Following the prescription of Bliese (2000) and Kozlowski and Klein (2000), we gather data at the originating level (individual). To evaluate the emergence pattern of TPB, we analyze the effect of the within-team dispersion in teams with different team tenures. In case the proactivity is characterized by a compositional emergence, the more a team is working together, the less the within-team dispersion should be. On the other hand, if tenure has the opposite effect, it will indicate a compilational emergent of proactivity.

To represent IPB, we follow the context-specific operationalization of proactivity presented by Parker *et al.* (2006). Adopting a context-specific approach in building IPB measures presents two advantages to general proactivity operationalization. First, being proactive highly depends on the contingent context in which individuals operate. Second, context-specific approaches have the merit of returning a more valid self-assessment of proactivity than generic proactivity-related answers such as “I am proactive” or “I make things happen” (Parker *et al.*, 2006). Following Parker *et al.* (2006) prescriptions, we built two IPB measures: Proactive Problem Solving (PPS) and Proactive Idea Implementation (PII).

Proactive Problem Solving. PPS is “self-starting, future-oriented responses that aim to prevent the reoccurrence of a problem or that involve solving it in an unusual and nonstandard way” (Parker *et al.*, 2006, p. 637). PPS was operationalized using a vignette technique (Parker *et al.*, 2006; Furlan *et al.*, 2019). Respondents were asked to choose from six corrective actions they would implement when facing an operational problem. Among the possible answers, there were three of them identified as “passive” (i.e., “I produce more parts to compensate for the defective ones,” “I temporarily fix the problem to reduce damages caused by the stop,” and “I rework the parts in the attempt of achieving the necessary quality”). The other three identified as “proactive” (i.e., “I try to find out why the parts are of poor quality,” “I try to sort out the problem so it will not happen again,” and “I involve several members of the team to find new technical solutions for addressing the problem”). PPS can take

values from 0 if no proactive answers are indicated to 3 if all the answers identified as "proactive" have been chosen. To mitigate any social desirability bias, even though the opportunity to answer with multiple choices was granted, respondents were advised to cross only the solutions they would likely put into practice.

Proactive Idea Implementation. PII "involves an individual taking charge of an idea for improving the workplace, either by voicing the idea to others or by self-implementing the idea" Parker *et al.*, 2006, p. 637). The evaluation involves collecting data from shop floor employees regarding the number of innovative ideas they have developed within the past year across four areas: health and safety, cost efficiency, process quality, and environmental impact. If at least one idea is reported, participants are additionally asked: (a) whether the idea was shared with others and to whom; and (b) whether any ideas were implemented, and if so, by whom. For each area, employees will receive a score of 0 if no ideas were generated or shared, 1 if they either shared or implemented an idea, and 2 if both actions were undertaken. The scores for all four areas will then be aggregated to derive an overall measure of each individual's propensity for PII.

IPB dispersion. We operationalized within-team IPBs variability as standard deviation and rWG of within-team individual response.

Team tenure. Even though we do not directly evaluate the evolution of the emergence pattern over time by employing a longitudinal study, we test the effect of time on proactivity emergence by evaluating the effect of team tenure (a -category measure ranging from "1 = less than one year" to "3 = more than five years"), on within-team variability. To capture the temporal effect on TPB emergence of team dynamics and interactions, we express team tenure in two ways. First, team tenure is operationalized as the individual tenure of the last employees joining the team to grasp the time the whole team spends working together. Second, we aggregate the tenure at the team level using the team members' tenure median (Koopmann *et al.*, 2016). Median has been preferred over means because it better represents the time teammates work together (Koopmann *et al.*, 2016).

We control for a set of variables in both regressions. Following Parker *et al.* (2006), we control for some antecedents of proactive behaviors compositionally aggregated at the team level (Harris and Kirkman, 2017): role breadth self-efficacy (six items; α=0.83), job autonomy (six items; α=0.86), and flexible role orientation (five items; α=0.61). Contextually, we also control for a set of demographic variables such as average team education (a 3-category measure ranging from "1 = non-high school graduate" to "3 = high school or higher degree"), team size, and team ID. Moreover, we control for team gender composition (% of females within the team) and team leader proactivity, which is assessed via a vignette-based scenario. To challenge the compositional emergence of TPB, we rely on the existing and validated operationalization of individual proactivity (Parker *et al.*, 2006). By following this procedure, we want to ensure that any differences in the empirics do not drive the results of this study.

We used STATA 17 to run our statistical analyses. We employ a hierarchical mixed-effect regression with robust standard error to examine multilevel data. Data are nested within 13 firms to reflect different organizational contexts (Zhang *et al.*, 2021). Regressions are presented in Equation 1.

$$Within\text{-}team\ dispersion = \beta 0 + \beta 1 Team\ Tenure + Controls + \varepsilon \quad [1]$$

5. Result

5.1 Preliminary results

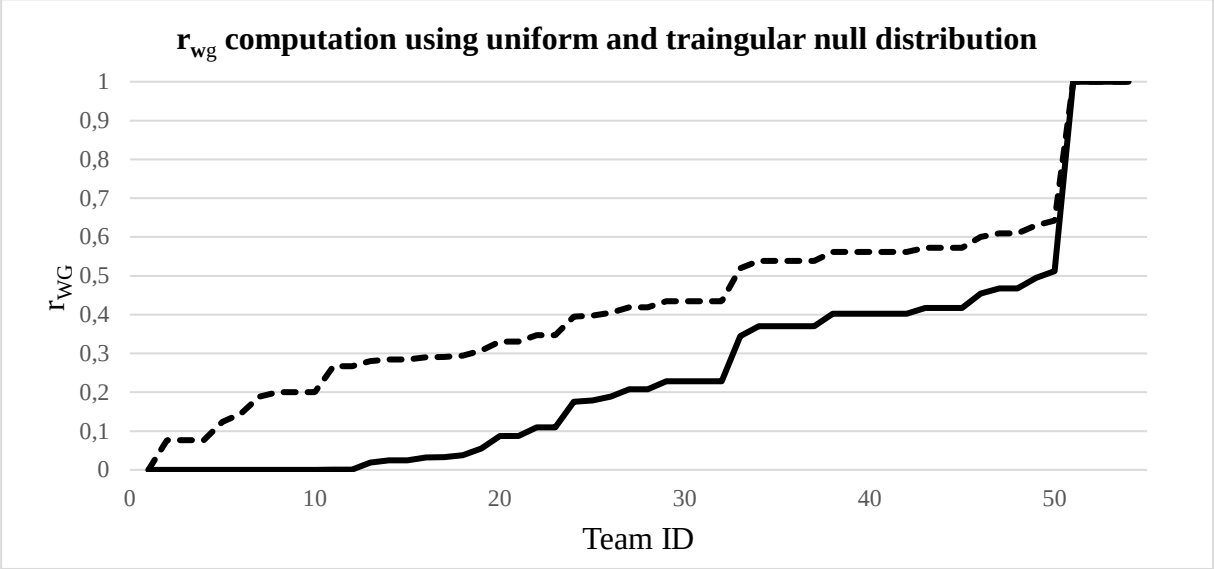
In multilevel research, team-level data aggregation is usually justified by employing intraclass correlation coefficients or inter-rater agreement index, e.g., ICC1, ICC2, and r_{WG} (Bliese, 2000; Kozlowski and Klein, 2000; Kozlowski, 2015). ICC greater than 0 means that there is a group effect for a specific construct, so then an ICC=0.15 implies that 15% of the variability of individuals'

response is explained by group membership (Bliese, 2000). Bliese *et al.* (2007) noted that values greater than 0 of the ICC index are evidence of group effects but are inadequate to explain their nature. On the one hand, group effects can reflect a common group tendency over a given phenomenon. On the other hand, it could occur due to the mere clustering of individual responses in working teams (Bliese, 2000). In other words, ICC is not suitable to detect whether a measure of reliability is due to a common team propriety or to individual clustering. Because of this ICC inadequacy, there is a need for a careful conceptualization of aggregate constructs reflecting higher-level properties, "Hence the need to integrate theory with alternate measurement options for assessing higher-level constructs" (Bliese *et al.*, 2007, p. 555).

r_{WG} index (James *et al.*, 1984) expresses the degree of interchangeability of raters within a group. Conceptually, the index compares the observed within-group ratings variance to an expected random variance (James *et al.*, 1984). The closer the index is to 1, the higher the within-group agreement, meaning picking a random team member's elemental contribution will reflect the general group tendency. A close-to-1 inter-rater agreement index supports the choice of operationalizing a higher-level construct via the mean of individual response since it captures the general tendency of a group.

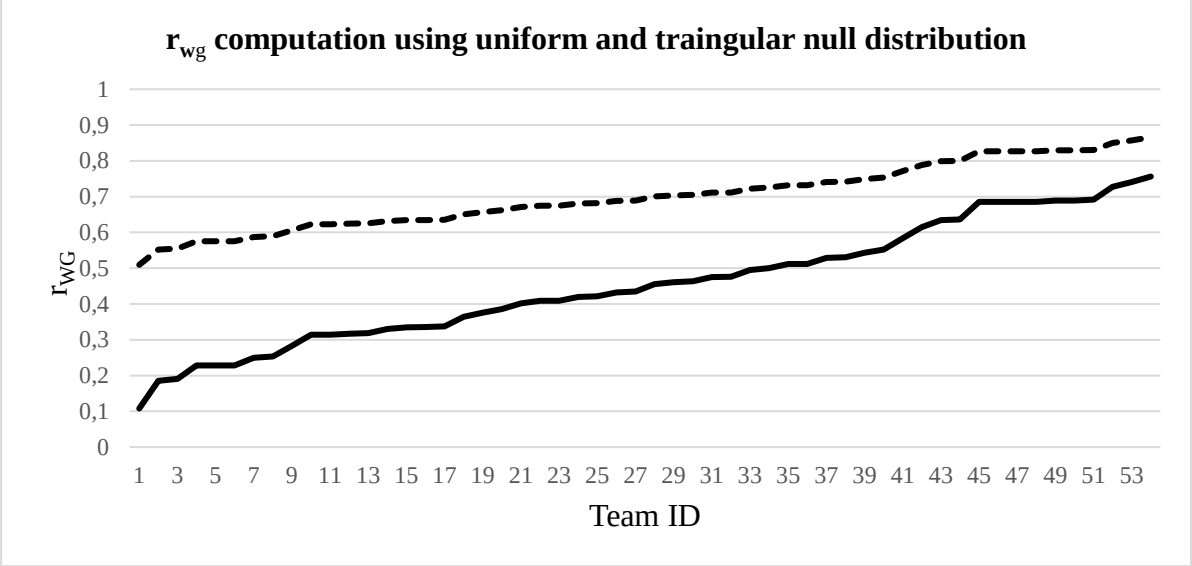
We follow the common procedure in multilevel research, computing the ICC and r_{WG} for both measures of IPB. As a result, PPS has an ICC (1) = 0.14 and ICC (2) = 0.48, while PII has a ICC (1) = 0.044 and ICC (2) = 0.20. If theoretically justified, those values can be enough to convergently aggregate the individual measure to the team level (Bliese, 2000; Quigley *et al.*, 2007; Williams *et al.*, 2010). To give a first glance at the non-compositional aggregation of TPBs, we calculated and depicted two measures of within-group agreement (r_{WG}) for each measure of IPB. We calculated the r_{WG} using a uniform null distribution and a triangular distribution, following the prescription of Bliese (2000), LeBreton and Senter (2007), and Roberson *et al.* (2007) about calculating the index using different types of random distribution. Following James *et al.* (1984) and LeBreton and Senter's (2007), we set to 0 all negative values of r_{WG}

Fig.1: PPS r_{WG} for each team using a uniform null and triangular distribution. The straight line represents rWG using a uniform null distribution, while the dotted line represents r_{WG} using a triangular null distribution.



Source: our elaboration

Fig.2: PII r_{WG} for each team using a uniform null and triangular distribution. The straight line represents rWG using a uniform null distribution, while the dotted line represents r_{WG} using a triangular null distribution.



Source: our elaboration

Although the pattern of the r_{WG} calculated using different distributions is similar, it might lead to a different conclusion about aggregating or not a variable at a higher level. For example, suppose we base our decision on aggregating PII using the average score of $r_{WGu} = 0.70$ or $r_{WGt} = 0.46$. Based on the first index, we would have confidently aggregated data using the average, while in the second case, an in-depth theoretical justification would be needed. This evidence is coherent with some of the critiques r_{WG} received over time about the suitability of using null distribution as random variance since for that to be appropriate, it should be proved that the population is distributed following a normal distribution (James *et al.*, 1984; Bliese, 2000; LeBreton and Senter, 2007). Based on this preliminary evidence, we can infer that stopping at the ICC level is insufficient to assess the validity of supposing a compositional emergence of proactivity. We present our regression analysis in Tables 2 and 3.

5.2 Regression results

The results of the PPS analysis confirm the positive correlation between team proactivity dispersion and team tenure (SD: β=0.316, SE=0.079; rWG: β=-0.253, SE=0.063), expressed as minimum team tenure. The result contrasts with the compositional convergence of proactivity, endorsing the hypothesis that TPB does not converge over time. No effect has been found between PPS dispersion and the median team tenure (SD: β=0.008, SE=0.108; rWG: β=-0.008, SE=0.085).

Results of the PII analysis are quite similar. The regression highlights a positive relationship between PII dispersion and team median tenure (SD: β=0.435, SE=0.206; rWG: β=-0.065, SE=0.031). A non-significant effect has been found between PII dispersion and the minimum team tenure (SD: β=0.029, SE=0.128; rWG: β=-0.004, SE=0.019).

Tab. 2: Effect of tenure on PPS dispersion. Data nested into 13 firms.

Dependent variable:	SD PPS		r_{WG} PPS		SD PPS		r_{WG} PPS	
Variables	**Coef.**	**z**	**Coef.**	**z**	**Coef.**	**z**	**Coef.**	**z**
Minimum Team Tenure	0.316**	3.98	-0.253**	-3.98				
Median Team Tenure					0.008	0.07	-0.008	-0.09
Education	-0.61	-0.33	0.042	0.29	-0.087	-0.44	0.063	0.40
Team gender composition	0.058	0.19	0.249	-0.16	-0.074	-0.29	0.068	0.33
Team Leader Proactivity	-0.030	-0.60	0.040	0.61	-0.033	-0.63	0.028	0.63
Team Size	0.020	0.94	0.019	-0.95	0.025	1.19	-0.020	-1.19
Team ID	-0.0001	-0.02	0.002	0.05	0.002	0.68	-0.002	-0.66
RBSE	-0.157	-0.74	0.170	0.74	-0.129	-0.64	0.103	0.64
FRO	0.039	0.36	0.086	-0.36	0.034	0.33	-0.027	-0.33
JA	0.144	0.74	0.155	-0.74	0.132	0.68	-0.106	-0.68
Constant	0.106	0.27	0.314	2.93	0.687	1.12	0.461	0.95
N° of observations				54				

† p < .10, * p < .05, ** p < .01

Source: our elaboration

Tab. 3: Effect of tenure on PPS dispersion. Data nested into 13 firms.

Dependent variable:	SD PII		r_{WG} PII		SD PII		r_{WG} PII	
Variables	**Coef.**	**z**	**Coef.**	**z**	**Coef.**	**z**	**Coef.**	**z**
Minimum Team Tenure	0.029	0.22	-0.004	-0.22				
Median Team Tenure					0.44*	2.11	-0.07*	-2.11
Education	-0.34	-0.58	0.050	0.58	-0.228	-0.52	0.034	0.52
Team gender composition	-0.96	-1.63	0.144	1.63	-0.681	-1.58	0.102	1.58
Team Leader Proactivity	0.028	0.23	-0.004	-0.23	0.048	0.40	-0.007	-0.40
Team Size	0.024	0.88	-0.004	-0.88	-0.003	-0.11	0.001	0.11
Team ID	0.009	1.01	-0.001	-1.01	0.004	0.57	-0.001	-0.57
RBSE	0.342	1.22	-0.051	-1.22	0.361	1.53	-0.054	-1.53
FRO	0.494*	2.96	-0.074	-2.96	0.49**	3.50	-0.07**	-3.50
JA	-0.35†	-1.79	0.05†	1.79	-0.43*	-2.43	0.07*	2.43
Constant	0.902	91	0.864	5.79	0.103	0.16	0.984	10.41
N° of observations				54				

† p < .10, * p < .05, ** p < .01

Source: our elaboration

In both analyses, congruent with a compilation emergence, the temporal effect seems to increase within-team dispersion, signalling a divergence emergent pattern of TPBs.

6. Discussion

The results of our analyses, paired with recent qualitative studies of proactivity, suggest that a compositional aggregation model is not always appropriate to describe this emergent construct. The positive effect of team tenure on within-team variability suggests that individual elemental contributions tend to diverge over time. This emergence is coherent with the multimodal distribution (Kozlowski, 2015), in which interactions among individuals tend to create smaller subgroups. This multi-modal configuration is consistent with the result of Zhang *et al.* (2021), who found that most performing teams are characterized by heterogeneity of individual proactive individuals.

Our study does not aim to provide a deterministic explanation of the TPB emergence, as we know it can change patterns over time (Kozlowski *et al.*, 2013). A collective phenomenon might follow different emergence patterns depending on contextual constraints and interactions characterizing it: emergence is often equifinal rather than a universal process (Kozlowski and Klein, 2000; Kozlowski, 2015). For example, depending on the interdependencies of solution implementation in solving a problem, a possible type of emergence could be the Minimum Emergence. In this disjunctive type of emergence, although all team members might display some degree of elemental contributions, the lowest contribution represents the overall team attribute (Kozlowski and Klein, 2000). In a highly interdependent context, the least proactive employee might be the determinant of TPB emergence due to the need for coordination during the goal generation and goal striving (Parker *et al.*, 2010) phase, in which ideas are discussed and implemented as a solution to an operational problem.

By proposing a general reconceptualization of TPB, we aim to provide both theoretical and practical contributions.

6.1 Theoretical Contributions

Theoretical contributions can be articulated into three subsections.

First, we shed light on proactivity emergence, contrasting the traditional assumed convergent emergence, by unveiling a divergent nature of TPB emergence. By unfolding the emergence pattern of proactivity, we advise a precise specification of the multilevel nature of proactivity in each contingent context. The effect of team tenure affects both measures of within-team IPBs variability, signaling that proactivity is an emergent construct. Looking at the results in Tables 2 and 3, it is clear how the higher the tenure, the more divergent TPB is. As argued before, temporal dynamics have two effects on proactivity emergence. First, by having a clear understanding of the task, employees can spot effective improvements. Second, the higher the tenure, the more within-team interactions can shape the emergence process. Results suggest that the dynamics shaping proactivity emergence lead to a heterogeneous configuration of team members IPB. Drawing on the MLT, we demonstrate that in our setting TPB follows a compilation emergence. Therefore, in studying team-level proactivity, we call for a contingent approach in which the context and team configuration shaping the emergence are explained.

Second, in operationalizing proactivity, the researcher should thoroughly consider multilevel issues in construct specifications. Self-reported data are usually used to synthesize individual-level variables (Klein *et al.*, 1994). So, building aggregated measures using means of individual-level variables suffers from conceptual and operative problems. Other than being affected by the typically associated self-reported bias (Podsakoff *et al.*, 2003; Spector, 2006; MacKenzie and Podsakoff, 2012), there is the risk of misrepresenting the level of analysis, creating a detachment between theory and the statistical results. To overcome these issues, we recommend operationalizing the aggregated proactivity starting from the level of origin, avoiding construct misrepresentation (Klein *et al.*, 1994). Furthermore, we encourage a multilevel adoption in future research on proactivity to unveil any underlying emergence process that has been overseen in extant literature (Kozlowski and Klein, 2000; Kozlowski *et al.*, 2013; Bell *et al.*, 2018). Given that construct emergence is not constant over time, we strongly encourage adopting longitudinal studies to observe the evolution of the emergence pattern (Harris and Kirkman, 2017). In cases where researchers opt for a composition view of TPBs, we call for a specific and substantial motivation in the convergent construct building.

Finally, evaluating the emergence pattern of different components of proactive behavior, we found that team tenure emerges differently from one another. Recognizing that different proactive behaviors emerge differently underlies acknowledging that they entail different kinds of processes and that a contingent approach is needed in studying the effect of antecedents and outcomes using a novelty lens. From the result of the first regression, we know that the two measures used as IPB proxies emerge with different team tenures.

PII. In Proactive Idea Implementation (Parker *et al.*, 2006), construct operationalization individuates two proactive steps: idea generation and implementation. The cognitive effort an employee must display to set a goal is not necessarily dependent on the whole team as it is an individual effort toward changing the status quo. Idea generation is only the first step toward an effective improvement. The second step is to voice, discuss, and implement the idea. Idea implementation can be either an individual or a collective effort. Depending on the type of interdependence, it could be possible to implement the idea alone or with a few co-workers. Median team tenure has a positive effect on TPB divergent emergence, signaling that for a team to implement an idea, there is no need for the whole team to have the same amount of tenure. Thus, voicing and effectively implementing ideas does not lead to processes of imitation (reduction in within-team dispersion). Rather, it leads to a polarization process in which the team dispersion is increased.

PPS. Proactive Problem-Solving measures the ability of individuals to proactively act to solve an operational problem. It underlies a certain degree of task knowledge for an employee to be able to solve the problem. Employees must exhibit a certain amount of process understanding and creativity to solve the problem in a nonstandard way. Coherently, PPS emerge divergently, proportional to an increase in the team's minimum tenure. Interaction among team members does not lead to convergence, implying that during problem-solving, team members do not end up resembling each other.

In both instances, the emergence is coherent with multi-modal emergence (Kozlowski, 2015). The major differences rely on the minimum shared tenure between teammates for the construct to emerge. Despite acknowledging the advantage of a holistic measurement and operationalization of proactivity (Parker *et al.*, 2010), we argue that a deep exploration of proactivity emergence requires a contingent analysis of each specific behavior and context to enhance our understanding of such a complex phenomenon.

6.2 Managerial Implications

We argue that adopting a multilevel approach and embedding the concepts of team interaction and dynamics allows a deeper understanding of proactivity emergence. As a result, scholars can draw refined inferences on these phenomena and better delineate the managerial implications. In our case, our results contrast with practical advice suggesting that organizations should foster and nurture proactive individuals regardless of context, task, or other contingent variables. Treating this phenomenon as homogeneous can end up being counterproductive. Creating an environment where proactivity is expected and enhanced can strain low-proactive employees (Bolino *et al.*, 2010) and create a detrimental and conflictual environment (Zhang *et al.*, 2021). We suggest focusing on making the context in which shared understanding can arise, facilitating the emergence of proactivity. We then suggest paying attention to team configuration: our results, paired with recent findings (Zhang *et al.*, 2021; Emich *et al.*, 2024), suggest that creating teams with only highly proactive individuals can end up being counterproductive. On the contrary, it seems that to foster proactivity emergence, managers should adopt a contingent approach tailored to the specific characteristic of the organizational context. In sum, we do not advise a “one size fits all” approach.

6.3 Limitations and future research directions

This paper suffers from several limitations. First, despite gathering data from 13 firms, repeating a similar study with a bigger sample size should be advisable to reach more precise and refined conclusions. Second, we focused only on a context-specific representation of individual proactivity, namely PPS and PII. Further studies could explore the emergence process of individual proactivity encompassing other proactive behaviors (e.g., feedback seeking or voicing). Third, repeating the research in different organizational contexts and practices could expand our knowledge about their impact on proactivity emergence.

Future research can explore the theoretical and practical implications of the compilation emergence of proactivity and evaluate the impact of different contexts. In addition, by adopting a compilation view of the proactivity aggregation process, a new leadership role can be defined in managing and fostering proactivity, or a new job design can be found to nurture proactivity emergence.

7. Conclusion

In this paper, we challenge the predominant view on TPB emergence. After reviewing the most relevant extant literature, we provide a first step toward the conceptualization of a non-convergent

TPB emergence. We provide preliminary evidence of a divergent emergence of two IPB measures, namely PII and PPS. We aim to initiate discussion on TPB emergence and the need for a contingent approach accounting for different organizational contexts. From a managerial standpoint, being aware of TPB's complex and nuanced emergence can guide managers into effectively implementing practices aiming to foster proactivity in the workplace, avoiding the "one size fits all" approach.

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Direttiva europea sulla sustainability due diligence della supply chain e PMI: un framework a supporto del cambiamento

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Abstract

Frame of the research. *The research focuses on the implications of the Corporate Sustainability Due Diligence Directive for European SMEs operating as suppliers of the companies to which the Directive directly applies. European SMEs need to equip quickly to be compliant with the sustainability requirements. The literature points out that SMEs need to be supported to bridge their gaps.*

Purpose of the paper. *The aim of the paper is to support SMEs in upgrading processes and competences, through a framework guiding due diligence decision-making processes.*

Methodology. *Starting from the analysis of the Directive scope, the framework is elaborated through a literature review on SMEs supply chain sustainability. The aim, according to a deductive approach, is to formulate a framework to be, in a second phase, inductively applied and verified to business cases.*

Results. *The research elaborates a first framework consisting of a due diligence decision-making process flow chart, a supply chain sustainability matrix, guidelines to select the most appropriate tools and the toolkit.*

Research limitations. *The conceptual framework has not found practical application yet. The second phase of the research will test the framework with SMEs operating in different supply chains, with different risk levels, and different degrees of engagement.*

Managerial implications. *The paper proposes an original multi-criteria, taylor-made, incremental and proportional implementation-oriented framework to promote greater SME involvement in sustainability issues and greater collaboration between companies along the supply chain.*

Originality of the paper. *The topic is very recent and the focus on SMEs needs more exploration. The Directive identifies SMEs as one of the critical elements of the supply chain and their need to be supported. The paper offers a useful contribution in this direction.*

Key-words*: Sustainability; Supply Chain; European Directive CSDDD; Due Diligence; SME*

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1. Premessa

Il tema della sostenibilità nelle sue diverse dimensioni (Elkington, 1997; 1998) è da tempo al centro delle politiche delle istituzioni e delle strategie aziendali. L'obiettivo è quello di trovare un punto di equilibrio tra le diverse istanze che ruotano intorno ad una attività economica che è divenuta sempre più complessa e rischiosa.

Si tratta di un tema che coinvolge diverse discipline e diversi attori in uno scenario globale che sta cambiando molto rapidamente, mettendo le imprese di fronte a sfide molto complesse. Il tema della sostenibilità testimonia il forte grado di integrazione che l'attività economica ha raggiunto sia a livello geografico che industriale (Baldwin 2006; 2019), a seguito del processo di globalizzazione, che fatica ad essere governato dalle istituzioni ai diversi livelli. Il processo di globalizzazione da un lato ha spezzato l'equilibrio tra la dimensione giuridico-politica degli Stati e quella economica delle imprese, rendendo molto più complesso un governo economico equilibrato, e dall'altro ha accentuato l'interdipendenza tra le imprese e tra le diverse fasi dei processi di produzione e distribuzione.

A fronte di supply chains sempre più integrate e disperse, perseguire con successo obiettivi di sostenibilità diventa più complesso sia per le istituzioni sia per le imprese. Le istituzioni hanno un perimetro di azione molto limitato, mentre per le imprese la performance dipende fortemente da fattori esterni e non controllabili, come le attività svolte dagli altri attori della filiera. Da tempo il supply chain management sottolinea come un vantaggio competitivo raggiunto a livello di supply chain rappresenti un punto di forza determinante nell'arena competitiva globale (Tan, Kannan, Handfield, 1998; Li, Ragu-Nathan, Ragu-Nathan, Subba Rao, 2006): una supply chain in grado di operare in modo sincronizzato e coerente permette per esempio di garantire lead time e livelli di qualità di prodotto superiori alla concorrenza; una supply chain trasparente e integrata dal punto di vista dei processi e delle informazioni può creare valore in termini di resilienza agli eventi disruttivi sempre più frequenti nell'attuale scenario geopolitico globale (Jüttner, Peck, Christopher, 2003; Christopher, Peck, 2004; Jüttner, 2005). Allo stesso modo un operare coordinato e orientato alla sostenibilità da parte di tutti gli attori della supply chain riduce i rischi a cui la supply chain è esposta e a cui la supply chain espone la società (Handfield, Sroufe, Walton, 2005).

In questo quadro si inserisce la Direttiva europea 2024/1760, nota anche con l'acronimo CSDDD (Corporate Sustainability Due Diligence Directive) o CS3D. Con questa Direttiva l'Unione Europea mira a creare un regime regolatorio stringente su un tema che considera fondamentale nel perseguimento di un modello di sviluppo più sostenibile e responsabilizzante, nel quale le imprese di maggiori dimensioni sono chiamate a conoscere le modalità di produzione e distribuzione adottate nella propria supply chain. L'obiettivo è quello di innescare quello che la letteratura chiama "trickle-down effect" o effetto a cascata (Ortiz *et al.*, 2023), nel quale le imprese focali che operano spesso in supply chain di natura globale, obiettivo diretto della Direttiva, facciano da volano di pratiche sostenibili (Patill *et al.*, 2022). La Direttiva non ha una esclusiva applicazione sul territorio europeo, questo non sarebbe coerente con l'estensione delle attività economiche. Le catene si estendono a livello globale e le imprese sono chiamate a gestire i rischi connessi alle catene globali (Christopher Mena, Yurt, 2011). Allo stesso modo le imprese non europee che operano sul territorio europeo sono chiamate a soddisfare i requisiti stabiliti nella Direttiva (Commissione europea, 2022).

Si tratta di una scelta rischiosa, che può ridisegnare il quadro competitivo globale (Enriques, Gatti, Shapira, 2025) anche a danno della competitività europea. In primo luogo, le imprese estere potrebbero decidere di trasferire le attività produttive fuori dall'Europa; in secondo luogo, non bisogna trascurare che il tessuto industriale europeo è composto da PMI che, dopo essere state messe in grave difficoltà dalle recenti crisi pandemiche ed energetiche (OECD, 2023; Politecnico di Milano, 2024), possono oggi trovare difficoltà ad adeguarsi alla normativa. Non si tratta in questo caso di non essere compliant rispetto a requisiti normativi, ma piuttosto di non essere compliant rispetto alle richieste del mercato, rappresentato dalle imprese focali delle filiere, oggetto di applicazione diretta della Direttiva.

La Direttiva ha suscitato quindi un acceso dibattito in merito alla sua applicabilità alle PMI (OECD, 2021), che ha portato ad un successivo ridimensionamento della portata normativa. Con il pacchetto Omnibus I, formalizzato con la Direttiva (UE) 2025/794 e pubblicato il 16 aprile 2025, l'obbligo di due diligence è stato infatti limitato ai soli fornitori diretti (tier 1), escludendo quelli indiretti lungo la catena di fornitura.

Malgrado questa semplificazione riduca l'estensione dell'effetto a cascata, l'impatto sulle PMI non potrà non essere significativo, dal momento che con il coinvolgimento del fornitore tier 1 si arriverà comunque a valutare anche le attività di livello successivo.

La letteratura evidenzia al riguardo le grandi difficoltà che le PMI incontrano nell'orientare i loro processi ai requisiti di sostenibilità (Lee e Klassen, 2008; Goh, Zailani, 2010; Mathiyazhagan *et al.*, 2013; Pereira, Tenera, Bispo, Wemans, 2015; Brustbauer, 2016; Ferreira de Araùlo Lima *et al.*, 2020) e il conseguente ritardo nella loro implementazione (Lanza, Roscio, 2022). Di fatto le PMI costituiscono un potenziale elemento di criticità se non di debolezza nella applicazione della disciplina sulla sostenibilità nella nuova concezione di filiera. Diversi autori sottolineano al riguardo la necessità di un processo di reskilling delle PMI e degli attori che le supportano nella loro attività gestionale (Dempere *et al.*, 2024; Ortiz *et al.*, 2024). Dempere *et al.* (2024) sottolineano al riguardo la necessità di supportare questi attori attraverso la formulazione di modelli, strumenti e metodologie che possano consentire loro di effettuare l'upgrading necessario in modo da restare competitive sul mercato non solo europeo. Si tratta di modelli e strumenti che richiedono di essere adattati alle esigenze e caratteristiche delle PMI (Pizzi *et al.*, 2022; Garrido-Ruso *et al.*, 2024), che non possono avvalersi di strumenti pensati per grandi imprese quotate e ben strutturate. Anche la Direttiva riconosce la necessità di supportare questi attori, ma al momento si tratta di un ecosistema ancora tutto da costruire.

Il paper mira a dare un contributo in questa direzione attraverso la proposta di un framework che possa guidare le PMI nella implementazione di una due diligence della loro catena di fornitura. A questo scopo il paper è così strutturato: il paragrafo 2 descrive la Direttiva e i suoi impatti sulle PMI; il paragrafo 3 è dedicato alla analisi della letteratura sul tema della sostenibilità della catena di fornitura nelle PMI e alla descrizione del framework, composto da un processo decisionale, una matrice di sostenibilità, delle linee guida e degli strumenti che per ogni livello di rischio può essere più opportuno adottare; nel paragrafo 4 si propongono alcune riflessioni conclusive e si suggeriscono alcune possibili linee di ricerca futura.

2. La Direttiva e l'impatto sulle PMI

La Direttiva (UE) 2024/1760 pubblicata il 5 luglio 2024 sulla Gazzetta ufficiale dell'Unione Europea (GU), relativa al dovere di diligenza delle imprese ai fini della sostenibilità, rappresenta un punto di svolta nel panorama normativo europeo. Questa direttiva, spesso indicata come CSDDD (Corporate Sustainability Due Diligence Directive) o CS3D, si inserisce in un contesto più ampio di politiche europee volte a promuovere la sostenibilità e la responsabilità sociale delle imprese. Essa trae origine dal Green Deal europeo (Commissione europea, 2019) e si basa su principi guida internazionali come quelli delle Nazioni Unite (United Nations, 2011) e dell'OCSE (2018; 2023b). L'obiettivo primario è quello di integrare la sostenibilità nella governance aziendale, assicurando che le imprese identifichino, prevengano, mitighino e rendano conto degli impatti negativi delle loro attività su due specifici ambiti: i diritti umani e l'ambiente.

A tale scopo la CSDDD impone alle imprese obblighi stringenti in materia di diritti umani e tutela ambientale lungo l'intera catena di fornitura, adottando un approccio basato sul dovere di diligenza (due diligence), articolato in sei fasi principali: 1) integrazione del dovere di diligenza nelle politiche e nei sistemi di gestione; 2) individuazione e valutazione degli impatti negativi; 3) prevenzione, arresto o minimizzazione degli impatti negativi; 4) monitoraggio e valutazione dell'efficacia delle

misure; 5) comunicazione pubblica e trasparente delle politiche dei processi e attività di due diligence; 6) riparazione degli impatti negativi generati.

La Direttiva adotta una definizione ampia di "impatti negativi", che comprende una vasta gamma di violazioni dei diritti umani e danni ambientali[3], e obbliga le imprese all'adozione di misure adeguate ad affrontare efficacemente gli impatti in modo proporzionato alla loro gravità e probabilità.

Inoltre essa prevede una serie di meccanismi che vanno a costituire il nuovo ecosistema della due diligence della sostenibilità. In particolare, prevede che gli Stati membri designino una o più autorità nazionali di controllo indipendenti, che hanno il compito di monitorare l'applicazione della Direttiva, condurre indagini in caso di sospette violazioni e imporre sanzioni. In caso di violazione degli obblighi previsti dalla Direttiva, le imprese possono infatti essere soggette a sanzioni pecuniarie e ad altre misure correttive. Le sanzioni devono essere effettive, proporzionate e dissuasive. Inoltre, le imprese possono essere ritenute responsabili civilmente per i danni causati dal mancato adempimento dei loro obblighi di due diligence, a condizione che il danno sia causato da violazioni specifiche. Infine, la Direttiva prevede l'istituzione di meccanismi di notifica e di reclamo a cui le persone e i soggetti interessati possono rivolgersi in caso di potenziali impatti negativi.

La Direttiva si applica in modo diretto alle imprese UE e non UE che operano in UE di maggiori dimensioni (si veda Tab. 1)[4].

Tab. 1: L'ambito di applicazione diretta della CSDDD

Tipologia	Requisiti
Società costituite nell'UE	Più di 1.000 dipendenti e fatturato netto globale superiore a 450.000.000 EUR nell'ultimo esercizio finanziario (o la capogruppo di un gruppo che soddisfa tali requisiti)
	Società con accordi di franchising o licenza nell'UE che generano diritti di licenza superiori a 22.500.000 EUR e con un fatturato netto globale superiore a 80.000.000 EUR (o la capogruppo di un gruppo che soddisfa tali requisiti).
Società costituite al di fuori dell'UE	Fatturato netto generato nell'UE superiore a 450.000.000 EUR nell'esercizio precedente all'ultimo (o la capogruppo di un gruppo che soddisfa tali requisiti).
	Società con accordi di franchising o licenza nell'UE che generano diritti di licenza superiori a 22.500.000 EUR e con un fatturato netto nell'UE superiore a 80.000.000 EUR (o la capogruppo di un gruppo che soddisfa tali requisiti).

Nota: Le società capogruppo possono essere esonerate dall'adempimento degli obblighi se la loro attività principale è la detenzione di azioni in filiali operative e non sono coinvolte nelle decisioni gestionali. In tal caso, una delle filiali stabilite nell'UE può essere designata per adempiere gli obblighi per conto della capogruppo.

Fonte: ns elaborazione da Direttiva (UE) 2024/1760 del Parlamento europeo e del Consiglio del 13 giugno 2024 relativa al dovere di diligenza delle imprese ai fini della sostenibilità e che modifica la direttiva (UE) 2019/1937 e il regolamento (UE) 2023/2859.

Essa avrà però un impatto indiretto ma molto significativo anche per le PMI, che costituiscono la spina dorsale del sistema economico europeo.

Il processo di due diligence sopra descritto non si applica infatti solo alle attività direttamente svolte dalle imprese di maggiori dimensioni, ma anche a quelle svolte dalle imprese fornitrici delle stesse, anche se secondo il successivo pacchetto Omnibus I (Direttiva (UE) 2025/794, 16 aprile 2025) dovranno essere coinvolti solo i loro fornitori diretti (tier 1).

Le imprese più grandi, nella logica dell'impresa focale, sono quindi chiamate a fare da volano di una gestione sostenibile lunga la supply chain. Le grandi imprese, per adempiere ai loro obblighi di diligenza, dovranno infatti chiedere ai loro fornitori e clienti di rispettare i codici di condotta e i piani di azione relativi alla sostenibilità. Ciò non potrà non coinvolgere anche le PMI europee, spesso attive contemporaneamente su più catene di fornitura.

In particolare, per le PMI il processo si tradurrà in:

[3] Ad esempio sfruttamento del lavoro minorile, deforestazione, inquinamento idrico, emissioni dannose e violazioni dei diritti umani, come condizioni lavorative insalubri o discriminazioni nelle catene di approvvigionamento.

[4] La Direttiva prevede una applicazione scaglionata in base a fatturato e numero di dipendenti, a partire dalle imprese più grandi nel 2027 e progressivamente estendendosi a quelle più piccole fino al 2029. I termini sono stati prorogati di un anno dal pacchetto Omnibus I.

- obblighi di conformità: le PMI dovranno adeguarsi ai requisiti di sostenibilità imposti dalle grandi aziende, che potrebbero richiedere di implementare sistemi di gestione della sostenibilità, effettuare valutazioni di impatto interne ed esterne e adottare pratiche più responsabili;
- costi e oneri amministrativi e gestionali: le PMI potrebbero dover sostenere costi aggiuntivi per adeguarsi ai nuovi standard, inclusi quelli relativi alla consulenza, alla formazione del personale, alla adozione e gestione di nuovi hardware e software, alla modifica dei processi produttivi;
- rischio di esclusione dal mercato: le PMI che non riescono a conformarsi ai requisiti di sostenibilità delle grandi aziende potrebbero essere escluse dalla catena di approvvigionamento, con evidenti conseguenze negative sul loro business e sul sistema economico nel suo complesso.

La Direttiva riconosce le difficoltà che le PMI potranno incontrare e responsabilizza le grandi imprese nei confronti della sfida che le PMI sono chiamate a raccogliere, evidenziando la necessità di offrire loro un supporto nel processo di adeguamento. Le grandi imprese in particolare devono offrire un sostegno mirato e proporzionato alle PMI, agendo in diverse direzioni:

- sviluppo delle capacità e competenze: le grandi aziende sono chiamate a fornire o consentire l'accesso a programmi di sviluppo delle capacità, formazione e potenziamento dei sistemi di gestione per le PMI. Ciò può comprendere l'assistenza nella creazione di codici di condotta, nella conduzione di valutazioni di impatto e nell'implementazione di piani d'azione correttivi;
- supporto finanziario: qualora il rispetto del codice di condotta o del piano d'azione in materia di prevenzione o correttivo comprometta la sostenibilità economica della PMI, le grandi aziende devono offrire un sostegno finanziario mirato e proporzionato. Tale sostegno può assumere diverse forme, come finanziamenti diretti, prestiti a tasso agevolato, garanzie di approvvigionamento continuo o assistenza nell'ottenere finanziamenti;
- condivisione di costi per verifiche: se vengono effettuate verifiche di conformità da terze parti indipendenti, i costi devono essere sostenuti dalle grandi aziende. Se però le PMI contribuiscono ai costi, hanno la possibilità condividere i risultati delle verifiche con altre aziende;
- garanzie contrattuali: le garanzie contrattuali richieste dalle grandi aziende devono essere eque, ragionevoli e non discriminatorie e devono essere accompagnate da misure adeguate di verifica della conformità;
- collaborazione e dialogo: le grandi aziende devono dialogare attivamente con i loro partner commerciali PMI per comprendere le loro esigenze e difficoltà e per trovare soluzioni comuni.

E' chiaro quindi che il risultato finale a livello di supply chain dipenderà molto da come agiranno le grandi imprese e dalla risposta che le PMI sapranno esprimere. La relazione di collaborazione su cui si reggono le supply chain sarà pertanto fondamentale e la supply chain diventerà una fonte di vantaggio competitivo ancora più cruciale che in passato (Frey *et al.*, 2013).

3. Un framework per la PMI per affrontare la sfida della due diligence

3.1 Sostenibilità, supply chain e PMI: il contributo della letteratura

Come è già stato evidenziato, la Direttiva introduce degli obblighi a carico delle grandi imprese, imponendo loro di fare luce sulla sostenibilità delle loro supply chain. Indirettamente questo implica il coinvolgimento delle PMI che operano lungo la supply chain delle grandi imprese focali. Malgrado il successivo Pacchetto Omnibus I abbia ristretto il campo di azione alle sole PMI che occupano la posizione di tier 1 nella supply chain, l'impatto della Direttiva sulle PMI resta significativo considerato il ruolo che le PMI rivestono nell'economia europea.

Secondo l'Annual Report on European SMEs 2023/2024 in Unione Europea nel 2023 erano attive 25,8 milioni di PMI, corrispondenti al 99,8% delle imprese del settore non finanziario. Esse occupavano 88,7 milioni di persone, corrispondenti al 65% circa dell'occupazione totale del settore

non finanziario e al 53% del valore aggiunto dello stesso. Secondo il Report la presenza delle PMI è massiccia in quasi tutte le catene del valore analizzate. In alcuni settori, come quello del tessile tecnico, dei droni, delle telecomunicazioni, del cloud computing, dei sistemi per lo spazio, della robotica superano il 90%. Allo stesso tempo le PMI contribuiscono in misura molto minore al valore aggiunto, poiché sono poco coinvolte nelle attività manifatturiere ad elevata intensità di capitale, mentre operano per lo più in mercati di nicchia e dei servizi accessori (Commissione europea, 2024).

Da questi numeri appare evidente che se le grandi imprese rappresentano il volano di tutto il framework, è dalla capacità di coinvolgere le PMI nel processo che dipende la buona riuscita della normativa (OCSE, 2023a). Per l'Unione Europea il fatto che le PMI riescano a stare al passo con la normativa appare imprescindibile, il contrario avrebbe un impatto negativo sul tessuto socio-economico europeo.

Il coinvolgimento delle PMI deriva da quello che Ortiz *et al.* (2023) definiscono "trickle-down effect" o effetto a cascata generato dalle relazioni che intercorrono tra gli attori della supply chain. Proprio questo effetto a cascata secondo gli autori impone la necessità di definire degli standard, raccomandazioni o linee guida per le PMI affinché esse possano essere messe di grado di contribuire con successo al raggiungimento degli obiettivi di sostenibilità. Ugualmente Dempere *et al.* (2024) evidenziano il rischio che la nuova disciplina rappresenti per le PMI un evento disruttivo, sottolineando l'importanza di riuscire ad attrezzare le PMI per tempo, sensibilizzandole e fornendo validi strumenti affinché riescano ad inserirsi nel processo.

Il contributo in questa direzione può provenire, secondo la Direttiva, dagli Stati che sono chiamati a supportare le imprese in questa trasformazione attraverso siti web, portali, piattaforme, dedicando particolare attenzione alle PMI, le quali possono anche ricevere sostegno finanziario dagli Stati stessi (art. 20), e dalle imprese di più grandi dimensioni, che come già evidenziato sono invitate a introdurre diverse iniziative/attività.

Si tratta di un know-how tutto da costruire in tempi molto rapidi, non solo per attrezzare le PMI di strumenti adeguati ma anche per supportare un rinnovamento culturale più generale. Gli eventi disruttivi che hanno messo alla prova le supply chain di tutto il mondo dimostrano quanto sia difficile diffondere una cultura imprenditoriale orientata alla valutazione dei rischi e a una scelta coerente degli strumenti più adeguati. Come evidenziato da Pizzi *et al.* (2022) per le PMI è necessario individuare risposte personalizzate per tenere conto delle loro specificità. Garrido-Ruso *et al.* (2024) ritengono che sia necessario costruire modelli semplificati e taylor-made per le PMI in grado di razionalizzare le azioni di intervento, dando priorità a quelle meno costose. Si tratta di un aspetto metodologico che merita di essere approfondito, considerato che, come evidenziato da Lanza e Roscio (2022) i sistemi di rating ESG sono concepiti per esaminare le grandi imprese quotate e ben strutturate.

Su questo fronte è opportuno evidenziare che il contributo della letteratura è piuttosto limitato dal momento che poca attenzione è stata dedicata al tema del contributo delle PMI alla sostenibilità delle supply chain (Garrido-Ruso, 2024; Zaman *et al.*, 2025; Ortiz *et al.*, 2024). Alcuni studi riconoscono l'importanza del ruolo delle PMI nella implementazione di pratiche sostenibili lungo le supply chain integrate a livello globale, ma allo stesso tempo la maggiore complessità del loro coinvolgimento (Meqdadi, Johnsen, Johnsen, 2012). Jorgensen e Knudsen (2006) evidenziano come le PMI possano svolgere un ruolo fondamentale nella promozione della applicazione degli standard di sostenibilità oltre il livello Tier 1 della supply chain.

Allo stesso tempo la letteratura evidenzia che i vantaggi che la PMI può ottenere dalla adozione di standard di sostenibilità sono numerosi (Dumber-Smith, 2005; Fisch, 2019; Tombolesi, 2024):

- aumenta il grado di differenziazione sul mercato rispetto alla concorrenza e attrarre così clienti e consumatori più consapevoli;
- migliora l'efficienza: l'implementazione di pratiche sostenibili può portare a un miglioramento dell'efficienza dei processi e a una riduzione dei costi a lungo termine;

- migliora la resilienza: le richieste da parte dei clienti di dare maggiore visibilità alla propria filiera di fornitura, di approfondire la conoscenza dei processi dei propri fornitori, possono portare a ridurre i rischi di fornitura;
- aumentano le opportunità di accesso a nuovi mercati: le PMI che rispettano gli standard di sostenibilità potrebbero accedere a nuovi mercati e a opportunità di collaborazione con grandi aziende;
- migliora la loro reputazione: l'adozione di pratiche sostenibili può migliorare la reputazione e l'immagine aziendale, sia nei confronti dei consumatori che dei dipendenti.

A fronte di questi vantaggi la letteratura riconosce unanimemente le maggiori difficoltà delle PMI rispetto alle grandi imprese (OCDE, 2021), evidenziando alcune criticità che possono trasformare le PMI in veri e propri colli di bottiglia della sostenibilità lungo le supply chain. Le PMI si caratterizzano spesso per una minore disponibilità di infrastrutture, informazioni, risorse e competenze per poter implementare sistemi di governance della sostenibilità (Lee e Klassen, 2008; Goh, Zailani, 2010). Un tema importante riguarda la carenza di competenze finanziarie delle PMI e le loro difficoltà ad accedere a strumenti innovativi che possano supportarle nel percorso (Fallah Lajimi, 2021; Locatelli, Schena, 2023). Le risorse umane inoltre spesso mancano delle competenze necessarie all'applicazione di standard ambientali (Mathiyazhagan *et al.*, 2013). Le PMI rispetto alle grandi imprese non possono poi far leva sulle economie di scala necessarie per avviare i grandi investimenti legati all'implementazione di pratiche sostenibili, né spesso possono apprezzare i benefici in termini reputazionali che ne potrebbero derivare (Pereira, Tenera, Bispo, Wemans, 2015; Brustbauer, 2016; Directorate-General for Justice and Consumers – European Commission, British Institute of International and Comparative Law, Civic Consulting, LSE, 2020). Per questa ragione spesso adottano strumenti e pratiche sostenibili in seguito a pressioni esterne da parte di imprese più grandi o da parte di istituzioni, evidenziando un approccio alla sostenibilità di tipo reattivo (Liu *et al.*, 2014; Ramakrishnan *et al.*, 2015). Ferreira de Araùlo Lima *et al.* (2020), sulla base di una systematic literature review, sottolineano infine che l'attenzione verso il tema dei rischi legati alla supply chain per la PMI è piuttosto recente, evidenziando un gap che richiede di essere colmato. Ciò malgrado le PMI operino in condizioni di rischio spesso maggiori rispetto alle grandi imprese a causa di diversi fattori, come una struttura finanziaria spesso debole e un minor grado di diversificazione delle attività.

Il quadro che emerge dalla letteratura trova conferma in diverse survey volte a fare il punto sul grado di maturità delle PMI rispetto al tema della sostenibilità e che evidenziano il sostanziale ritardo delle PMI.

Con riferimento al quadro europeo, di particolare interesse sono i risultati della quarta edizione del White Paper Fostering Sustainability in Small and Medium-Sized Enterprises di SDA Bocconi School of Management Sustainability Lab, nel quale si fa il punto sulla transizione sostenibile delle PMI europee. Facendo riferimento ad un campione di più di 1260 PMI europee, la ricerca individua 4 categorie di PMI: le imprese cosiddette Heroes, che hanno già implementato una strategia o un piano di azione ESG, le imprese Soon-to-be, che hanno attivato un processo di implementazione di una strategia o di un piano d'azione ESG, le imprese Undecided, che potrebbero in futuro adottare piani di azione o strategie ESG, e le cosiddette Laggards, che non hanno intenzione di introdurre strategie e piani ESG.

Nel 2025 le imprese Heroes e Soon-to-be rappresentano il 44%, mentre le imprese Undecided costituiscono il 15% e le Laggards il 38% del campione.

Malgrado la ricerca evidenzi un trend in crescita delle imprese impegnate sul fronte della sostenibilità (25% Heroes e 19% Soon-to-be), resta ancora prevalente la quota di imprese non coinvolte (66%) (SDA Bocconi School of Management, Sustainability Lab, 2025).

In Italia la situazione appare peggiore. Una survey condotta nel 2021 su un campione di oltre 10mila imprese italiane, con fatturato dai 2,5 milioni a 350.000 milioni di euro, ha evidenziato una sostanziale scarsa attenzione verso i temi del cambiamento climatico e dell'impatto sull'operatività aziendale e verso l'adozione di sistemi di misurazione e reporting dell'impatto ambientale derivante

dai processi produttivi aziendali, con il 79% delle imprese che ha risposto di non averne adottati e di non avere intenzione di farlo in futuro (Lanza, Roscio, 2022).

L'impegno delle PMI è invocato dalla letteratura, che sottolinea la necessità di un generale sforzo di reskilling in modo da dotarle di quelle competenze di riprogettazione dei sistemi e dei processi di produzione, di selezione di fornitori più responsabili e dei prodotti più sostenibili (Dempere *et al.*, 2024), di valutazione e selezione di strumenti finanziari adeguati (Locatelli, Schena, 2023). Ortiz *et al.* (2024) ritengono che lo sforzo di reskilling riguardi anche i fornitori di servizi contabili e di rendicontazione che sono chiamati a svolgere un ruolo cruciale e che sono essi stessi PMI.
L'accesso a risorse e competenze di varia natura (finanziaria, tecnologica, tecnica, etc.) per colmare il gap può essere raggiunto anche attraverso la partnership con le altre imprese della supply chain (Frey *et al.*, 2013), in particolare quelle focali. Sotto questo profilo la agilità e la cultura adattiva che caratterizzano le PMI possono costituire un vantaggio nell'implementazione di nuovi processi e procedure rispetto alla grande impresa, più rigidamente organizzata (OCSE, 2021). La collaborazione grande impresa-PMI corrisponde a quello che la letteratura definisce approccio orientato al mentoring, in contrapposizione all'approccio monitoring/control. Quest'ultimo include azioni come l'auditing della performance dei fornitori, la somministrazione di questionari, l'ispezione dei fornitori, la raccolta di altre informazioni in merito alla sostenibilità dei fornitori, mentre l'approccio orientato al mentoring prevede relazioni di partnership fra clienti e fornitori, focalizzate su interventi formativi per i fornitori (Meqdadi, Johnsen, Johnsen, 2012). Su questo fronte però la letteratura evidenzia la necessità di un ulteriore contributo da parte della ricerca. Patil *et al.* (2022) hanno condotto una review della letteratura relativa al ruolo che l'impresa focale può avere nel coinvolgimento dei fornitori nel perseguimento degli obiettivi di sostenibilità, dalla quale emerge che l'attenzione è per lo più concentrata sulla misurazione della performance dei fornitori, mentre poca attenzione è dedicata alle azioni che le imprese possono intraprendere una volta che le informazioni sono state ottenute ed elaborate. Gli autori sostengono che sarebbe necessario potenziare la ricerca su metodi e modelli utili per supportare le grandi imprese nella gestione di un reale cambiamento.

La sfida che la Direttiva pone è quindi molto importante, non solo per le PMI ma anche per il sistema economico europeo che sulle PMI si fonda. I gap, come visto, sono diversi e vanno colmati in tempi molto brevi. E' necessario e urgente uno sforzo congiunto da parte delle imprese, dell'accademia e delle istituzioni. Disporre di framework di riferimento che guidino attraverso la scelta di criteri, modalità operative e strumenti, al di là e in modo sinergico a quanto i diversi clienti di maggiori dimensioni direttamente coinvolti nella Direttiva potranno chiedere attraverso accordi, contratti e strumenti specifici, appare imprescindibile per poter organizzare in modo efficiente ed efficace il processo di due diligence della filiera di fornitura. Questo è l'obiettivo che persegue il framework proposto nel prosieguo del lavoro.

3.2 Il framework proposto

A fronte delle criticità che le PMI possono incontrare nella implementazione di pratiche sostenibili, come è già stato sottolineato, letteratura e Direttiva sottolineano la necessità di fornire loro un supporto affinché riescano a colmare il gap. Allo stesso tempo, secondo una ricerca dell'International Organization of Employers e dell'International Labour Organisation in merito all'attenzione delle PMI verso il tema dei diritti umani, le PMI auspicano che i diversi attori svolgano un ruolo guida e di supporto: i governi attraverso la definizione di normative e linee guida, le organizzazioni internazionali attraverso la promozione di best practices e il supporto agli Stati nella promozione del rispetto dei diritti umani da parte delle imprese e infine le associazioni di imprese attraverso attività formativa su questi temi e diffusione di best practices (IOE e ILO, 2016).

Il presente articolo mira a contribuire in questa direzione proponendo un framework operativo che possa supportare i practitioners delle PMI nell'implementazione di un processo di due diligence per il governo dei rischi lungo la catena di fornitura.

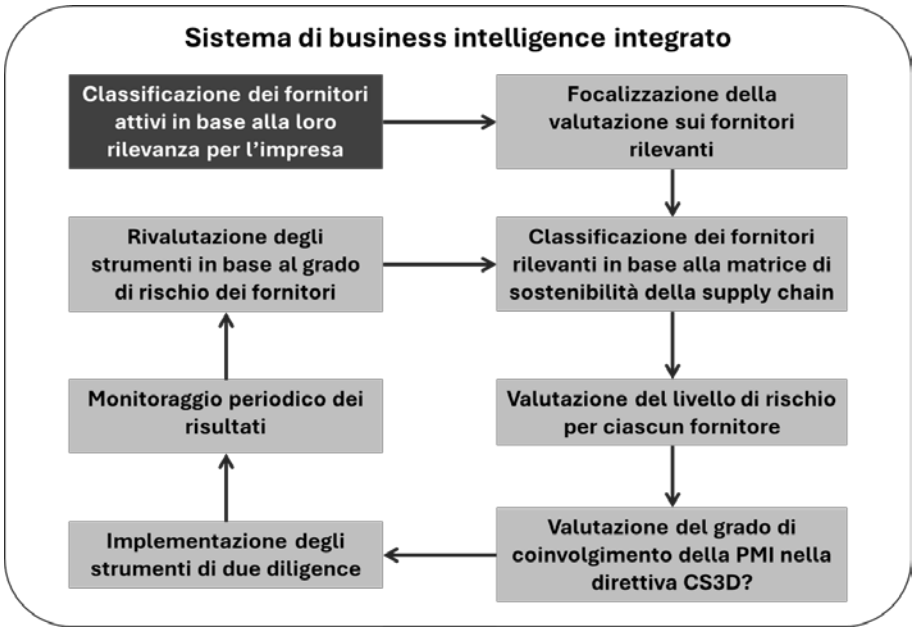
Il framework dovrà essere integrato al sistema di valutazione dei fornitori adottato dalla PMI, in modo che possa apportare un contributo di valore informativo e decisionale focalizzato sui temi sensibili per la Direttiva, e più in generale al sistema di business intelligence adottato dalla PMI.

Se l'impresa non è dotata di un sistema di valutazione dei fornitori e di un più ampio sistema di business intelligence dovrà effettuare un primo investimento importante, per il quale sarà necessario garantire un adeguato ritorno.

Il framework si articola in un processo decisionale (Fig. 1) e da diversi supporti: una matrice decisionale, alcune linee guida per valutare il rischio, un mix di diversi strumenti che possono essere adottati dall'impresa in funzione del livello di rischio individuato.

La prima fase del processo decisionale prevede la individuazione dei fornitori più rilevanti. Sotto questo profilo l'impresa può fare riferimento a strumenti come la matrice di Kraljic (1983), che individua i fornitori degli input in base al rischio di fornitura e al valore economico da essi generato per l'impresa. L'impresa potrà quindi decidere di sottoporre a due diligence i fornitori strategici, quelli dei prodotti leva e dei prodotti colli di bottiglia. La selezione potrà poi valutare la rilevanza del fornitore anche in termini di continuità delle forniture e utilizzo diffuso di quanto fornito nei prodotti dell'impresa. Naturalmente la focalizzazione sui fornitori più rilevanti risponde all'opportunità di procedere con gradualità, attivando i vantaggi di un processo di acquisizione delle competenze basato sul learning-by-doing. Questo approccio appare in linea con quanto afferma il documento OECD Due Diligence Guidance for Responsible Business Conduct (2018), il quale stabilisce che la due diligence deve essere adeguata alle specifiche circostanze in cui opera l'impresa, tra cui la dimensione, il business model, la posizione nella supply chain e la natura dei prodotti/servizi[5].

Fig. 1: Il processo decisionale di due diligence della PMI



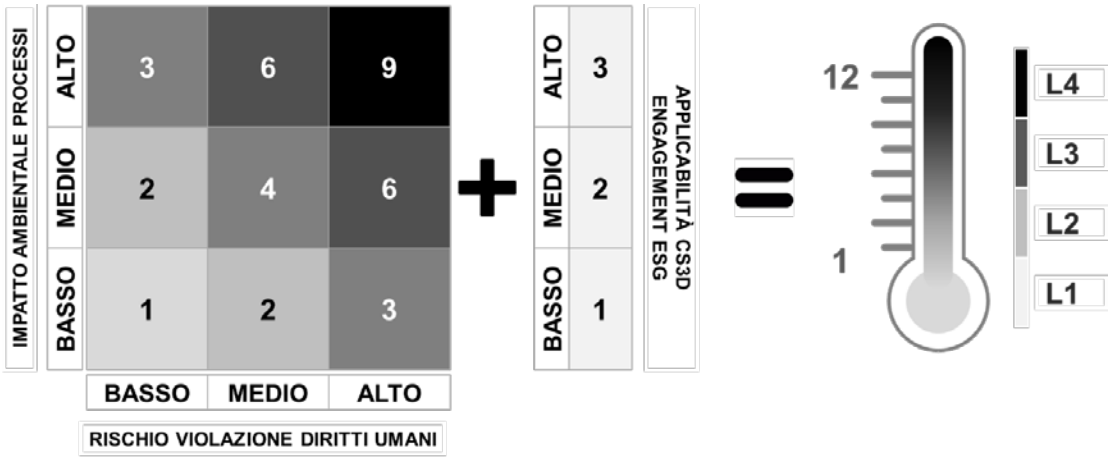
Fonte: ns. elaborazione.

[5] In particolare il documento OECD Due Diligence Guidance for Responsible Business Conduct (2018, p. 18) prevede che "Due diligence is appropriate to an enterprise's circumstances. The nature and extent of due diligence can be affected by factors such as the size of the enterprise, the context of its operations, its business model, its position in supply chains, and the nature of its products or services. Large enterprises with expansive operations and many products or services may need more formalised and extensive systems than smaller enterprises with a limited range of products or services to effectively identify and manage risks". Il documento specifica ancora che "The size or resource capacity of an enterprise does not change its responsibility to conduct due diligence commensurate with the risk, but may affect how an enterprise carries it out. Enterprises with resource constraints may rely more heavily on collaborative approaches in carrying out due diligence and may have to make more careful decisions in the context of prioritisation. They may also take advantage of existing resources such as model policies or public information on risks in certain supply chains and seek technical assistance from industry associations they are members of" (OECD, 2018, p. 46).

Una volta individuati i fornitori rilevanti l'impresa potrà procedere alla valutazione di rischio di ciascuno, avvalendosi della matrice di sostenibilità della catena di fornitura proposta in Fig. 2. La matrice si focalizza sulle due dimensioni prese a riferimento dalla Direttiva, vale a dire l'impatto ambientale dei processi produttivi dei fornitori e i rischi di violazione dei diritti umani da parte degli stessi. La scelta di queste variabili appare coerente con i criteri di selezione dei fornitori orientati alla CSR, che includono il rispetto dei diritti umani, la tutela dei diritti dei lavoratori quanto a numero di ore lavorate, le condizioni lavorative, il divieto del lavoro minorile, la sicurezza sul lavoro, l'impatto ambientale delle operations, la salubrità degli ambienti lavorativi (Xu *et al.*, 2013).

Il Paese di localizzazione delle attività operative o di quelle dei loro fornitori rilevanti è considerato un elemento dirimente dal punto di vista di entrambe le variabili, dal momento che se nel Paese non esistono normative a tutela dell'ambiente e del lavoro il rischio dovrà essere considerato elevato.

Fig. 2: Matrice di sostenibilità della supply chain



Fonte: ns. elaborazione.

Lo strumento guida, nella prima fase, nella valutazione in logica multi-criterio e assegnazione di un livello di rischio combinato derivante dalla natura dei processi produttivi e logistici dei fornitori e dai rischi di violazione dei diritti umani e dei lavoratori.

La fase successiva riguarda l'azienda che effettua la valutazione. In questa fase si considera il livello di coinvolgimento della PMI rispetto alle implicazioni della direttiva CS3D. Le imprese che operano in mercati con grandi clienti soggetti alla direttiva o che adottano strategie ESG per ottenere un vantaggio competitivo ricevono un punteggio di rischio più alto, in quanto sono chiamate ad adottare pratiche di valutazione più rigorose nella valutazione dei propri fornitori. Tale punteggio va ad integrare quello derivante dalla matrice di sostenibilità.

Alle variabili utilizzate viene associato un livello di rischio basso, medio, alto in funzione della linea guida proposta in Tabella 2. Per esempio con riferimento all'impatto ambientale avrà rilevanza il grado di obsolescenza della tecnologia utilizzata, come anche il consumo energetico sia in termini di volumi sia in termini di tipologia di fonti utilizzate. Sarà inoltre rilevante considerare le politiche di gestione dei rifiuti, specie in caso di uso di materiali nocivi o pericolosi. Con riferimento ai rischi di violazione dei diritti umani il rischio sarà basso nel caso di imprese che operano in Paesi dove esiste una legislazione chiara e una solida cultura di tutela dei diritti, mentre crescerà all'aumentare di criticità come lo sfruttamento minorile, il lavoro nero, la discriminazione. Strettamente connesso a questo è il criterio legato al Paese di localizzazione: un elevato livello di rischio sarà assegnato a quei Paesi che si caratterizzano per una legislazione debole, elevata corruzione, instabilità politica e violazioni diffuse dei diritti umani. Al riguardo si può fare riferimento a ranking elaborati da diverse istituzioni, come quello pubblicato periodicamente da WageIndicator Foundation[6] in funzione del rispetto dei diritti umani e delle condizioni di lavoro rilevate. Fornitori con attività operative situate

[6] WageIndicator Foundation, https://labourrightsindex.org/

nei Paesi con ranking più elevato devono essere oggetto di attenta valutazione in quanto ad elevato rischio.

Tab. 2: Linee guida per l'assegnazione dei punteggi nella matrice di sostenibilità della supply chain

Criteri di Valutazione	**Basso Rischio**	**Medio Rischio**	**Alto Rischio**
Impatto dei processi produttivi (Ambiente)	Fornitori con processi a basso impatto ambientale, utilizzo di tecnologie pulite, produzione con basso consumo di risorse naturali, uso di energia rinnovabile e pratiche di economia circolare.	Fornitori con processi che hanno un impatto ambientale moderato, con margini di miglioramento, gestione dei rifiuti non sempre ottimale, e consumo energetico standard.	Fornitori con processi ad alto impatto ambientale, elevato consumo di risorse, tecnologie obsolete, gestione dei rifiuti non conforme e alto consumo di energia da fonti non rinnovabili.
Rischi di violazione dei diritti umani	Fornitori in Paesi con elevata tutela dei diritti umani, rispetto delle normative sul lavoro, assenza di lavoro minorile e discriminazione, condizioni di lavoro sicure e dignitose e sindacalizzazione attiva.	Fornitori in Paesi con alcuni rischi di violazione dei diritti umani, necessità di controlli aggiuntivi su lavoro minorile e discriminazione, alcune aree di miglioramento su condizioni di lavoro.	Fornitori in Paesi con alto rischio di violazioni dei diritti umani, casi di sfruttamento del lavoro, lavoro minorile, condizioni di lavoro non sicure, assenza di diritti sindacali, forte discriminazione.
Paese di localizzazione	Paesi OECD con normative stringenti in ambito ambientale e sociale, elevata trasparenza e basso rischio corruzione.	Paesi con normative in via di sviluppo, moderata trasparenza e rischio corruzione contenuto.	Paesi con normativa ambientale e sociale debole, elevato rischio corruzione, instabilità politica, conflitti sociali, e diffusa violazione dei diritti umani.

Fonte: ns. elaborazione.

Infine il livello di coinvolgimento della PMI è un parametro che misura quanto una PMI sia "coinvolta" e quindi "esposta" a obblighi crescenti in materia di due diligence ESG, in funzione del ruolo che ricopre nella catena del valore dei propri clienti. Più l'azienda è coinvolta (per esempio perché parte di supply chain critiche, strategiche o sotto attenzione normativa), maggiore è il rischio legato alla compliance e all'inadeguatezza delle pratiche adottate. Il modello prende spunto dai concetti di "saliency" e "responsibility diffusion" sviluppati nella letteratura sulla due diligence nelle supply chain globali (OCSE, 2018; UN, 2011; Shift Project, 2021; Commissione europea, 2022.

In particolare:

- la saliency rappresenta la rilevanza e gravità potenziale degli impatti ESG lungo la supply chain, percepiti come prioritari;
- la responsibility diffusion esprime il grado di trasferimento a valle degli obblighi ESG dai grandi clienti ai fornitori, anche senza obblighi normativi diretti.

Ai fini del framework si propone qui una classificazione su tre livelli di coinvolgimento e rischio, misurati sulla pressione e sulle aspettative esterne in particolare da parte di clienti soggetti alla direttiva CSDDD:

- *Livello rischio 3 – Coinvolgimento elevato*
  La PMI è fornitore tier 1 di imprese soggette a CS3D, con obblighi ESG contrattuali strutturati. Gli indicatori tipici utilizzati possono essere: contratti attivi con imprese CS3D; clausole ESG vincolanti; partecipazione ad audit o piattaforme ESG (es. Sedex, Ecovadis); settore/area ad alta saliency; elevata responsibility diffusion (es. forniture critiche).
  I rischi principali possono essere così individuati:
  - rischio contrattuale e reputazionale;
  - esclusione dalla supply chain;
  - necessità di governance ESG formalizzata.
- *Livello rischio 2 - Coinvolgimento intermedio*
  La PMI è fornitore tier 1 o tier 2 o ha relazioni indirette con imprese CS3D, oppure ha avviato volontariamente una strategia ESG. Gli indicatori tipici utilizzati possono essere: relazioni commerciali con fornitori tier 1 di imprese CS3D; ricezione di questionari ESG o richieste generiche; adozione di politiche ESG interne (codice etico, obiettivi ambientali, certificazioni); saliency media o futura esposizione prevista.
  I rischi principali possono essere così individuati:
  - rischio emergente da future richieste ESG;

- incoerenza tra strategia e capacità operativa;
- pressione crescente da clienti.

- *Livello rischio 1 - Coinvolgimento limitato*
  La PMI ha relazioni occasionali o informali con clienti CS3D e nessuna strategia ESG interna attiva, ma c'è interesse e intenzione di svilupparla.
  Gli indicatori tipici utilizzati possono essere: nessun contratto strutturato con imprese CS3D; nessuna richiesta ESG ricevuta; nessuna pratica ESG interna già attiva; settore a bassa saliency.
  I rischi principali possono essere così individuati:
  - rischio latente di futura esclusione;
  - inadeguatezza a fronte di evoluzioni normative o di mercato.

La Tabella 3 sintetizza i criteri di attribuzione del livello di rischio in termini di coinvolgimento della PMI.

Tab. 3: Linee guida per l'assegnazione dei punteggi nella matrice di sostenibilità della supply chain

Livello	Relazione con clienti CS3D	Strategia ESG interna	Saliency	Responsibility Diffusion	Rischio
3	Fornitore diretto (Tier 1)	Qualsiasi (obbligo esterno dominante)	Alta	Elevata	**Alto**
2	Fornitore indiretto (Tier 2) oppure proattivo ESG	Presente	Media	Moderata	**Medio**
1	Nessuna relazione strutturata	Assente ma da sviluppare	Bassa	Assente	**Basso**

Fonte: ns. elaborazione.

Lo score complessivo, per ciascun fornitore, ottenuto dall'applicazione della matrice e poi corretto con la misura del livello di coinvolgimento della PMI, permette di individuare quattro livelli di attenzione che orientano verso l'adozione di uno o più degli strumenti di due diligence.

In particolare, in Tabella 4 vengono individuati gli strumenti raccomandati in base al livello di rischio assegnato. Come già evidenziato, la logica adottata è progressiva e cumulativa: man mano che aumenta il livello di criticità, si aggiungono strumenti di valutazione più rigorosi. Questo approccio garantisce che gli elementi più critici siano sottoposti a un controllo sempre più dettagliato, riducendo il rischio associato e migliorando la gestione della qualità, della sicurezza o della conformità alla normativa, e quindi in conclusione il governo della due diligence.

Tab. 4: Gli strumenti di due diligence per livello di rischio

Livello	Score	Criticità	Strumento
L1	2-3	Non critico	Questionari e modelli valutazione in-house
L2	4-6	Da monitorare	Piattaforme e modelli di valutazione di parti terze
L3	6-9	Critico	Visite da parte di auditors interni
L4	9-12	Estremamente critico	Audits condotti da parti terze

Fonte: ns. elaborazione.

Gli strumenti di due diligence per la valutazione dei fornitori sono stati individuati in funzione del focus su aspetti ambientali, sociali e di governance (ESG) secondo quanto emerge dalla letteratura (Lajimi, 2021; Li *et al.*, 2024) e sono descritti e confrontati in Tabella 5. Gli strumenti variano in termini di costo, affidabilità e profondità dell'analisi, permettendo di adottare strategie progressive in base al livello di rischio e all'importanza del fornitore.

Gli strumenti in-house potranno essere adottati in caso di score non critici o per una valutazione di prima istanza di tutti i fornitori, per individuare quelli su cui concentrare l'attenzione. Malgrado questa soluzione risulti tra quelle individuate la meno costosa, va sottolineato che essa può richiedere

uno sforzo di risorse non trascurabile in una PMI che non sia già dotata di infrastrutture, competenze e processi adeguati a questo scopo.

Le soluzioni proposte in caso di score intermedi richiedono comunque un impegno maggiore in termini di utilizzo di piattaforme/portali di parti terze o attività di auditing svolte direttamente dall'impresa, per le quali dovrà disporre di personale qualificato. In questo caso la PMI potrà esercitare un controllo diretto e puntuale e dovrà essere in grado di documentare le procedure adottate e i risultati rilevati.

La situazione di rischio estremo è quella per la quale è raccomandato il coinvolgimento di parti terze indipendenti, chiamate a svolgere attività di audit presso i fornitori. Si tratta evidentemente della soluzione più costosa e che richiede tempi più lunghi, per la quale la PMI deve potersi attrezzare, anche eventualmente coinvolgendo economicamente la grande impresa della filiera, come suggerito dalla Direttiva.

Agli strumenti proposti possono essere aggiunte anche le garanzie contrattuali: la PMI può inserire clausole contrattuali che obbligano i fornitori al rispetto degli standard di sostenibilità e diritti umani, attraverso la sottoscrizione di un codice di condotta dei fornitori o clausole più specifiche negoziate con il singolo fornitore. Si tratta di uno strumento che non è stato inserito in tabella perché dipende fortemente dal potere contrattuale delle parti, che spesso le PMI non hanno nelle loro relazioni industriali (Jorgensen, Knudsen, 2006), e va di conseguenza valutato caso per caso.

Tab. 5: Strumenti di due diligence

Strumento	**Descrizione**	**Utilizzo**	**Vantaggi**	**Svantaggi**
Questionari di autovalutazione	Questionari standardizzati che i fornitori compilano per fornire informazioni sulle loro pratiche ambientali, sociali e di governance (ESG).	Adatti per una prima valutazione di tutti i fornitori, consentono di identificare rapidamente i potenziali rischi e le aree di miglioramento.	Basso costo, facile implementazione, raccolta di dati su larga scala.	Rischio di risposte non veritiere o incomplete, necessità di validazione.
Piattaforme e portali fornitori di parti terze	Piattaforme online che offrono servizi di valutazione, monitoraggio e gestione dei rischi della catena di fornitura	Utili per valutare la conformità dei fornitori a standard ESG, accedere a report e analisi di rischio, monitorare le performance nel tempo.	Accesso a dati standardizzati e verificati, facilità di monitoraggio, reportistica automatizzata. Benchmarking con altre aziende	Costi di abbonamento, possibili limitazioni nella personalizzazione.
Visite di seconda parte	Audit condotti direttamente dalla PMI o da personale qualificato per verificare in loco le pratiche dei fornitori	Raccomandati per fornitori strategici o ad alto rischio, permettono una valutazione approfondita dei processi e delle condizioni di lavoro.	Controllo diretto, verifica della conformità sul campo, identificazione di criticità non evidenti con altri strumenti.	Maggiori costi e tempi di implementazione, necessità di risorse specializzate.
Visite/Audit di Terza Parte (Audit Indipendenti)	Audit condotti da enti di certificazione o auditor indipendenti per valutare la conformità dei fornitori a standard e normative.	Raccomandati per fornitori ad alto rischio, offrono una garanzia di imparzialità e affidabilità nella valutazione.	Maggiore credibilità, elevata affidabilità della valutazione, conformità a standard riconosciuti.	Costi elevati, tempi di implementazione più lunghi.

Fonte: ns. elaborazione.

Per comprendere il funzionamento del framework, in Tabella 6 vengono proposti alcuni casi di applicazione del framework. Per ragioni di sintesi nel testo viene presentato a titolo esemplificativo il caso n. 1. Si consideri una PMI che ha un fornitore rilevante (per tipologia di input, continuità delle forniture e utilizzo diffuso di quanto fornito nei prodotti dell'impresa) che fornisce componentistica metallica cromata. Tale fornitore realizza le lavorazioni di stampaggio e il trattamento superficiale di cromatura in un proprio stabilimento localizzato in Sri Lanka. La PMI ha inoltre diversi clienti importanti nella filiera della pelletteria.

La valutazione effettuata sulla base della matrice di sostenibilità attribuisce un punteggio pari a 9 (alto-alto), sia per quanto riguarda il rischio di violazione dei diritti umani nel Paese considerato, come emerge anche dal ranking della WageIndicator Foundation, sia per quanto riguarda l'impatto del processo produttivo di cromatura, considerato ad alto rischio sotto il profilo dell'impatto ambientale per l'utilizzo del cromo esavalente, la difficoltà di smaltimento dei fanghi residui, l'elevato consumo di energia e l'emissione di sostanze tossiche.

La valutazione in merito al livello di coinvolgimento della PMI rispetto alla Direttiva CS3D può essere considerato medio-alto (punteggio 2-3) perché l'impresa ha clienti con importanti brand del luxury che esprimono richieste di conformità significative. Il punteggio complessivo è quindi di 11-12 punti, che corrisponde a un livello L4 di rischio (Tab. 3), ovvero "estremamente critico". Questo suggerisce nel caso specifico di condurre anche audit di parti terze presso lo stabilimento del fornitore.

La stessa PMI nel caso in cui non fosse coinvolta in una filiera critica come quella della pelletteria potrebbe invece valutare in alternativa di organizzare un audit utilizzando proprie risorse senza aggiungere gli oneri di una valutazione esterna.

Tab. 6: L'applicazione del framework: possibili scenari

Caso 1	Azienda del settore alimentare
Contesto	Una PMI piemontese produce prodotti dolciari artigianali e si rifornisce di cacao da un fornitore in Ghana. Lavora come OEM di clienti rilevanti.
Rilevanza del fornitore	Materia prima critica (Kraljic: bottleneck/strategico).
Matrice di sostenibilità	- Impatto ambientale: medio (coltivazione estensiva, ma senza utilizzo di sostanze chimiche pericolose) - Rischio diritti umani: alto (aree rurali con rischio di lavoro minorile) - Paese: Ghana → medio/alto rischio secondo ranking internazionali.
Punteggio rischio combinato	6
Livello di coinvolgimento della PMI	Alto (opera in settore critico, è fornitore tier1) → punteggio 3
Score totale	9 → livello L4 – Estremamente critico
Azioni suggerite	- Questionari specifici da sottoporre al fornitore - Visita annuale condotta da team Qualità & ESG della PMI - Visite/audits periodici condotti da parte terze con supporto economico-finanziario dei clienti che chiedono evidenze
Caso 2	Azienda costruttore di macchine
Contesto	Una PMI emiliana produce macchinari per il packaging e si rifornisce di viti ad alta resistenza da un fornitore in Cina
Rilevanza del fornitore	Input tecnico specifico, difficile da sostituire (Kraljic: prodotti bottleneck)
Matrice di sostenibilità	- Impatto ambientale: alto (processo ad alta intensità energetica e uso di zinco) - Diritti umani: medio (rischi legati alle condizioni di lavoro, turni prolungati) - Paese: Cina → medio/alto rischio
Punteggio rischio combinato	6
Livello di coinvolgimento della PMI	Medio (l'azienda ha rapporti occasionali con aziende direttamente coinvolte in ambito CS3D ma ha una strategia di marketing e commerciale attiva sui temi ESG) → punteggio 2
Score totale	8 → livello L3 – Critico
Azioni suggerit3	- Audit interno approfondito, con raccolta di evidenze documentali - Verifica incrociata tramite piattaforme terze.
Caso 3	Azienda della filiera tessile
Contesto	Una PMI toscana produce tessuti per l'arredamento, acquistando filati da un fornitore in Spagna
Rilevanza del fornitore	input non strategico ma ad alta diffusione (Kraljic: prodotti leva).
Matrice di sostenibilità	- Impatto ambientale: basso (filati biologici, certificati GOTS) - Diritti umani: basso (UE, normativa forte) - Paese: Spagna → basso rischio
Punteggio rischio combinato	3
Livello di coinvolgimento della PMI	Medio (aderisce a un distretto sostenibile) → punteggio 2
Score totale	5 → livello L2 – Da monitorare
Azione suggerita	Utilizzo di una piattaforma ESG esterna per il monitoraggio e aggiornamento periodico delle certificazioni

Come evidenziato dagli esempi, l'implementazione del framework e dei diversi supporti proposti (matrice decisionale, linee guida, strumenti) per la due diligence della catena di fornitura consente alle PMI di gestire in modo efficace i principali rischi individuati dalla Direttiva. La scelta degli strumenti più adeguati dipende dal livello di rischio identificato, dal livello di coinvolgimento della PMI e dalle risorse disponibili. Come già sottolineato, per una PMI un approccio graduale, che parta da strumenti semplici e meno costosi, per poi passare a valutazioni più approfondite, è raccomandabile perché consente una graduale familiarizzazione con processi, modelli e strumenti nuovi che, senza mettere a rischio la stabilità aziendale, possono impattare in modo significativo sull'intero posizionamento aziendale nel mercato e nella filiera.

4. Considerazioni conclusive e future prospettive di ricerca

La Direttiva (UE) 2024/1760 rafforza il regime regolatorio, valorizzando anche il ruolo delle PMI nel perseguimento degli obiettivi di sostenibilità.

Per le PMI europee che costituiscono il perno del sistema economico-industriale europeo si tratta di una sfida molto impegnativa, che richiederà la creazione di un nuovo ecosistema a supporto del processo. La Direttiva sottolinea al riguardo il ruolo degli Stati e la responsabilità delle imprese di maggiori dimensioni nel supportare le PMI in questo processo.

Non si tratta solo di applicare nuovi strumenti ma di aderire ad una cultura di impresa che riconosca l'importanza della responsabilità economica e sociale oltre i confini del proprio operato. La supply chain sustainability è un obiettivo di lungo termine che può maturare gradualmente, favorendo anche una maggiore collaborazione tra tutti gli attori della filiera e dell'ecosistema.

Il framework proposto in questo lavoro mira a promuovere questo approccio, che, come evidenziato dalla letteratura, fatica a consolidarsi nelle PMI a causa di barriere interne ed esterne (Fallah Lajimi, 2021; Lanza, Roscio, 2022). Il framework costruito è coerente con quanto raccomandato dalla letteratura quanto a molteplicità di criteri e strumenti proposti (Li *et al.*, 2024), adattabilità alle esigenze e caratteristiche della PMI e delle supply chain in cui opera (Pizzi *et al.*, 2022; Garrido-Ruso *et al.*, 2024) e a gradualità e proporzionalità di implementazione (OECD, 2018).

Attraverso i diversi strumenti proposti dal framework e alla esemplificazione di casi pratici la ricerca mira a colmare il gap oggi ancora presente rispetto alle esigenze delle PMI di implementazione di strategie, piani e azioni orientate alla sostenibilità.

Al fine di procedere in questa direzione la successiva fase di ricerca prevede il testing del framework in specifici casi aziendali, diversi per ruolo dell'impresa nella supply chain, grado di coinvolgimento dell'impresa e livello di rischio della catena di fornitura. La seconda fase di ricerca avrà natura applicata e sarà svolta attraverso la metodologia della intervista semistrutturata ad imprese Tier 1 di imprese soggette alla CS3D.

L'obiettivo è contribuire a costruire knowledge e practices a supporto delle PMI che consentano una migliore esplorazione del tema di ricerca. Come evidenziato dalla letteratura è necessario un ampio sforzo per colmare i gap ancora esistenti. La ricerca potrebbe svilupparsi lungo diversi filoni, che potenzino la capacità della PMI di affrontare il tema della sostenibilità anche in logica proattiva. Particolare attenzione dovrebbe essere posta alle sinergie che potranno svilupparsi tra le diverse disposizioni normative europee, *in primis* tra la Direttiva sulla sostenibilità e la Direttiva sul Corporate Sustainability Reporting. Questo permetterebbe alle PMI di individuare significative economie di scala e di scopo, ottimizzando le risorse impiegate nella rendicontazione e migliorando la trasparenza verso gli stakeholder.

Inoltre le PMI dovrebbero essere supportate nella individuazione di un sistema di metriche con cui misurare nel tempo la performance della loro supply chain in ottica di sostenibilità, nonché di un sistema di tools integrati, nel quale i molti strumenti (es. standard e certificazioni ISO, linee guida GRI, framework ESG) che via via sono stati adottati dalle imprese possano essere organizzati in logica olistica, garantendo coerenza e completezza nella valutazione delle performance sostenibili.

Attenzione particolare andrebbe poi prestata al ruolo della Funzione Acquisti nelle PMI e alla necessità di attrezzare le risorse che operano in questa Funzione rispetto alle valutazioni richieste dalla Direttiva, individuando competenze e strumenti operativi per integrare criteri di sostenibilità nei processi di approvvigionamento e gestione dei fornitori.

Sarebbe necessario infine esplorare il tema della collaborazione tra Stati nella costruzione di un ecosistema omogeneo a livello europeo, per promuovere una applicazione equilibrata sul territorio europeo, favorendo lo scambio di best practices e l'armonizzazione delle normative nazionali, al fine di evitare disparità competitive e garantire un livello uniforme di impegno verso la sostenibilità.

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Track 13
Sustainability

Outward Foreign Direct Investment and ESG Performance: The Moderating Role of CSR Sustainability Committees

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Abstract

Frame of the research. *Outward foreign direct investment (FDI) is a key driver of firm internationalization, influencing firms' environmental, social, and governance (ESG) performance. However, its impact on ESG is not always straightforward and depends on firms' internal governance structures. This study examines the moderating role of the CSR Sustainability Committee in ensuring that outward FDI enhances sustainability outcomes.*

Purpose of the paper. *The paper investigates whether and how outward FDI improves ESG performance and whether the CSR Sustainability Committee strengthens this relationship. By integrating Stakeholder Theory, Institutional Theory, and the Resource-Based View, it clarifies the mechanisms through which international expansion affects firm sustainability.*

Methodology. *Using a panel dataset of 125 Italian listed firms from 2011 to 2023, the study applies multiple linear regression models to examine the impact of outward FDI on ESG performance, considering the moderating role of the CSR Sustainability Committee.*

Results. *Findings indicate that outward FDI positively influences ESG performance, but its effect is stronger when a CSR Sustainability Committee is in place. The governance and social dimensions of ESG benefit the most, while no significant effect is observed on the environmental pillar.*

Managerial implications. *Firms engaging in outward FDI should establish CSR Sustainability Committees to effectively integrate sustainability best practices across international operations. Policymakers should incentivize structured ESG governance to enhance responsible investment.*

Originality of the paper. *This study contributes to the literature by demonstrating that internal governance mechanisms are essential for firms to leverage international expansion for sustainability improvements.*

Key words: *Outward FDI; ESG; CSR Sustainability Committee; Corporate Governance; Sustainability Strategies.*

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1. Introduction

In recent years, firm sustainability has become a key strategic component for global firms. Increasing regulatory and social pressure has prompted firms to incorporate environmental, social, and governance (ESG) principles into their strategies to improve transparency, accountability, and firm risk management (Kateb and Alahdal 2024; Wei and Zheng 2024). In parallel, foreign direct investment (FDI) is considered a key lever for international economic growth and integration, leading to improvements in firm practices, including sustainability governance (Chrystella *et al.,* 2025).

According to the definition, 'Corporate Social Responsibility (CSR) is the voluntary integration by firms of social and environmental concerns into their relevant operations'(European Commission 2001). Increased global competitiveness has pushed firms to improve resource management, particularly those that generate competitive advantage, such as CSR (García-Sánchez 2020). On the other hand, FDI is defined as 'the category of international investment that reflects the objective of obtaining a lasting interest by an investor in one economy in a firm resident in another economy' (Wacker 2016).

However, the relationship between outward FDI and ESG performance is not always linear. While foreign investment can facilitate the transfer of more sustainable technologies and incentivize responsible practices (Torrecillas and Fernández 2022), it can also lead to "greenwashing" effects or opportunistic choices by firms (Zhang 2023). In this context, a CSR Sustainability Committee could play a crucial role in moderating this relationship, ensuring that foreign investment actually results in improved ESG practices.

This study aims to explore the link outward FDI and firms' ESG performance, paying particular attention to the role of sustainability governance. In particular, it aims to understand how the presence of a CSR Sustainability committee can influence this relationship by strengthening or modulating the positive impact of outward FDI on firms' environmental, social, and governance practices.

To explain the interaction between outward FDI, ESG, and CSR Sustainability Committee, our study relies on three established theoretical perspectives: Stakeholder Theory (Freeman 1994), Institutional Theory (DiMaggio and Powell 1983) and Resource-Based View (Barney 1991). Stakeholder Theory highlights how foreign investment can improve ESG performance, but only if supported by stakeholder-conscious governance (Narula 2012; Kateb and Alahdal 2024). The Institutional Theory suggests that outward FDIs push firms to adopt global ESG standards, with the CSR committee facilitating this adaptation (Khodijah 2022; Wang *et al.,* 2024). Finally, the Resource-Based View emphasizes how outward FDIs transfer resources and expertise that, if effectively managed by a CSR committee, can become a sustainable competitive advantage (Beamish and Chakravarty 2021).

Empirically, we built a database of 125 Italian listed firms, for 12 years from 2011 to 2023, of which ESG performance data and outward FDI data were available.

This study makes a significant contribution to the literature in three main directions. First, it delves into the relationship between outward FDI and ESG performance, highlighting how foreign investment can act as a lever to promote firm sustainability. Second, it analyzes the role of the CSR Sustainability Committee as a moderating element in this relationship, filling a gap in sustainability governance research. Finally, it integrates different theoretical perspectives to provide a broader and more comprehensive view of the dynamics governing the interaction between outward FDI, ESG and governance structures.

In addition to its academic value, the implications of this research are also relevant for policy makers and multinational firms. The study provides useful insights on how to structure sustainability policies and governance strategies to maximize the benefits of outward FDI, fostering a more responsible and value-creating approach in the long run.

2. Theoretical framework

The increasing recognition of the strategic significance of sustainability and corporate social responsibility for firms has substantially influenced this trend (Cooney *et al.*, 2022; Teerikangas *et al.,* 2022). Firms acknowledge the enduring advantages of incorporating sustainability and corporate social responsibility into their operations and plans, including enhanced reputation, heightened stakeholder engagement, and superior risk management (Louche *et al.,* 2017; Chollet and Sandwidi 2018; Khuong *et al.,* 2021; Hwang *et al.,* 2022). Moreover, customers are becoming more cognizant of the sustainability pledges of specific firms and are increasingly basing their purchasing decisions on these commitments. CSR is a significant factor for firms engaging in outward FDI, as it aids in alleviating the adverse effects of their operations and enhancing their reputation among stakeholders (Aguilera-Caracuel *et al.,* 2017; Choukroune and Donde 2021; De Nyeadi *et al.,* 2021). Consequently, comprehending the correlation between outward FDI and CSR is essential for firms, governmental bodies, and scholars.

To explain the interaction between outward FDI, ESG, and CSR Sustainability Committee, our study relies on three established theoretical perspectives: Stakeholder Theory (Freeman 1994), Institutional Theory (DiMaggio and Powell 1983) and Resource-Based View (Barney 1991).

According to stakeholder theory, firms do not only operate by following economic goals, but must respond to the needs of a variety of stakeholders (shareholders, employees, customers, governments, and local communities) (Freeman 1994). Foreign investment can act as a catalyst for improved ESG performance, as international investors often demand higher standards in terms of sustainability (Narula 2012). However, to maximize these benefits, the presence of a CSR Sustainability Committee may be essential to align stakeholder expectations and implement effective ESG strategies (Kateb and Alahdal 2024).

Institutional theory suggests that firms are subject to regulatory, coercive, and mimetic pressures that influence their strategic behavior (DiMaggio and Powell 1983). Outward FDI can lead local firms to comply with global ESG standards, especially if the investors' home country has more stringent environmental regulations (Wang *et al.,* 2024). In addition, a CSR Sustainability Committee can increase a firm's sensitivity to these institutional pressures and facilitate the adoption of advanced ESG practices (Khodijah 2022).

The Resource-Based View postulates that firms gain a sustainable competitive advantage through the accumulation of distinctive and hard-to-mimic assets (Barney 1991). ESG practices can be a strategic asset to enhance reputation and attract responsible investors (Beamish and Chakravarty 2021). Outward FDI can facilitate the transfer of resources, knowledge, and technologies that improve the ESG performance of host firms (Beamish and Chakravarty 2021). A CSR Sustainability committee could act as a governance mechanism that ensures that such resources are effectively integrated into firm strategy (Melis *et al.,* 2024).

The integration of Stakeholder Theory, Institutional Theory, and the Resource-Based View provides a sound theoretical framework for understanding how outward FDIs can influence firms' ESG performance, and how the presence of a CSR Sustainability Committee can moderate this relationship. While outward FDI responds to stakeholder pressures and institutional imperatives to improve ESG practices, a sustainability committee can serve as a strategic catalyst for transforming these investments into sustainable competitive advantages, ensuring that the resources transferred are effectively integrated into firm strategy.

3. Hypothesis development

The internationalization of firms through outward FDI is not only a strategy to expand business and gain new market share, but also an opportunity to improve their performance in terms of ESG (Qing *et al.,* 2024) . Firms that make outward FDI are exposed to a broader regulatory environment

and often more stringent ESG standards, prompting them to adopt more advanced sustainability practices (Qing *et al.*, 2024).

One of the main factors explaining this relationship is the need for compliance with ESG regulations in target markets. Many outward FDI target countries have stringent regulations on issues such as carbon emissions, protection of workers' rights, and transparent governance (Qing *et al.*, 2024). To operate successfully in these markets, investing firms are often forced to adopt higher standards in their core structure as well, thereby improving the ESG performance of the entire firm group (Qing *et al.*, 2024).

Another key mechanism is related to reputation and access to global markets. Firms with a strong international presence need to build and maintain a positive reputation to attract responsible investors and maintain strong business relationships with global partners (Wang *et al.*, 2024). In this sense, an increased focus on sustainability through the integration of ESG into business strategies helps to strengthen the brand and ensure a competitive advantage in the long run (Wang *et al.*, 2024).

In addition, outward FDI facilitates the transfer of ESG technologies and best practices. By coming into contact with more advanced business ecosystems in terms of sustainability, investing firms acquire new skills and innovations that can also be applied to domestic operations (Amendolagine *et al.*, 2021). This leads to systemic improvement in ESG management at the firm level (Amendolagine *et al.*, 2021). Finally, several empirical studies have shown that firms with strong exposure to outward FDI show significant progress in their ESG scores compared to those that operate exclusively in domestic markets. An analysis of global firms found that, on average, firms with a high level of outward investment improve their transparency, environmental efficiency, and corporate governance faster than those that do not expand overseas (Qing *et al.*, 2024).

Therefore, we can make the following hypothesis:

HP 1: Outward FDI has a positive impact on ESG performance.

Although outward FDI can facilitate improved ESG performance, the effectiveness of this process depends on the firm's ability to integrate consistent and structured ESG strategies into its international operations. In this context, the presence of a CSR Sustainability Committee plays a key role in ensuring that outward investments are geared toward clear and measurable sustainability goals.

A CSR Sustainability committee helps the investing firm define, monitor, and implement consistent ESG strategies across domestic and international operations (Qing *et al.*, 2024). Without an appropriate governance structure, firms risk applying inconsistent ESG standards in the different countries in which they operate, with the danger of being perceived as opportunistic or incurring regulatory sanctions in more regulated markets (Qing *et al.*, 2024).

In addition, the CSR Sustainability committee facilitates coordination among international business units, ensuring that ESG best practices acquired in destination countries are also integrated into decision-making processes throughout the firm (Melis *et al.*, 2024). This is particularly relevant for multinational firms that operate in very different regulatory and cultural environments, where the risk of fragmentation of ESG strategies is high (Melis *et al.*, 2024). Another key element is monitoring and transparency in ESG reporting. Firms that have a CSR Sustainability committee tend to disclose more information about their ESG practices, increasing the trust of investors and business partners (Kateb and Alahdal 2024). This is especially important for firms that engage in outward FDI, as robust ESG governance can reduce the risk of greenwashing and improve firm credibility in international markets (Kateb and Alahdal 2024). Finally, empirical evidence suggests that firms with a sustainability committee make better use of outward FDI to improve their ESG performance than those without structured governance in this area. A recent study showed that firms with CSR Sustainability Committees record faster and more consistent improvements in their ESG scores after international expansion than those without a formal sustainability committee (Qing *et al.*, 2024).

Therefore, we can formulate the following hypothesis:

H2: The presence of a CSR Sustainability Committee positively moderates the relationship between outward FDI and ESG Performance

4. Data and method

The research sample consists of 125 Italian firms from 2011 to 2023, yielding a total of 1,500 observations. We utilized many databases. Information regarding the firm's sustainability characteristics and diversity policy was obtained from Thomson Reuters. The data concerning the degree of internationalization of Italian firms were taken from Reprint (Mariotti and Mutinelli 2017) and the specific data of a firm (*e.g.*, age, location, economic and financial data) were extracted from the Orbis Bureau van Dijk database (Orbis Intellectual Property for data regarding innovation).

Dependent variable. The ESG score reflects a firm's total performance in environmental, social, and governance criteria (Gregory 2024). A superior score signifies enhanced performance on ESG factors.

In accordance with Fandella *et al.*, (2023) and Priem and Gabellone (2024), the robustness tests utilize the following: the ESG governance pillar score, indicating a firm's performance in governance; the ESG social pillar score, reflecting a firm's performance in social aspects; and the ESG environmental pillar score, denoting a firm's performance in environmental matters.

Independent variable. To measure the degree of Internationalization, we considered the total outward FDI performed by a firm (Zona *et al.*, 2022).

CSR sustainability committee is a dummy variable indicating whether the firm has a dedicated committee or team for CSR. Literature suggests that the presence of such committees enhances corporate governance, which in turn can positively influence ESG performance (Dixon-Fowler *et al.*, 2017; Liu and Zhang 2017).

Control variables. Return on Assets (ROA) assesses firm profitability, serving as a metric for firm productivity and profitability, and positively influences ESG performance (He and Jiang 2019). Firm size, indicated by employee count (Agnese *et al.*, 2024; Cambrea *et al.*, 2024). The OECD guidelines serve as a binary indicator of a firm's assertion of compliance with the OECD Guidelines for Multinational Enterprises. Industry, a categorical variable denoting the firm's sector; NACE Rev. 2 codes were aggregated to the most general level.

We employed multiple linear panel regression models to analyze ESG performance. Researchers have proposed employing either the initial differences or the fixed effects (inside) estimators (Andres and Vallelado 2008). To address a potential endogeneity concern, we select all independent variables with one-year lags (Liang *et al.*, 2013; Ashwin *et al.*, 2015). Random effects were employed because, as stated by Hilbe (2011), these estimators demonstrate more efficiency than fixed-effects estimators when the data originate from a large population of observations and when there are numerous panels in the dataset. The Hausman test validates this selection.

We test hypothesis 1, taking into account the effects of outward FDI on the ESG Score.

Model 1: ESG Score =f(FDI + CSR sustainability committee + control varisbiles)

We test hypothesis 1, taking into account the effect of interaction between outward *FDI* and *CSR sustainability committee* on the *ESG Score.*

*Model 2: ESG Score =f(FDI * CSR sustainability committee + control varisbiles)*

As a robustness check, we considered several specifications of ESG Score, in particular *ESG governance pillar, ESG social pillar* and *ESG environmental pillar*.

5. Results

The value of variance inflation factors is 3.66, potential multicollinearity is not an issue (Shrestha 2022).

Table 1 presents overall descriptive statistics for the entire sample.

Tab. 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ESG Score	1500	53.701	18.673	3.185	94.641
ESG environmental pillar	1500	52.015	23.703	0	98.907
ESG governance pillar	1500	47.39	22.54	0.323	97.045
ESG governance pillar	1500	60.286	20.994	6.674	96.347
FDI	1500	8.707	20.493	0	155
CSR sustainability committee	1500	0.891	0.312	0	1
OECD Guidelines	1500	0.09	0.286	0	1
ROA	1500	4.52	8.131	-58.108	38.945
Firm size	1500	8586.727	18660.264	5	167014
Administration	1500	0.008	0.089	0	1
Arts	1500	0.016	0.126	0	1
Construction	1500	0.016	0.126	0	1
Electricity and gas	1500	0.08	0.271	0	1
Estate	1500	0.008	0.089	0	1
Finance and insurance	1500	0.208	0.406	0	1
Health	1500	0.016	0.126	0	1
IT	1500	0.072	0.259	0	1
Manufacturing	1500	0.392	0.488	0	1
Mining and quarrying	1500	0.016	0.126	0	1
Other services	1500	0.008	0.089	0	1
Professions	1500	0.072	0.259	0	1
Public administration	1500	0.016	0.126	0	1
Trade	1500	0.048	0.214	0	1

Source: our elaboration

Table 2 presents our results.

Tab. 2: Results

	Model 1	Model 2
VARIABLES	ESG Score	ESG Score
FDI	0.0927*	0.0236
	(0.0483)	(0.0408)
CSR sustainability committee	1.574**	0.701
	(0.652)	(0.6859)
FDI*CSR sustainability committee		0.0851**
		(0.0365)
OECD Guidelines	7.043***	7.139***
	(0.990)	(0.965)
ROA	0.000452	0.00327
	(0.0486)	(0.0493)
Firm size	0.000184***	0.000187***
	(4.76e-05)	(4.79e-05)
Administration	-58.30***	-58.34***
	(5.232)	(5.214)
Arts	-7.837	-7.952
	(9.544)	(9.604)
Construction	-11.09	-11.15
	(12.00)	(12.02)
Electricity and gas	6.037	5.970
	(6.285)	(6.281)
Estate	8.894*	8.935*
	(5.190)	(5.176)
Finance and insurance	-9.235	-9.415
	(6.089)	(6.084)
Health	-17.15***	-17.33***

	(5.916)	(5.864)
IT	-15.30**	-15.44**
	(7.150)	(7.141)
Manufacturing	-11.52**	-11.73**
	(5.618)	(5.610)
Mining and quarrying	10.22*	10.08*
	(5.825)	(5.813)
Other services	-5.077	-5.363
	(5.182)	(5.163)
Professions	-10.51	-10.52
	(6.706)	(6.697)
Public administration	-24.80***	-24.82***
	(6.067)	(6.071)
Trade	-20.55***	-20.58***
	(6.024)	(6.020)
Constant	59.32***	60.15***
	(5.197)	(5.173)
Observations	1,500	1,500
Number of firms	125	125
R^2	0.4436	0.4391

*** p<0.01, ** p<0.05, * p<0.1
Source: our elaboration

These results suggest an interesting picture of how FDI and CSR sustainability committee interact to influence a firm's ESG score.

In the first model, FDI appears to have a positive and significant effect on ESG score, meaning that firms that receive more foreign investment tend to improve their sustainability practices. The presence of a CSR Sustainability committee also shows a positive and significant impact, suggesting that firms with dedicated sustainability governance achieve higher ESG scores.

However, when the interaction between FDI and the CSR committee is introduced in the second model, the situation changes. The direct effect of FDI becomes negligible, while the role of the CSR committee is reduced, losing significance. This could mean that FDI alone is not enough to improve firm sustainability, but its impact becomes positive and relevant only when a firm has an active sustainability committee. In other words, simply receiving capital from abroad is not enough to improve ESG practices: structured internal governance is also needed to leverage these investments effectively.

This positive interaction between FDI and CSR committee is perhaps the most interesting element of the model, because it indicates that sustainability governance plays a key role in directing foreign investments toward more responsible business practices. Without a committee to direct these investments from an ESG perspective, their sustainability impact may be minimal or even zero.

Table 3 presents our robustness check.

Tab. 3: Robustness check

VARIABLES	Model 3 ESG environmental pillar	Model 4 ESG environmental pillar	Model 5 ESG governance pillar	Model 6 ESG governance pillar	Model 7 ESG social pillar	Model 8 ESG social pillar
FDI	0.0333	-0.0317	0.0923	0.0978	0.113*	-0.000974
	(0.0698)	(0.0556)	(0.0872)	(0.0878)	(0.0628)	(0.0448)
CSR sustainability committee	0.543	-0.316	2.117**	2.194*	1.570*	0.0941
	(0.867)	(0.889)	(0.863)	(1.011)	(0.848)	(0.8274)
FDI*CSR sustainability committee		0.0834		-0.00711		0.143***
		(0.0602)		(0.0294)		(0.0527)
Controls	YES	YES	YES	YES	YES	YES
R^2	0.4375	0.4350	0.2630	0.2639	0.3639	0.3575

*** p<0.01, ** p<0.05, * p<0.1

Source: our elaboration

As concern environmental impact, neither foreign investment nor the presence of a sustainability committee has a significant effect. This suggests that, at least in this sample of firms, the drive toward more sustainable environmental practices are not directly dependent on foreign capital or internal governance dedicated to sustainability.

Turning to ESG governance, however, a clear effect emerges: the presence of a CSR Sustainability Committee is associated with a significant improvement in corporate governance. A structured committee dedicated to sustainability is likely to help the firm set clearer strategies, better meet ESG standards, and make its policies more transparent. However, the interaction with FDI is not significant, indicating that foreign investment alone is not a key factor in improving governance.

The most interesting result, however, comes with the social pillar of ESG. Here, while FDI alone does not seem to make a difference, its combination with a CSR Sustainability Committee has a positive and significant effect. This means that firms that receive foreign investment and, at the same time, have a sustainability committee, manage to improve their social policies more effectively, probably by implementing corporate social responsibility initiatives, improving worker welfare or strengthening their positive impact on communities.

5 Conclusion

This study provides valuable insights into the relationship between outward FDI and ESG performance, emphasizing the critical role of the CSR Sustainability Committee in ensuring that international expansion translates into meaningful sustainability improvements. The findings confirm that outward FDI alone lead to enhanced ESG performance and the presence of a CSR Sustainability Committee serves as a key moderating factor, ensuring that foreign investments align with firm sustainability goals and responsible business practices.

The empirical results highlight several important dynamics. First, outward FDI demonstrates a positive effect on ESG performance when considered independently. However, when firms have a CSR Sustainability Committee, this effect becomes significantly more pronounced. Specifically, firms with such governance mechanisms exhibit higher ESG governance scores, suggesting that structured internal oversight plays a fundamental role in enhancing transparency, accountability, and long-term sustainability integration.

A particularly significant finding is the impact of outward FDI on the social dimension of ESG. Firms that expand internationally while having a CSR Sustainability Committee tend to implement more responsible labor policies, stronger community engagement programs, and improved CSR initiatives. This suggests that internationalization, when accompanied by effective governance structures, allows firms to assimilate global social sustainability standards and stakeholder-oriented strategies more efficiently. Conversely, the study finds limited evidence of a direct impact of outward FDI on environmental performance. While internationalization may expose firms to stricter environmental regulations and advanced sustainability practices in foreign markets, the results indicate that additional regulatory frameworks, industry-specific policies, and green technological investments may be required to translate outward FDI into significant environmental improvements.

From a theoretical perspective, this study makes a meaningful contribution to the literature by integrating Stakeholder Theory, Institutional Theory, and the Resource-Based View to explain how outward FDI interacts with sustainability governance structures. While Stakeholder Theory highlights that foreign investment can enhance ESG performance through accountability to various stakeholder groups, Institutional Theory suggests that outward FDI exposes firms to global regulatory pressures, prompting the adoption of sustainability standards. Meanwhile, the Resource-Based View reinforces the idea that outward FDI facilitates the transfer of sustainability-related knowledge, technology, and best practices, which, when effectively managed by a CSR Sustainability Committee, can become a sustainable competitive advantage.

The findings offer important insights for firm managers, policymakers, and investors.

For managers, the results highlight the necessity of establishing or strengthening a CSR Sustainability Committee, particularly for firms engaged in outward FDI. Without a well-structured governance framework, firms risk adopting fragmented and inconsistent ESG strategies across different markets, limiting the sustainability benefits of international expansion. A CSR Sustainability Committee ensures that best practices acquired in foreign markets are effectively integrated across all business operations, fostering a cohesive sustainability strategy.

For policymakers, the study suggests that regulatory authorities should encourage firms to institutionalize sustainability governance structures, particularly in multinational firms operating in diverse regulatory environments. Incentivizing the creation of CSR Sustainability Committees could help ensure that international expansion fosters firm sustainability, rather than solely financial growth.

For investors, the presence of a CSR Sustainability Committee serves as a key indicator of a firm's long-term commitment to responsible business practices. Investors seeking sustainable investments should prioritize firms that have structured governance mechanisms to manage ESG risks and opportunities.

Despite its contributions, this study presents some limitations that future research could address.

The research focuses on 125 Italian listed firms, which may limit the generalizability of the findings to other geographic and industry contexts. Future research should expand the sample to include firms operating in different regulatory environments and economic sectors to gain a more comprehensive understanding of the relationship between outward FDI, ESG, and sustainability governance.

Although panel data methods help mitigate endogeneity concerns, the study does not establish definitive causality. Future studies could adopt experimental or longitudinal approaches to strengthen causal interpretations.

The results indicate that outward FDI does not significantly influence the environmental dimension of ESG. Future research should investigate the specific conditions under which international expansion contributes to environmental improvements, such as the role of green financing, industry-specific regulations, and technological innovation.

Overall, this study underscores the idea that outward FDI can serve as a powerful driver for ESG performance, but only when supported by structured governance mechanisms. The presence of a CSR Sustainability Committee emerges as a crucial enabler of responsible internationalization, ensuring that firms leverage their global expansion to enhance social and governance dimensions of sustainability. While outward FDI provides firms with opportunities to improve their ESG performance, it is not a sufficient condition for sustainability advancements unless accompanied by strong internal governance structures.

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ESG and Financial Performance: Unveiling the market impact in the Stoxx Europe 600

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Abstract

Frame of the research. *The research contributes to the growing body of literature exploring the relationship between Corporate Social Performance (CSP) and Corporate Financial Performance (CFP). It emphasizes the distinction between market-based and accounting-based metrics and investigates how industry differences affect the importance of this relationship.*

Purpose of the paper. *This study investigates whether the implementation of practices enhances corporate value and assesses whether firms have economic and financial incentives to pursue sustainability beyond regulatory requirements, with a specific focus on industry-specific differences.*

Methodology. *Using a regression approach, the analysis examines a multi-year sample of firms from the Stoxx Europe 600 index. Financial performance is measured through Tobin's Q (market-based) and ROE (accounting-based), while ESG scores are incorporated to test the presence of a non-linear relationship.*

Results. *The findings reveal a convex (U-shaped) relationship between CSP and CFP when measured by Tobin's Q, highlighting the market's ability to recognize the intangible value of sustainability. However, no significant relationship is found with ROE, suggesting that traditional accounting metrics fail to capture the long-term benefits of sustainability initiatives.*

Research limitations. *The primary limitations relate to the methodological scope, which does not consider variables such as individual ESG components and differences in legal systems. Moreover, providers' lack of standardization in ESG data may impact the results' comparability and reliability.*

Managerial implications. *Managers should consider sustainability adoption as a strategic tool for long-term value creation, particularly in sectors where market-based rewards for sustainability are more apparent.*

Originality of the paper. *This study distinguishes between market-based and accounting-based financial performance, offering industry-specific insights into sustainability adoption and clarifying the varying impacts of sustainability across different performance metrics.*

Key words: *Sustainable development*; *ESG; CFP; Value creation; Sectoral readiness*

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1. Introduction

Over the past decade, sustainable development (Brundtland Commission, 1987) has become a cornerstone for policy strategies, corporate practices, investment decisions, consumer choices, and an increasingly prominent academic focus. Its transformative impact has redefined the traditional relationship between economics and finance, expanding its scope and strategic importance. No longer merely an organizational variable, sustainability has evolved into a paradigm that shapes interactions among regulatory, industrial, and financial systems on a global scale.

The interconnection between the economy, finance, and sustainability is now critical in building effective organizational models and resilient production systems. This is evidenced by the surge in sustainable investments, which exceeded $35.3 trillion globally in 2022, accounting for more than 36% of professionally managed assets (GSIA, 2022). At the same time, regulatory frameworks have tightened, with policies like the European Union's Corporate Sustainability Reporting Directive (CSRD) mandating over 50,000 companies to disclose their Environmental, Social, and Governance (ESG) performance.

As a result, business operations are increasingly characterized by heightened complexity stemming from the interplay between real and financial dimensions - fundamental to entrepreneurial activity - and the sustainability dimension, which has become inescapable. This evolution is driven by regulatory interventions and rising market and social expectations, with 73% of global consumers stating they prefer sustainable products (Lee & Rhee, 2023; IBM Institute for Business Value, 2024). In this scenario, integrating sustainability into corporate strategies is no longer optional; it is imperative for ensuring long-term competitiveness and value creation (Clark *et al.*, 2015; Kotsantonis *et al.*, 2016).

Over the years, firms have grappled with the dual challenge of aligning financial performance with social and environmental objectives to maintain and acquire credibility and reputation (Freeman, 1984; Coulson, 2009; Ng & Zabihollah, 2015; Ziolo *et al.*, 2019). Achieving this balance requires addressing the often-divergent expectations of shareholders and broader stakeholders while ensuring coherence between economic outcomes and societal goals (Porter & Kramer, 2006; Ng & Zabihollah, 2015; Crespi & Magliavacca, 2020). This dynamic has been further intensified by the growing prominence of stakeholder capitalism, where companies are increasingly evaluated not only on financial returns but also on their contributions to broader sustainability goals (Freeman *et al.*, 2020; Eccles *et al.*, 2021).

Considering the above, examining the impact of incorporating sustainability factors into corporate decision-making on companies' economic and financial performance is essential for emphasizing whether firms possess consistent incentives to engage in sustainability initiatives.

Although several studies have explored the relationship between firms' corporate social performance (CSP) and corporate financial performance (CFP), using different CSP dimensions and CFP measures, the academic literature is far from mature. Scholars point out that this relationship can be positive, negative, or mixed, with significant variations across industries.

Two major theoretical frameworks dominate this discourse. The value-enhancing theory posits that integrating environmental, social, and governance (ESG) criteria into corporate strategies can generate competitive advantages and drive long-term shareholder value (Porter & Van Der Linde, 1995; Miralles-Quiròs *et al.*, 2018). Empirical evidence suggests that strong ESG performance enhances access to capital (Cheng *et al.*, 2014), reduces financing costs (El Ghoul *et al.*, 2011; Dhaliwal *et al.*, 2012), and improves organizational outcomes such as talent acquisition, customer loyalty, and operational efficiency (Turban & Greening, 1997; Gangi *et al.*, 2019).

Conversely, the shareholder expense theory argues that ESG investments may impose excessive costs, potentially eroding firm value (Barnea & Rubin, 2006). Critics contend that the financial benefits of ESG practices are often overstated or inconclusive, with limited evidence linking sustainability initiatives to improved financial performance (Cornell & Damodaran, 2020).

Methodological inconsistencies and ambiguities in ESG metrics further complicate the assessment of their economic impact (Wood & Jones, 1995; Chatterji *et al.*, 2016).

In summary, the relationship between CSP and CFP is inherently ambiguous. The variation in findings can be attributed to several factors, including differences in the definitions of ESG and CFP measures employed and variability in sampling methods. Moreover, the time frame of sustainability initiatives is crucial; potential short-term costs may obscure long-term benefits, as the value generated by sustainability efforts often takes time to materialize (Eccles *et al.*, 2014).

This research contributes to the existing literature examining the impact of CSP on CFP, considering both market-based and accounting-based perspectives. It explores a non-linear (concave or convex) relationship and further analyzes industry differences.

The research elicits several significant findings.

When analyzed from a market-based perspective, the analysis reveals a convex relationship between CSP and CFP, indicating that the market acknowledges and values sustainability as an intangible asset. Conversely, no significant relationship emerges when CFP is evaluated using an accounting-based perspective, suggesting that traditional financial metrics fail to capture the value generated by sustainability practices entirely. Results show that sustainability can be viewed as an intangible asset whose value gradually materializes through reputational capital, stakeholder relationships, and risk management rather than immediate financial returns. While the market-based perspective captures this intangible value, traditional accounting metrics do not due to their rigid structure and short-term focus. Market mechanisms are more dynamic and flexible, capable of anticipating the long-term benefits of adopting sustainability. In contrast, accounting frameworks remain bound by procedural rigidity and conventional logic, struggling to incorporate these intangible elements.

Moreover, the analysis indicates that the CSP-CFP relationship varies across industries due to sector-specific priorities, challenges, and readiness levels for adopting sustainability practices. Some sectors show better alignment between sustainability practices and business strategy, driven by heightened stakeholder pressure and regulatory focus on transparency, resulting in economic benefits.

This paper proceeds with Section 2, which provides the literature review and develops the research hypotheses; Section 3, which explains the research design; Section 4, which gives the results analysis and principal findings along with their implications; and Section 5, which concludes the study and offers suggestions for future research.

2. Background and research questions definition

Sustainability has garnered increasing stakeholder interest, prompting firms to incorporate these aspects into their strategic frameworks to enhance their credibility and reputation (Coulson, 2009; Dhaliwal *et al.*, 2012). Several contributions in the academic literature have highlighted that firms prioritizing sustainability and effectively disclosing related information to the market are positively evaluated by shareholders (Coulson, 2009; Birindelli *et al.*, 2015; Miralles-Quiròs *et al.*, 2019a; La Torre *et al.*, 2021).

The study of the relationship between sustainability (CSP) and economic-financial performance (CFP) has been a recurring theme in the academic literature, revealing outcomes that are sometimes positive, sometimes negative, and occasionally mixed. Moreover, as noted by Friede *et al.* (2015), each factor of the overall ESG score encapsulates a diverse array of elements that may be linked to a firm's CFP. On this point, Alshehhi *et al.* (2018), analyzing 132 publications on the relationship between CSP and CFP, highlight that 78% of the publications supported a positive relationship, while 6% reported a negative relationship. No relationship was found in another 6% of cases, whereas a convex or concave relationship was observed in the remaining 10%. The authors argue that the factors influencing the relationship between CSP and CFP are firm size, industry type, and the national context.

Studies reporting positive results can be attributed to the value-enhancing theory, which views sustainability as a source of competitive advantage for firms (Porter & Van Der Linde, 1995; Porter & Kramer, 2011) and as a driver of long-term shareholder value creation (Miralles-Quirós *et al.*, 2018). This perspective also considers the improvement of the trust-based relationship with stakeholders (Gray *et al.*, 1995; Aguilera *et al.*, 2006; Mackenzie, 2007; Money & Schepers, 2007; Gill, 2008; Bear *et al.*, 2010; Kolk & Pinkse, 2010; Li *et al.*, 2010; Vanhamme *et al.*, 2012; Wu & Shen, 2013) and the mitigation of potential liabilities (Waddock & Graves, 1997).

In this regard, Lo & Sheu (2007), investigating a sample of large U.S. non-financial firms from 1999-2002, highlighted a significant positive relationship between CSP and CFP (measured by Tobin's Q).

Wu & Shen (2013), analyzing a sample of 162 banks in 22 countries from 2003-2009, highlighted a significant positive relationship between CSP and CFP (measured by ROA and ROE). Along the same lines, Cornett et al. (2016), examining a sample of 235 U.S. banks, found a significant positive relationship between CSP and CFP (measured by ROE), with varying intensity depending on the period and bank size (measured by total assets). Large banks show simultaneous improvements in sustainability and ROE.

Velte (2017), investigating a sample of more than 80 firms from 2010 to 2014, found a significant positive relationship between CSP and CFP (measured by ROA). These findings are partially corroborated by Nizam *et al.* (2019), who analyzed a sample of 713 banks from 75 countries from 2013 to 2015 and reported a significant positive relationship between CSP and CFP (measured by ROE). However, they also highlighted that this effect is more pronounced for smaller banks (measured by total assets). Similarly, Brogi & Lagasio (2019), investigating a sample of U.S. listed banks over 2000-2016, found a positive and statistically significant relationship between CSP and CFP (measured by ROA).

Along the same lines, Buallay *et al.* (2020) examined the relationship between CSP and CFP from an operational (ROA), financial (ROE), and market (Tobin's Q) perspective. Using a sample of 59 listed banks in MENA countries during the period 2008-2017, they revealed a significant impact of sustainability on shareholder return (measured by Tobin's Q), with variations attributable to the specific characteristics of the bank (measured by total assets, financial leverage, and asset quality) and its geographical location (measured by GDP and governance).

Studies reporting negative results can be attributed to the stakeholder-expense theory, which interprets sustainability as a mere operational cost for firms, leading to adverse effects on firm value (Miralles-Quirós *et al.*, 2018).

Buallay *et al.* (2019) analyze the CSP-CFP relationship from an operational (ROA), financial (ROE), and market (Tobin's Q) perspective on a sample of 530 banks over the period 2008-2017. They found that the relationship is negative across all these dimensions. These findings are further supported by Forgione *et al.* (2020).

As for studies presenting mixed results, Miralles-Quirós *et al.* (2019a) found a positive relationship between sustainability and shareholder value creation (measured by Tobin's Q) while emphasizing differences related to individual bank characteristics (ROA, financial leverage, and capital ratios) and geographical location. Expanding on this analysis of stock prices, Miralles-Quirós *et al.* (2019b) showed that environmental (E) and governance (G) performance are positively associated with stock prices, in contrast to social (S) performance. According to the authors, the stock market rewards adopting sound environmental policies and good governance practices that mitigate potential agency issues.

Similarly, Buallay (2019) reported a mixed relationship depending on the financial performance perspective (operational, financial, or market) and the specific sustainability pillars (E, S, and G). In this regard, environmental sustainability (E) shows a positive relationship between the financial (ROE) and market (Tobin's Q) perspectives. In contrast, social sustainability (S) exhibits a negative relationship across all financial performance measures (ROA, ROE, and Tobin's Q), while governance sustainability (G) displays a positive relationship in the market perspective (Tobin's Q)

but a negative relationship in the operational (ROA) and financial (ROE) perspectives. These findings expand the earlier contribution by Soana (2011), who analyzed the relationship from an accounting-based financial perspective (measured by ROA, ROE, and cost-to-income ratio) and a market perspective (measured by P/BV and P/E) using a sample of 37 banks, found no statistically significant relationship.

Broadening the range of financial performance indicators, La Torre *et al.* (2021) showed that the relationship between overall sustainability and financial performance is positive only from a value-based management perspective (measured by EVA), negative from a market perspective (measured by capitalization to book value and Tobin's Q), and non-existent from an operational (ROA) and financial (ROE) perspective.

Finally, some studies highlight the presence of a non-linear convex (U-shaped) or concave (inverted U-shaped) pattern. In this regard, Trumpp & Guenther (2017) investigated a sample of 2,361 firm years from 2008 to 2012 and controlled by specific firm characteristics (measured, *inter alia*, by total asset and leverage) and geographical location (i.e., law system). They found a concave (inverted U-shaped) pattern between CSP and CFP (measured by ROA). They also showed that the relationship between CSP and CFP differs between industries, with the U-shaped functional form demonstrated for manufacturing and service industries.

Barnett & Salomon (2012), analyzing a sample of 3,100 firms from 1991 to 2006, controlled by specific firm characteristics (measured, *inter alia*, by firm size and debt ratio), found a convex (U-shaped) pattern between CSP and CFP (measured by ROA). Similarly, Fuji *et al.* (2013), analyzing a sample of Japanese manufacturing firms from 2001 to 2008, found a convex (U-shaped) pattern between CSP and CFP (measured by ROA). Along the same lines, Misani & Pogutz (2015) investigated a sample of 127 firms over the period 2007-2013, controlled by specific firm characteristics (measured, *inter alia*, by total asset and leverage), found a convex (U-shaped) pattern between CSP and CFP (measured by Tobin's Q).

In summary, the academic literature examining the relationship between CSP and CFP demonstrates a varied use of performance metrics, including accounting-based, monetary, and mixed approaches that combine internal (accounting or financial) and external (market-related) data. Accounting-based metrics, grounded in the accrual principle of financial statements, have the advantage of being readily measurable and interpretable due to their reliance on established practices. However, they suffer from inherent limitations that may affect the interpretation of the investigated phenomena. These limitations include, particularly in the context of sustainability, the potential omission of dynamics related to the accumulation of intangible resources.

Mixed indicators partially address these limitations. Adopting a shareholder-based perspective, they emphasize the residual nature of corporate results and their correlation with the financial market's expectations (Gatti, 2014). From a broader perspective, these indicators account for the valuation of intangible assets not reflected in financial statements (Guatri & Bini, 2002; Guatri & Bini, 2009) while mitigating potential distortions arising from the application of accounting standards and principles (Damodaran, 2006).

Considering that implementing sustainability practices internally in line with external stakeholder expectations can represent an intangible asset (Robinson *et al.*, 2011; Wu & Shen, 2013; Marsat & Williams, 2014; Edmans, 2023) - and acknowledging that such an asset may not be accurately reflected by accounting-based indicators (Lev, 2017) - it is appropriate to investigate the connection between sustainability and economic-financial performance by expanding the analysis to include mixed metrics. This entails adopting a dual perspective: market-based and accounting-based.

Specific industries face greater public scrutiny than others due to increased stakeholder pressure and rising demands for transparency and regulatory compliance. As Lambrechts *et al.* (2019) demonstrate, companies across different sectors prioritize stakeholder expectations in varied ways. Forward-thinking firms adopt a multi-fiduciary approach, aligning stakeholder-driven priorities with sustainability disclosures to meet various stakeholder groups' diverse interests and expectations (Fasan & Mio, 2016; Morioka & De Carvalho, 2016; Rodriguez-Fernandez, 2016).

The importance of sustainability factors varies significantly across industries, reflecting sector-specific priorities and challenges. While governance considerations tend to be relatively consistent across sectors, environmental and social factors exhibit substantial sector-specific relevance (Park & Jang, 2021). Even within the same industry, firms may face varying stakeholder demands, experiencing different intensity levels in these pressures (Azmi *et al.*, 2021).

Additionally, the weighting of sustainability factors is influenced by industry classification and national contexts, shaped by distinct environmental, economic, geographical, and political dynamics. However, current sustainability frameworks often fail to adequately capture the complexities of country- and industry-specific management environments, limiting the accuracy and relevance of standardized assessments (Park & Jang, 2021).

Therefore, further investigation into the impact of industry characteristics on ESG criteria remains a valuable and necessary endeavor.

In summary, considering (i) that the internal implementation of sustainability practices aligned with the expectations and demands stemming from the external environment may constitute a form of intangible asset, which accounting-based indicators might not fully capture, and (ii) that substantial differences may exist across industries regarding sustainability practices, this study aims to enrich the academic literature exploring the relationship between ESG and economic-financial performance using both accounting-based and market-based metrics, while simultaneously investigating potential sectoral differences.

To achieve the objectives of the study, the following hypotheses have been formulated:

- H1. CSP and market-based CFP are positively related, showing a non-linear (concave or convex) pattern that varies across industries;
- H2. CSP and accounting-based CFP are positively related, showing a non-linear (concave or convex) pattern that varies across industries.

3. Research design

The following paragraphs provide a detailed illustration of the analytical methodology adopted to test the aforementioned hypotheses.

3.1 Sample and data collection

The selected sample consists of 493 industrial firms (belonging to 9 industries and 66 sub-industries) listed on the Stoxx Europe 600 (i.e., an index with a fixed number of 600 components representing large, mid, and small-capitalization firms among 17 European countries).

Data for the investigation period (2014-2023) were obtained from annual financial reports processed through the Refinitiv Eikon database. This database was chosen for two main reasons: firstly, it is widely used in academic literature for similar studies (Cheng *et al.*, 2014; Luo *et al.*, 2015; Ferrell *et al.*, 2016; Hawn & Ioannou, 2016); and secondly, it standardizes and compares ESG metrics, capturing the sustainability profiles of individual firms.

The dataset comprises longitudinal data, characterized by a cross-sectional nature (n different analytical units) and a time frame (observed over T years). The analysis was conducted using the statistical software STATA.

Tab. 1 shows the industry-wide distribution of sample firms.

Tab. 1: Industry-wide distribution of sample

N.	Industries	N. of firms	% of firms
1	Discretionary Consumer Goods	75	15%
2	Energy and Utilities	52	11%
3	Health and Biotechnology	52	11%
4	Industry and Transportation	84	17%
5	Materials and Construction	62	13%
6	Real Estate	29	6%
7	Services	23	5%
8	Staples Consumer Goods	56	11%
9	Technology and Communications	60	12%
Total		**493**	**100%**

Source: our elaboration

3.2 Dependent variables

Based on the existing academic literature, we used a dual perspective: market-based and accounting-based categories.

From a market-based perspective, Tobin's Q indicator represents market expectations without requiring risk adjustments or normalizations. It reflects the firm's prospective value creation performance (Lindenberg & Ross, 1981; Lang & Stulz, 1994). Specifically, if the indicator is greater than (or less than) one, the firm is creating (or destroying) value, as the market attributes a value to the firm greater (or lesser) than the replacement cost of its assets. Academic literature highlights that Tobin's Q is particularly suitable for studies with characteristics similar to the present one, as it captures the combined effect of historical valuations and future expectations (Jiao, 2010).

From the accounting-based perspective, the dependent variable used is ROE, which expresses overall profitability per unit of invested equity (Tutino, 2015).

This approach enables an assessment of both market expectations regarding the values expressed by the firm and any intangible resources not reflected in the financial statements, such as CSP (Guatri & Bini, 2002; Guatri & Bini, 2009), while also mitigating potential distortions arising from the application of accounting metrics (Damodaran, 2006).

3.3 Independent and control variables

For the independent variables, the analysis focuses on the relationship between sustainability, as measured by ESG metrics and their underlying components (environmental, social, and governance), and the dependent variables: market-based (Tobin's Q) and accounting-based (ROE).

Except for the year-over-year GDP growth variable, sourced from the World Bank database, the independent variables were extracted from the Refinitiv Eikon database. This database integrates qualitative and quantitative information of various types provided by individual firms.

Regarding individual ESG components, Refinitiv Eikon collects and calculates over 630 ESG measures at the firm level. A subset of 186 of the most comparable and sector-relevant measures contribute to the overall corporate evaluation and scoring process. These measures are grouped into 10 general categories, which, through sector-specific weighting reflecting material relevance, form the three ESG pillars: Environmental (E), Social (S), and Governance (G).

The overall ESG score is derived from a weighted average of these three pillars. Based on publicly available data, it assesses a firm's sustainability performance, commitment, and effectiveness. The score ranges from 0 to 100, representing poor to excellent sustainability performance. The same methodology applies to the individual E, S, and G pillars and their underlying components.

Moreover, considering previous academic studies regarding a non-linear relationship between sustainability and economic-financial performance, a quadratic term of ESG has been included in our

model to capture a potential convex or concave pattern (Miras-Rodriguez *et al.*, 2015; Han *et al.*, 2016; Nollet *et al.*, 2016; Nuber *et al.*, 2020; Naimy *et al.*, 2021) ([1]).

To enhance the reliability of the analytical model, control variables that better account for the variability of the dependent variables were employed, as suggested by the academic literature. These control variables are categorized into two types: firm-specific and country-specific.

Regarding the firm-specific variables, the analytical model includes:

- size: measured as the natural logarithm of total assets, as firm performance may depend on its size (Chih *et al.*, 2010; Wu & Shen, 2013; Cornett *et al.*, 2016; Brogi & Lagasio, 2019; Buallay *et al.*, 2019; Miralles-Quiròs *et al.*, 2019a; Azmi *et al.*, 2021; La Torre *et al.*, 2021);
- leverage ratio: defined as total liabilities divided by total assets, providing a synthetic indicator of the impact of the firm's capital structure (Choi &Wang, 2009; Barnett & Salomon, 2012).

Regarding country-specific variables, as highlighted in the academic literature, there is a relationship between a firm's economic-financial performance and the context in which it operates. Accordingly, the annual GDP growth rate of the country where the firm's headquarters is located was considered (Wu & Shen, 2013; Buallay *et al.*, 2019; Gangi *et al.*, 2019; Miralles-Quiròs *et al.*, 2019a; Azmi *et al.*, 2021; La Torre *et al.*, 2021).

Tab. 2: Variables used

Variables	Abbreviation	Description	Reference
Dependent variables			
Tobin's Q	TQ	It measures a firm's prospective value creation performance and is calculated by dividing market capitalization by total assets.	Lo & Sheu, 2007; Choi &Wang, 2009; Buallay *et al.*, 2019; Miralles-Quiròs *et al.*, 2019a; Buallay *et al.*, 2020; La Torre *et al.*, 2021.
ROE	ROE	It measures a firm's profitability per unit of invested equity and is calculated by dividing its net income by its total equity of common shares.	Wu & Shen, 2013; Cornett *et al.*, 2016; Nizam *et al.*, 2019; Buallay *et al.*, 2020.
Independent variable			
ESG Score	ESG	The firm score is based on self-reported environmental, social, and corporate governance information.	Brogi & Lagasio, 2019; Buallay, 2019; Miralles-Quirós *et al.*, 2019b; La Torre *et al.*, 2021.
ESG Score^2	ESG_SQ	Defined as the squared of the ESG Score to appreciate potential non-linear relationship (convex or concave) between CSP and CFP.	Miras-Rodriguez *et al.*, 2015; Han *et al.*, 2016; Nollet *et al.*, 2016; Nuber *et al.*, 2020; Naimy *et al.*, 2021.
Control variables			
Firm size	Size	Natural logarithm of total assets. Firm size can be related to the extent of stakeholders' interests in the firm's sustainability activities.	Chih *et al.*, 2010; Wu & Shen, 2013; Cornett *et al.*, 2016; Brogi & Lagasio, 2019; Buallay *et al.*, 2019; Miralles-Quiròs *et al.*, 2019a; Azmi *et al.*, 2021; La Torre *et al.*, 2021.
Leverage ratio	Lev	Defined as total liabilities divided by total assets. Leverage can affect a firm's financial performance.	Choi &Wang, 2009; Barnett & Salomon, 2012.
GDP	GDP	The annual GDP growth rate of the country where the firm's headquarters is located. Studies reveal that financial performance is sensitive to GDP growth.	Wu & Shen, 2013; Buallay *et al.*, 2019; Gangi *et al.*, 2019; Miralles-Quiròs *et al.*, 2019a; Azmi *et al.*, 2021; La Torre *et al.*, 2021.

Source: our elaboration

3.4 Statistical tools

This study's empirical analysis is based on market-based and accounting-based perspectives, represented by the dependent variables TQ (market-based) and ROE (accounting-based).

Multiple regression equations were estimated at the general (considering the whole sample) and industry level (considering the differences among sectors) to analyze the relationship between sustainability and economic-financial performance. In particular, in light of tests conducted (e.g., Breusch-Pagan and Hausman), different types of panel regression analyses have been employed:

[1] We standardized the ESG and ESG_SQ variables to reduce multicollinearity issues that often occur when including a variable and its squared term in the same regression model. Standardization entails subtracting the mean and dividing by the standard deviation, which ensures that the variables have a mean of zero and a standard deviation of one.

pooled ordinary least squares (OLS), random effects (RE), and fixed effects (FE) models. The panel regression model used can be expressed in the following baseline model:

$$Y_{it} = \alpha + \beta \mathrm{X}_{it} + \gamma \mathrm{Z}_{it} + \eta_i + \varepsilon_{it} \; ; \; i = 1,2 \ldots N; \; t = 1,2 \ldots T$$

Where:

- Y_{it} represents the financial performance measure (either TQ or ROE) of firm i at time t;
- X_{it} is a matrix containing the key independent variables of interest (ESG and ESG_SQ) for firm i at time t;
- Z_{it} represents the firm control variables (Size, Lev, and GDP) at time t;
- η_i represents unobserved firm-specific heterogeneity, which is assumed to be time-invariant;
- ε_{it} it the stochastic error term, assumed to be independently and identically distributed (i.i.d.).

Finally, the model includes temporal effects for each year within the observation period to account for omitted variables that vary over time but not across entities.

4. Results and discussion

4.1 Descriptive statistics

Tab. 3 provides descriptive statistics of the variables used in the analysis.

Tab. 3: Descriptive statistics

Industry	Stats	TQ	ROE	ESG	Lev	Size	GDP
Discretionary Consumer Goods	Mean	2.5	0.2	61.5	0.6	23.1	1.6
	SD	3.6	0.4	20.8	0.3	1.6	3.4
	Min	0.0	-3.3	4.3	0.0	17.9	-10.9
	Max	40.5	2.6	94.2	1.4	27.1	8.9
Energy & Utilities	Mean	0.7	0.1	70.1	0.7	23.9	1.6
	SD	1.0	0.2	14.3	0.2	1.3	3.8
	Min	0.0	-1.9	12.8	0.2	19.1	-10.9
	Max	10.0	1.4	94.5	1.3	26.7	11.4
Health & Biotechnology	Mean	3.8	0.2	66.5	0.5	22.3	1.7
	SD	6.9	0.5	16.3	0.2	1.8	2.8
	Min	0.2	-2.4	19.1	0.1	17.6	-10.9
	Max	110.5	10.3	94.9	1.0	25.6	8.9
Industry & Transportation	Mean	1.9	0.2	61.8	0.6	22.5	1.8
	SD	2.9	0.1	16.6	0.1	1.2	3.4
	Min	0.1	-0.3	9.2	0.1	19.8	-10.9
	Max	35.4	2.0	92.7	1.2	25.7	24.6
Materials & Construction	Mean	1.5	0.1	69.3	0.5	23.0	1.8
	SD	1.8	0.1	14.2	0.2	1.2	3.1
	Min	0.1	-0.5	21.6	0.2	19.7	-10.9
	Max	13.4	0.8	91.8	1.1	25.6	24.6
Real Estate	Mean	1.1	0.1	61.3	0.5	22.8	1.6
	SD	3.1	0.0	19.2	0.1	0.9	3.4
	Min	0.1	-0.2	2.8	0.2	20.8	-10.9
	Max	31.2	0.3	91.1	0.8	25.4	8.6
Services	Mean	1.4	0.2	64.9	0.7	22.7	2.3
	SD	1.1	0.8	13.3	0.1	0.7	4.5
	Min	0.2	-11.3	26.7	0.2	21.3	-10.3
	Max	4.9	1.1	86.2	1.0	24.6	24.6
Staples Consumer Goods	Mean	1.6	0.2	66.6	0.6	22.9	2.0
	SD	1.2	0.9	14.5	0.2	1.4	3.9
	Min	0.0	-0.3	20.9	0.0	18.6	-10.9
	Max	7.1	20.5	93.9	1.1	26.2	24.6
Technology & Communications	Mean	3.6	0.3	64.2	0.6	22.4	1.6
	SD	8.7	2.1	17.4	0.2	1.9	3.1
	Min	0.1	-20.8	4.4	0.1	17.3	-10.9
	Max	89.8	26.0	94.0	1.4	26.4	8.9
Total	**Mean**	**2.1**	**0.2**	**65.1**	**0.6**	**22.8**	**1.7**
	SD	**4.5**	**0.9**	**16.9**	**0.2**	**1.5**	**3.4**
	Min	**0.0**	**-20.8**	**2.8**	**0.0**	**17.3**	**-10.9**
	Max	**110.5**	**26.0**	**94.9**	**1.4**	**27.1**	**24.6**

Source: our elaboration

The analysis of ESG performance across the sample shows a generally stable trend over the 2014-2023 period, with a compound annual growth rate (CAGR) of +2%, reaching an average ESG score of 65.1/100 in 2023. Despite strong overall sustainability performance, significant differences exist across industries. Energy & Utilities sector leads with the highest average ESG score (70.1/100); conversely, Real Estate sector has the lowest average score (61.3/100) and has considerable variability in ESG practices. Sectors like Discretionary Consumer Goods and Real Estate display higher dispersion in ESG values, suggesting inconsistent adoption of sustainability practices, while the Services and Materials & Construction sectors show more uniformity.

In summary, the distribution of ESG scores across the sectors in the sample indicates a lack of uniformity in integrating sustainability principles into corporate governance processes and strategic frameworks, both across industries and, in some cases, even among firms within the same sector. This heterogeneity may be attributed to varying levels of regulatory compliance, external pressures, and peer influence, as well as the relative adaptability of firms to these evolving contextual conditions.

4.2 Regression results

Considering the market-based perspective (Tab. 4), the regression analysis conducted on the entire sample reveals a convex (U-shaped) relationship between sustainability and TQ, confirmed by the statistical significance of the positive coefficient of ESG_SQ. In contrast, the coefficient of ESG is not significant. This suggests that, at the aggregate level, corporate sustainability does not exert a linear impact on TQ but rather a quadratic one. Specifically, beyond a certain minimum threshold (ESG = 64,27/100), sustainability positively and significantly affects TQ. This finding implies that, at lower levels of sustainability, the market does not perceive ESG practices as value-enhancing. However, once a firm's ESG commitment surpasses a critical point, its market valuation improves.

Regarding the control variables, Size exhibits a negative and significant coefficient, indicating that larger firms tend to have a lower TQ, which may reflect more constrained growth expectations than smaller enterprises. Conversely, Lev is not significant, suggesting that the level of indebtedness does not play a decisive role in the relationship between sustainability and TQ at the aggregate level. On the other hand, GDP has a positive and significant coefficient, suggesting that a more favorable macroeconomic environment is associated with an increase in firms' market value, although its overall impact remains limited.

A more granular sectoral analysis reveals significant differences. In Energy & Utilities, Health & Biotechnology, and Staples Consumer Goods sectors, both ESG and ESG_SQ are negative and not significant, suggesting that sustainability does not exert a relevant impact on firms' market value within these industries. The lack of significance may indicate that ESG considerations are already embedded in industry practices or that other financial and operational factors play a more dominant role in shaping firm value.

In the Technology & Communications and Discretionary Consumer Goods sectors, ESG is positive but not significant, whereas ESG_SQ is positive and statistically significant. Similar to the aggregate level, this finding indicates that the relationship between sustainability and TQ follows a convex (U-shaped) pattern, meaning that at low levels of ESG, firm value tends to decline. Still, higher ESG scores increase market valuation beyond a certain threshold. This suggests that the market applies a sustainability premium only when ESG engagement reaches a certain intensity, recognizing its role as a source of competitive advantage. The critical sustainability threshold is estimated at 58,64/100 for the Technology & Communications sector and 51,82/100 for the Discretionary Consumer Goods sector.

In contrast, the Industry & Transportation sector presents a different dynamic. ESG is negative and not significant, while ESG_SQ is negative and significant, indicating a concave (inverted U-shaped) relationship between sustainability and TQ. Unlike other sectors where ESG becomes beneficial beyond a certain point, in this case, an excessive focus on sustainability appears to be associated with a decline in market valuation once a firm surpasses a specific threshold (ESG =

49,83/100). This result suggests that, in this sector, ESG investments might be perceived as costly rather than value-enhancing, potentially due to high regulatory compliance costs, operational inefficiencies, or investor skepticism regarding the financial returns of ESG initiatives.

In a nutshell, the analysis confirms that the relationship between sustainability and TQ varies significantly across sectors. Industry & Transportation sector is the only one exhibiting a concave (inverted U-shaped) relationship, indicating that excessive ESG efforts may lead to diminishing market valuation. In contrast, the Technology & Communications and Discretionary Consumer Goods sectors confirm a convex (U-shaped) relationship, where sustainability is penalized at lower levels but becomes beneficial beyond a specific threshold. The Energy & Utilities, Health & Biotechnology, and Staples Consumer Goods sectors show no significant relationship, suggesting that sustainability does not influence firm market value within these industries. These findings indicate that sector-specific characteristics, including competitive dynamics and regulatory frameworks, are critical in shaping the relationship between sustainability and market valuation.

Tab. 4: Market-based perspective

Industries	**Discretionary Consumer Goods** (1)	**Energy & Utilities** (2)	**Health & Biotechnology** (3)	**Industry & Transportation** (4)	**Materials & Construction** (5)
ESG	0.326	-0.008	-0.242	-0.245	0.101
ESG_SQ	0.351***	-0.010	-0.144	-0.170*	-0.064
SIZE	-3.150***	-0.422***	-3.195**	-0.639*	-0.537*
Lev	-0.953	0.222	-2.578	-3.347**	0.487
GDP	0.109	-0.008	0.046	0.042	0.047*
Cons	74.63***	10.54***	76.27***	18.08*	13.28**
Time effects	Yes	Yes	Yes	Yes	Yes
N	566	477	422	729	578
Model	FE	FE	FE	FE	FE
Prob > F	0.000	0.000	0.0231	0.000	0.000
R-sq					
Within	0.314	0.125	0.070	0.083	0.103
Between	0.335	0.241	0.286	0.172	0.273
Overall	0.262	0.168	0.175	0.116	0.251

Industries	**Real Estate** (6)	**Services** (7)	**Staples Consumer Goods** (8)	**Technology & Communications** (9)	**Overall** (10)
ESG	0.349	0.154	-0.096	0.308	0.012
ESG_SQ	0.089	0.001	-0.019	0.485**	0.127**
SIZE	-0.900	-0.928***	-1.236***	-1.743**	-1.813***
Lev	0.753	-0.384	-0.510	5.492***	0.506
GDP	0.182*	0.007	0.014	0.036	0.049*
Cons	20.70	22.62***	30.15***	39.16**	42.75***
Time effects	Yes	Yes	Yes	Yes	Yes
N	257	215	497	518	4,259
Model	FE	FE	FE	FE	FE
Prob > F	0.019	0.000	0.000	0.000	0.000
R-sq					
Within	0.116	0.203	0.398	0.149	0.071
Between	0.013	0.028	0.267	0.321	0.233
Overall	0.006	0.060	0.199	0.286	0.173

(Note: *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$)

Source: our elaboration

Moving to the accounting-based perspective (Tab. 5), the regression analysis conducted on the entire sample shows that the relationship between ROE and the ESG variables, both in their linear (ESG) and quadratic (ESG_SQ) forms, is positive but not statistically significant. In other words, there is insufficient empirical evidence to assert that sustainability exerts any meaningful influence on firms' financial performance from an accounting-based perspective.

Shifting the focus to the individual sectors included in the sample, several key findings emerge. The services sector stands out as the only industry where the relationship between ROE and ESG variables is positive and statistically significant, suggesting a convex (U-shaped) relationship. Specifically, before reaching a certain sustainability threshold (ESG = 56.33/100), ROE tends to

decline, but beyond this critical point, firms with higher ESG scores experience an increase in profitability.

For the remaining sectors under analysis, the relationship between ROE and ESG variables appears to be statistically non-significant, with no clear pattern in terms of directionality. In some cases, the relationship is positive, while in others, it is negative, indicating a lack of a consistent or systematic link between sustainability and financial performance across industries.

Tab. 5: Accounting-based perspective

Industries	**Discretionary Consumer Goods** (1)	**Energy & Utilities** (2)	**Health & Biotechnology** (3)	**Industry & Transportation** (4)	**Materials & Construction** (5)
ESG	-0.003	-0.028	0.036	0.005	-0.011
ESG_SQ	-0.004	-0.006	0.001	0.002	0.005
Size	-0.036	-0.016	0.021	0.020	-0.023
Lev	-0.016	0.024	0.700**	0.051	-0.088
GDP	-0.009	-0.011*	0.006	-0.001	-0.001
Cons	1.065*	0.533	-0.624	-0.278	0.702
Time effects	Yes	Yes	Yes	Yes	Yes
N	555	471	427	725	583
Model	RE	RE	RE	FE	FE
Prob > F	0.002	0.001	0.007	0.009	0.000
R-sq					
Within	0.063	0.075	0.039	0.045	0.120
Between	0.035	0.096	0.263	0.101	0.075
Overall	0.046	0.056	0.105	0.001	0.084

Industries	**Real Estate** (6)	**Services** (7)	**Staples Consumer Goods** (8)	**Technology & Communications** (9)	**Overall** (10)
ESG	0.003	0.162***	0.026	0.064	0.012
ESG_SQ	-0.001	0.125**	-0.023	-0.008	0.009
Size	-0.008*	-0.178	-0.006	-0.341**	-0.078***
Lev	0.099***	-0.485	0.273*	2.085**	0.433***
GDP	0.002	0.003	0.009	0.009	-0.001
Cons	0.185*	4.323	0.162	6.990*	1.718***
Time effects	Yes	Yes	Yes	Yes	Yes
N	248	216	496	508	4,229
Model	RE	OLS	OLS	RE	RE
Prob > F	0.000	0.004	0.008	0.032	0.000
R-sq					
Within	0.059			0.038	0.007
Between	0.361			0.124	0.031
Overall	0.159	0.095	0.021	0.087	0.017

(Note: *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$)

Source: our elaboration

4.3 Discussion and Implications

The results elicit several findings regarding the CSP-CFP relationship.

Considering the market-based perspective, empirical evidence indicates that this relationship follows a convex (U-shaped) pattern, suggesting that sustainability investments have a non-linear impact on TQ. Specifically, in the early stages of implementation, adopting sustainability practices tends to reduce TQ. However, once a critical threshold is surpassed, the same investments generate significant and measurable benefits, contributing to a substantial increase in corporate value (Barnett & Salomon 2012).

This dynamic can be explained from multiple perspectives. In the initial phase, sustainability investments entail high costs and delayed benefits, particularly for firms that require significant operational restructuring to comply with sustainability standards. These costs may include upgrading production facilities, training personnel, implementing low-impact technologies, and strengthening governance systems. Without immediate tangible results, the market penalizes companies, reducing their short-term valuation.

However, once this critical threshold is reached, sustainability investments yield cumulative benefits, such as risk reduction, enhanced corporate reputation, and increased attractiveness to institutional investors focusing on sustainability. These factors contribute to a significant rise in TQ, as the market recognizes sustainability practices as a long-term strategic asset that enhances resilience and opens new growth opportunities.

Conversely, empirical evidence does not exhibit a statistically significant relationship with sustainability practices from an accounting-based perspective. This lack of significance reflects a structural disconnection between traditional accounting metrics and the value created by sustainability investments. While TQ captures future market expectations and progressively rewards firms implementing sustainability initiatives, ROE remains tied to a short-term logic, focused exclusively on current operational performance. Consequently, sustainability practices often generate long-term benefits and are not adequately reflected in traditional accounting metrics.

A crucial aspect of this divergence lies in the intangible nature of sustainability. Sustainability practices can be considered an intangible asset whose value-creation capacity does not immediately appear in operating income but gradually materializes through the accumulation of reputational capital, long-term stakeholder relationships, and improved risk management related to environmental and social issues (Guatri & Bini, 2002; Damodaran, 2006; Guatri & Bini, 2009). While acknowledged by the market and reflected in TQ, this intangible value remains undervalued by traditional accounting metrics such as ROE, which are not designed to capture these dimensions.

While the market demonstrates greater flexibility and adaptability, successfully identifying the positive effects of the ESG adoption process, the accounting perspective tends to remain rigid and rooted in traditional schemes. Accounting logic is often dominated by procedural rigidity and hyper-formalization, which struggles to incorporate intangible elements such as reputational capital, systemic risk mitigation capacity, or the strategic value of stakeholder relationships (Edmans, 2023). The market, by contrast, is a more dynamic mechanism, able to bypass these rigidities and anticipate the long-term benefits associated with ESG policies.

Moreover, the results highlight that the CSP-CFP relationship varies across industries, reflecting sector-specific priorities and challenges. Differentiated statistical significance highlights the diverse levels of sectoral readiness regarding firms' ability to adopt and effectively implement sustainability policies.

In some sectors, firms exhibit a higher alignment between sustainability practices and business strategy, enabling them to integrate these initiatives more effectively into their operations and corporate governance. In these contexts, sustainability practices are closely linked to stakeholder trust and brand reputation, which can translate into tangible economic benefits and be more readily reflected in market-based CFP measures. The high level of readiness in such sectors stems from more significant stakeholder pressure and an existing regulatory focus on transparency and ethical standards.

Conversely, other sectors may experience lower readiness levels, resulting in a weaker or non-existent relationship between CSP and CFP. In industries where governance and social policies have historically been less emphasized, adopting sustainability practices may still be at an early stage, with companies struggling to align these initiatives with their core business operations. This can lead to fragmented or inconsistent implementation, making it difficult for the market or investors to recognize and reward such efforts. Furthermore, sectors, where operational efficiency and financial performance are traditionally prioritized over softer governance aspects, may perceive ESG adoption as a compliance-driven exercise rather than a strategic opportunity, further delaying the integration process and reducing its measurable impact.

The variability in sectoral readiness also reflects differences in resource availability, operational complexity, and industry-specific norms. In capital-intensive industries with rigid organizational structures, adopting governance-related ESG practices may require significant time and resources, thus slowing progress.

Based on Porter & Kramer's concept of shared value (Porter & Kramer, 2011), the relationship between CSP and TQ in the consumer goods sector becomes particularly relevant. In this context, sustainability can be seen as a source of competitive advantage that can influence sales volumes, differential pricing strategies, and market share. Sustainability adoption can create added value for consumers, enhance brand perception, foster loyalty among sustainability-conscious customers, and legitimize premium pricing for products perceived as more responsible. Moreover, the ability to differentiate based on sustainability criteria can be a decisive factor in highly competitive industries, where sustainable innovation and transparency in production processes become essential tools for strategic positioning. The statistical significance observed in this sector reflects the growing importance of sustainability as a driver of consumer preferences, suggesting that companies capable of fully integrating ESG practices into their value proposition can achieve a sustainable competitive advantage in the long term. In other words, incorporating sustainability within corporate strategies enhances long-term value creation, fosters innovation-driven competitive advantages and mitigates financial and reputational risks associated with non-compliance and negative externalities (Ferreira *et al.*, 2021).

From investors' perspective, the results underscore the importance of adopting a forward-looking, multi-dimensional perspective when evaluating companies. Relying exclusively on accounting indicators may lead to underestimating the growth potential of firms engaged in sustainability. Long-term-oriented investors should prioritize market-based indicators, which provide a more comprehensive view of future expectations and the strategic impact of ESG policies (Gentry & Shen, 2010).

From policy policymakers' perspective, the convex ESG-TQ relationship, the lack of significance with ROE, and the differences among sectors highlight the need for a multi-dimensional approach to sustainability policy design, adopting targeted, flexible, and size-sensitive frameworks that address the specific needs of different industries and companies. In this vein, fiscal incentives and targeted financial support could help firms in the early stages of ESG adoption to overcome economic barriers and accelerate their transition (Cipollone, 2022; Sabatini, 2022). Additionally, promoting enhanced ESG reporting standards that integrate tangible and intangible dimensions would improve transparency and facilitate market evaluation.

5. Conclusions

This study addresses a gap in the literature by providing a deeper understanding of the relationship between Corporate Social Performance (CSP) and Corporate Financial Performance (CFP). It explores a non-linear dynamic while adopting a dual perspective - market-based (Tobin's Q) and accounting-based (ROE) - to capture financial and economic performance. Additionally, it highlights industry-specific variations, offering a more nuanced analysis of CSP's impact across sectors.

The results, partially consistent with previous research (Barnett & Salomon, 2012; Fuji *et al.*, 2013; Misani & Pogutz, 2015), highlight a convex (U-shaped) relationship between CSP and CFP, but only when measured using market-based metrics. This finding supports the stream of academic literature that associates sustainability with a form of intangible asset that may not be adequately captured by accounting-based metrics. Considering that sustainability is a medium- to long-term phenomenon, these results could be attributed to a temporal effect. The findings indicate that the CSP-CFP relationship follows a non-linear trajectory. In the early stages, sustainability initiatives tend to have a negative impact on financial performance, as the associated costs outweigh the initial benefits. However, over time, this dynamic reverses-sustainability efforts begin to yield tangible financial gains, ultimately strengthening the positive link between ESG engagement and firm performance.

Accounting metrics, by their nature, offer a simplified representation of a more complex financial reality. They rely on historical data and conservative valuations, omitting forward-looking elements such as risk and the time value of money. In contrast, market-based metrics provide a more dynamic

assessment, quickly incorporating new accountability, compliance, and transparency information. They also capture the anticipated future effects of economic initiatives, including reductions in agency costs (Gentry & Shen, 2010).

Moreover, the impact of sustainability on financial performance varies significantly across industries. Sector-specific factors - such as competitive dynamics, regulatory frameworks, and stakeholders' expectations - are crucial in shaping the relationship between sustainability and firms' financial performance (Lambrechts *et al.*, 2019).

The results of this study can be utilized to evaluate listed firms' investment portfolios from investors' and stakeholders' perspectives. Firms' CSP can be compared to the proposed thresholds to assess possible future performance in terms of TQ.

This study has several limitations. Methodologically, the econometric model could be refined by incorporating additional variables, such as analyzing individual ESG components separately and accounting for differences in legal systems. Theoretically, the lack of standardization in ESG data and ratings - stemming from variations in providers' methodologies, including frameworks, key indicators, qualitative assessments, and weighting - may affect result reliability and lead to divergent conclusions.

Future research should enhance the proposed framework by extending the observation period, incorporating additional variables, and conducting analyses using data from different ESG providers to improve comparability and robustness.

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Dal consiglio di amministrazione alla performance sociale: come la qualità del consiglio di amministrazione promuove la performance sociale in risposta a feedback di performance sociale negativi e positivi

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Abstract

Frame of the research. *The Board of Directors (BoD) plays a key role in promoting the social activities of companies.*

Purpose of the paper. *This study examines whether BoD quality-defined as the effectiveness of BoD structure, composition, and functioning-improves social performance. Moreover, this study examines the moderating role of the social performance feedback received-determined by the difference between recorded social performance and social performance aspirations.*

Methodology. *A panel regression analysis was conducted on an unbalanced dataset of 1,299 European companies over the period 2014-2023.*

Results. *BoD quality enhances social performance. Moreover, negative social performance feedback has a positive effect on social performance, regardless of its magnitude. In the presence of such feedback, a high-quality BoD enables a higher level of social performance. Instead, positive social performance feedback improves social performance. However, when such feedback is present, a high-quality BoD reduces its positive effect on social performance.*

Research limitations. *This study does not explore the specific mechanisms through which BoD quality enables companies to respond to positive or negative social performance feedback.*

Managerial implications. *This study confirms the importance of the BoD in driving social performance and highlight the need for a high-quality BoD to manage situations where social performance either exceeds or falls short of aspirations.*

Originality of the paper. *This study investigates how BoD quality affects social performance and suggests plausible mechanisms leading to a positive contribution. Secondly, it demonstrates how this relationship is moderated by the social performance feedback received. Thirdly, this study focuses on the social dimension of CSR, which is usually less studied compared to the environmental dimension or CSR as a whole.*

Key words: *Quality of the board of directors; Behavioural theory of the firm; Social performance feedback; Social performance*

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1. Introduzione

Negli ultimi anni, una maggiore consapevolezza delle questioni ambientali e sociali ha spinto le imprese a implementare iniziative di Responsabilità Sociale d'Impresa (Corporate Social Responsibility - CSR) (Ananzeh *et al.*, 2022). Queste iniziative hanno ricevuto molta attenzione sia nella ricerca accademica sia nella pratica manageriale (Lin e Nguyen 2022), anche considerato i loro effetti positivi sulla legittimità e sulla performance dell'impresa (Govindan *et al.*, 2021).

All'interno della CSR, la dimensione sociale e le attività sociali-ovvero le iniziative volte a costruire fiducia e lealtà, migliorare la soddisfazione dei dipendenti, promuovere ambienti di lavoro sicuri, rispettare i diritti umani, seguire standard etici e offrire prodotti e servizi che tutelano la salute e la sicurezza dei clienti (Baraibar-Diez e Odriozola 2019; Arayakarnkul *et al.*, 2022)-hanno acquisito una crescente rilevanza (Arayakarnkul *et al.*, 2022).

Il Consiglio di Amministrazione (CdA) svolge un ruolo fondamentale nel promuovere tali iniziative sociali (Govindan *et al.*, 2021; Dwekat *et al.*, 2022). In particolare, il CdA identifica le aspettative degli stakeholder, sviluppa strategie volte a soddisfarle e supervisiona il top management durante la loro esecuzione (Arayakarnkul *et al.*, 2022; Giannarakis *et al.*, 2023). Considerato il ruolo del CdA, la letteratura esistente ha ampiamente esaminato come le sue caratteristiche (e.g., l'indipendenza, la presenza di un comitato CSR e la diversità di genere) influiscono sulla performance sociale (Govindan *et al.*, 2021; Kwarteng *et al.*, 2023).

Poiché le attività sociali sono complesse, i CdA devono essere costituiti in modo tale che le questioni sociali ricevano la giusta attenzione (Uyar *et al.*, 2020). In particolare, in linea con la *agency theory* (Jensen e Meckling 1976), la *stakeholder theory* (Freeman 1984), la *resource dependence theory* (Hillman and Dalziel 2003) e la *upper echelons theory* (Hambrick and Mason 1984), riteniamo che, per migliorare la performance sociale, il CdA debba essere strutturato in modo da combinare efficacemente specifiche caratteristiche, garantendo così la formazione di un CdA "di qualità".

Sulla base di queste considerazioni, il primo obiettivo di questo studio è esaminare se la qualità del CdA migliora la performance sociale, dove la qualità del CdA è definita come una struttura, composizione e funzionamento efficaci del CdA, valutati come segue:

- la struttura del CdA comprende l'indipendenza del CdA, la presenza di un comitato CSR, la non-dualità del CEO e l'esistenza di politiche volte ad assicurare una buona struttura del CdA;
- la composizione del CdA è definita dalla diversità di genere nel CdA;
- il funzionamento del CdA si riferisce alla frequenza delle riunioni del CdA e alla partecipazione degli amministratori e delle amministratrici alle riunioni del CdA.

Inoltre, lo studio considera quanto postulato dalla *behavioral theory of the firm* (Cyert e March 1963), secondo cui la strategia di un'impresa è influenzata dal feedback di performance sociale ricevuto, ovvero dalla differenza tra la performance sociale registrata e l'obiettivo di performance sociale (Cyert e March 1963). La letteratura suggerisce come la risposta del CdA sia diversa a seconda che l'impresa riceva un feedback di performance sociale positivo (quando la performance sociale registrata è superiore all'obiettivo di performance) o negativo (quando la performance sociale registrata è inferiore all'obiettivo di performance) (Greve 2003, 2008). Pertanto, il secondo obiettivo di questo studio consiste nell'esaminare come la relazione tra la qualità del CdA e la performance sociale è influenzata dal tipo di feedback di performance sociale ricevuto.

Riepilogando, lo studio risponde alle domande di ricerca seguenti:

- Qual è l'effetto della qualità del CdA sulla performance sociale?
- Come la relazione tra la qualità del CdA e la performance sociale è influenzata dal tipo di feedback di performance sociale ricevuto?

Per raggiungere gli obiettivi dello studio, è stata condotta un'analisi di regressione di tipo panel su un dataset non bilanciato di 1.299 imprese europee nel periodo 2014-2023.

Lo studio è strutturato come segue. La Sezione 2 espone il background teorico dello studio, esaminando l'impatto della qualità del CdA sulla responsabilità sociale, l'impatto dei feedback di performance sociale negativo e positivo sulla responsabilità sociale e la loro interazione. La Sezione

3 descrive la metodologia adottata nello studio, facendo riferimento ai dati, al metodo e alle variabili utilizzati. La Sezione 4 espone e discute i risultati alla luce della letteratura precedente. La Sezione 5 è dedicata alle conclusioni dello studio.

2. Background teorico

2.1 La qualità del CdA e l'impatto sulla responsabilità sociale

Il CdA svolge un ruolo fondamentale nell'affrontare le questioni sociali dell'impresa (Arayakarnkul *et al.,* 2022). Il CdA è l'organo preposto a comprendere e affrontare le aspettative degli stakeholder, formulare le strategie relative alle questioni sociali e supervisionare il top management nell'esecuzione di queste strategie (Arayakarnkul *et al.*, 2022; Giannarakis *et al.*, 2023).

La relazione tra il CdA e la performance sociale dell'impresa è stata studiata facendo riferimento a diverse teorie. Questo studio si avvale di quattro teorie per spiegare tale relazione: la *agency theory* (Jensen e Meckling 1976), la *stakeholder theory* (Freeman 1984), la *resource dependence theory* (Hillman and Dalziel 2003) e la *upper echelons theory* (Hambrick and Mason 1984). Secondo la *agency theory*, quando la proprietà e il controllo sono separati, ci possono essere conflitti di interesse a causa dell'asimmetria informativa esistente tra il management e gli azionisti (Jensen e Meckling 1976). In riferimento alle questioni sociali, alcuni/e manager potrebbero promuovere le attività sociali, mentre altri/e potrebbero trascurarle nonostante i benefici economici che queste attività possono creare per gli azionisti (Arayakarnkul *et al.,* 2022). Il CdA svolge pertanto un ruolo centrale nel promuovere le attività sociali (Disli *et al.,* 2022). Secondo la *stakeholder theory*, le imprese dovrebbero investire in attività sociali per soddisfare le aspettative degli stakeholder, migliorare la reputazione dell'impresa e creare valore per gli azionisti (Freeman 1984; Shahbaz *et al.,* 2020). Il CdA ha pertanto il compito di risolvere i conflitti tra il management e gli stakeholder non investitori (Freeman 1984) e mantenere buone relazioni con gli stakeholder (Ben Selma *et al.,* 2022).

La composizione del CdA è altrettanto importante per promuovere le attività sociali. Secondo la *resource dependence theory*, il CdA fornisce risorse critiche per il successo dell'impresa, tra cui l'accesso a fonti esterne di informazioni e risorse e i legami con gli stakeholder e l'ambiente esterno (Pfeffer e Salancik 1978; Hillman e Dalziel 2003). Queste risorse sono essenziali per migliorare il processo decisionale, la formulazione delle strategie e la legittimità dell'impresa (Ben Selma *et al.,* 2022). Queste risorse svolgono un ruolo chiave anche in relazione alla performance sociale (Abdullah *et al.,* 2024). Infine, secondo la *upper echelons theory*, le caratteristiche degli amministratori e delle amministratrici (e.g., genere, età, istruzione) influenzano le loro percezioni e decisioni (Hambrick e Mason 1984) e, indirettamente, la formulazione e l'implementazione delle strategie sociali (Biswas *et al.,* 2018; Shahbaz *et al.,* 2020).

In linea con la *agency theory*, la *stakeholder theory*, la *resource dependence theory* e la *upper echelons theory*, la qualità del CdA-definita come una struttura, composizione e funzionamento efficaci del CdA-è associata a una performance sociale maggiore (Govindan *et al.,* 2021; Kwarteng *et al.,* 2023). In questo studio, la qualità del CdA è valutata attraverso le seguenti dimensioni:

- la struttura del CdA comprende l'indipendenza del CdA, la presenza di un comitato CSR, la non-dualità del CEO e l'esistenza di politiche volte ad assicurare una buona struttura del CdA;
- la composizione del CdA è definita dalla diversità di genere nel CdA;
- il funzionamento del CdA si riferisce alla frequenza delle riunioni del CdA e alla partecipazione degli amministratori e delle amministratrici alle riunioni del CdA.

Di seguito, ogni caratteristica è discussa in riferimento al suo impatto sulla performance sociale.

Indipendenza del CdA. Gli amministratori e le amministratrici indipendenti, ovvero coloro che non sono impiegati dall'impresa e che non hanno legami commerciali significativi con essa (Disli *et al.,* 2022), apportano conoscenze e altre risorse chiave, forniscono raccomandazioni oggettive durante le discussioni del CdA e migliorano il controllo del management riducendo il rischio di opportunismo

(Kwarteng *et al.,* 2023; Abdullah *et al.,* 2024). In relazione alle attività sociali, gli amministratori e le amministratrici indipendenti sono impegnati a soddisfare le aspettative degli stakeholder, apportano conoscenze rilevanti per la promozione delle attività sociali e riconoscono i benefici a lungo termine di queste attività (Biswas *et al.,* 2018; Cabral e Sasidharan 2021; Dwekat *et al.,* 2022). Di conseguenza, la presenza di amministratori e amministratrici indipendenti è associata a una performance sociale superiore (Hussain *et al.,* 2018). Tuttavia, secondo alcuni studi, l'indipendenza del CdA non influisce sulla performance sociale (e.g., Uyar *et al.,* 2020, 2021; Disli *et al.,* 2022; Kwarteng *et al.,* 2023) e in alcuni casi può danneggiarla (Radu *et al.,* 2022).

Presenza di un comitato CSR. Il comitato CSR ha diversi compiti in relazione ai temi CSR: identifica i bisogni degli stakeholder e li soddisfa, monitora l'implementazione delle attività sociali e valuta i risultati raggiunti (Baraibar-Diez e Odriozola 2019; Abdullah *et al.,* 2024). Inoltre, il comitato CSR sensibilizza sui potenziali rischi sociali e lo protegge l'impresa dalle conseguenze di comportamenti irresponsabili (Shahbaz *et al.,* 2020; Endrikat *et al.,* 2021; Abdullah *et al.,* 2024). La letteratura esistente identifica una relazione positiva tra la presenza di un comitato CSR e la performance sociale (Uyar *et al.,* 2020, 2021; Govindan *et al.,* 2021; Giannarakis *et al.,* 2023). Tuttavia, alcuni studi suggeriscono che il comitato CSR non influenza la performance sociale (Abdullah *et al.,* 2024).

Non-dualità del CEO. La dualità del CEO si verifica quando il ruolo di CEO e presidente del CdA sono ricoperti dalla stessa persona (Finkelstein e D'Aveni 1994). Questa situazione è svantaggiosa per diverse ragioni: centralizza il potere in una singola persona, indebolisce la funzione di monitoraggio del CdA e compromette l'indipendenza del CdA (Cabral e Sasidharan 2021; Dwekat *et al.,* 2022). In presenza della dualità del CEO, la fiducia degli azionisti e degli stakeholder potrebbe essere minore a causa della possibilità che il CEO adotti comportamenti opportunistici (Finkelstein e D'Aveni 1994; Endrikat *et al.,* 2021; Uyar *et al.,* 2021). Per queste ragioni, la non-dualità del CEO è raccomandata (Cabral e Sasidharan 2021). La dualità del CEO può scoraggiare l'implementazione di attività sociali e influire negativamente sulla performance sociale (Cabral e Sasidharan 2021; Govindan *et al.,* 2021; Uyar *et al.,* 2021) in quanto il CEO potrebbe privilegiare i benefici economici di breve termine a discapito delle iniziative sociali che creano valore a lungo termine (Beji *et al.,* 2021). Al contrario, gli studi esistenti mostrano come la non-dualità del CEO è associata a un maggiore impegno nelle attività sociali poiché gli interessi degli stakeholder vengono considerati in misura maggiore e per il CEO risulta più difficile distogliere l'attenzione dalle questioni sociali (Endrikat *et al.,* 2021; Govindan *et al.,* 2021).

Esistenza di politiche volte ad assicurare una buona struttura del CdA. Le politiche volte ad assicurare una buona struttura del CdA configurano aspetti quali la composizione e la diversità del CdA, i criteri di selezione degli amministratori e delle amministratrici (inclusi le qualifiche e l'esperienza richieste) e l'istituzione di comitati per il reclutamento (Fernandes *et al.,* 2023). Studi esistenti mostrano come la presenza di queste politiche migliora la performance sociale dell'impresa, considerato il loro effetto sulla struttura del CdA (Fernandes *et al.,* 2023).

Diversità di genere nel CdA. Le amministratrici apportano abilità, punti di vista e informazioni uniche al CdA e promuovono un dialogo aperto e partecipativo, consentendo al CdA di prendere decisioni migliori (Shahbaz *et al.,* 2020; Arayakarnkul *et al.,* 2022; Ben Selma *et al.,* 2022). Inoltre, le amministratrici consentono di ridurre i costi di agenzia e i comportamenti opportunistici (Lin e Nguyen 2022; Giannarakis *et al.,* 2023). Le amministratrici sono generalmente più sensibili alle questioni etiche e sociali (Ardito *et al.,* 2020; Beji *et al.,* 2021), aumentando così la consapevolezza del CdA riguardo a queste tematiche e la capacità di soddisfare le richieste di vari tipi di stakeholder (Shahbaz *et al.,* 2020; Cabral e Sasidharan 2021). Numerosi studi evidenziano che la diversità di genere nel CdA migliora la performance sociale (e.g., Biswas *et al.,* 2018; Hussain *et al.,* 2018; Uyar *et al.,* 2020, 2021; Disli *et al.,* 2022; Radu *et al.,* 2022). Tuttavia, alcuni studi suggeriscono che la diversità di genere nel CdA non influenza la performance sociale (Shahbaz *et al.,* 2020; Lin e Nguyen 2022; Kwarteng *et al.,* 2023) e danneggia in alcuni casi il benessere dei dipendenti (Ardito *et al.,* 2020).

Frequenza delle riunioni del CdA. Riunioni frequenti del CdA sono indice di due effetti contrapposti: un'inefficienza del CdA o una maggiore assiduità e meticolosità e, di conseguenza, efficacia del CdA (Dwekat *et al.,* 2022; Kwarteng *et al.,* 2023). Le riunioni frequenti del CdA favoriscono lo scambio di informazioni, la discussione di idee e la capacità del CdA di guidare e monitorare il management nell'esecuzione delle strategie (Giannarakis *et al.,* 2023). Secondo la letteratura esistente, le riunioni frequenti del CdA migliorano la performance sociale perché consentono di affrontare al meglio le esigenze degli stakeholder ed eventuali rischi legati agli aspetti sociali (Hussain *et al.,* 2018; Kwarteng *et al.,* 2023). Tuttavia, secondo altri studi, le riunioni frequenti del CdA non influenzano la performance sociale dell'impresa (Disli *et al.,* 2022).

Partecipazione degli amministratori e delle amministratrici alle riunioni del CdA. La partecipazione degli amministratori e delle amministratrici alle riunioni del CdA influenza la formulazione e l'attuazione delle strategie, migliorando la capacità di monitoraggio del management e riducendo il rischio di comportamenti opportunistici (Uyar *et al.,* 2020). Secondo gli studi esistenti, una maggiore partecipazione alle riunioni del CdA migliora la performance sociale (Shahbaz *et al.,* 2020; Uyar *et al.,* 2020). Tuttavia, altri studi suggeriscono che una maggiore partecipazione alle riunioni del CdA non incide sulla performance sociale (Giannarakis *et al.,* 2023).

Poiché l'indipendenza del CdA, la presenza di un comitato CSR, la non-dualità del CEO, l'esistenza di politiche volte ad assicurare una buona struttura del CdA, la diversità di genere nel CdA, la frequenza delle riunioni del CdA e la partecipazione degli amministratori e delle amministratrici alle riunioni del CdA hanno generalmente un impatto positivo sulla performance sociale, è avanzata l'ipotesi secondo cui la qualità del CdA-definita come una struttura, composizione e funzionamento efficaci del CdA sulla base delle caratteristiche menzionate-migliora la performance sociale:

Ipotesi 1: La qualità del CdA aumenta la performance sociale.

2.2 Feedback di performance sociale negativo e positivo e l'impatto sulla performance sociale

La *behavioral theory of the firm* afferma che il comportamento di un'impresa è influenzato dalla differenza tra la performance registrata e l'obiettivo di performance (Cyert e March 1963). L'obiettivo di performance è la performance desiderata per gli obiettivi organizzativi e serve come punto di riferimento per guidare le azioni, migliorare la performance e valutare se la performance registrata è soddisfacente o meno (Cyert e March 1963). L'obiettivo di performance è costituito da due componenti: l'obiettivo di performance storico, basato sulla performance passata dell'impresa, e l'obiettivo di performance sociale, basato sulla performance registrata delle imprese simili (Greve 2003).

Nell'attuazione delle strategie volte a raggiungere l'obiettivo di performance, il CdA risponde diversamente a seconda che l'impresa riceva un feedback di performance sociale positivo (quando la performance sociale registrata è superiore all'obiettivo di performance) o negativo (quando la performance sociale registrata è inferiore all'obiettivo di performance) (Greve 2003, 2008).

Feedback di performance sociale negativo. Quando la performance registrata è inferiore all'obiettivo di performance, il CdA sperimenta una pressione sulla performance ed è spinto ad avviare una "ricerca problemistica", ovvero una ricerca di soluzioni (e.g., cambiamenti organizzativi o comportamenti rischiosi) per migliorare la performance (Cyert e March 1963). La ricerca della soluzione e le risposte dipendono dall'entità del feedback di performance sociale negativo (Audia e Greve 2006).

Feedback di performance sociale negativo "grave". In presenza di un feedback di performance sociale negativo "grave", la performance sociale registrata è notevolmente inferiore all'obiettivo di performance e il CdA percepisce una minaccia per la sopravvivenza dell'impresa perché la legittimità è compromessa (Du e Vieira, 2012). Tale percezione di minaccia genera stress psicologico e ansia negli amministratori e nelle amministratrici, ostacolando la loro capacità di elaborare informazioni e

riducendo la flessibilità comportamentale (Audia e Greve 2006). Il CdA adotta un approccio più rigido e avverso al rischio, cercando di dare priorità alla sicurezza e preservando le risorse esistenti (Audia e Greve 2006). In questa situazione, gli investimenti nelle attività sociali vengono ridotti perché potrebbero distogliere risorse da altri obiettivi e intaccare la performance finanziaria; le attività sociali generano infatti costi immediati a fronte di benefici di lungo periodo (Price e Sun 2017; Zhong *et al.,* 2022).

Feedback di performance sociale negativo "minore". In presenza di un feedback di performance sociale negativo "minore", la performance registrata è leggermente inferiore all'obiettivo di performance e il CdA percepisce tale divario come riparabile (Audia e Greve 2006). In questa situazione, il CdA intensifica gli sforzi e intraprende azioni correttive volte a ottenere rendimenti immediati e a raggiungere l'obiettivo di performance (Greve 2008; Saridakis *et al.,* 2023). Inoltre, il CdA aumenta gli investimenti in attività sociali perché esse rafforzano la legittimità dell'impresa, alleviano le preoccupazioni degli stakeholder e consentono all'impresa di accedere a nuove risorse (Lee e Yang 2022; Zhu e Zhang 2024), consentendo così all'impresa di raggiungere l'obiettivo di performance (Saridakis *et al.,* 2023).

Sulla base di quanto discusso, la seguente ipotesi è avanzata:

Ipotesi 2: Il feedback di performance sociale negativo ha un effetto ad U sulla performance sociale.

Feedback di performance sociale positivo. In presenza di un feedback di performance sociale positivo, la performance registrata è superiore all'obiettivo di performance e può verificarsi un effetto negativo o positivo sulla performance futura (Saridakis *et al.,* 2023).

Effetto negativo sulla performance. Un feedback di performance sociale positivo segnala che non è necessario apportare cambiamenti nel breve periodo (Cyert e March 1963; Greve 2008). Il CdA è soddisfatto della performance sociale attuale e dell'andamento della gestione dell'impresa (Hu *et al.,* 2023; Saridakis *et al.,* 2023). In queste situazioni, il CdA è meno motivato a migliorare la performance sociale e potrebbe presentarsi una situazione di inerzia organizzativa (Greve 2003). In alternativa, il CdA potrebbe utilizzare le risorse in eccesso per lo sfruttamento di nuove opportunità o iniziative secondarie, spinto dai buoni risultati ottenuti dall'allocazione delle risorse in passato (Greve 2008; Saridakis *et al.,* 2023). Per quanto riguarda le attività sociali, un feedback di performance sociale positivo potrebbe indurre il CdA a ridurre gli investimenti nelle attività sociali poiché le iniziative intraprese in passato sono state ottimali e perché gli investimenti in attività sociali comportano costi immediati e potrebbero peggiorare la performance finanziaria (Xu e Zeng 2021; Saridakis *et al.,* 2023). Pertanto, la seguente ipotesi è avanzata:

Ipotesi 3a: Il feedback di performance sociale positivo riduce la performance sociale.

Effetto positivo sulla performance. In alternativa, un feedback di performance sociale positivo potrebbe indurre il CdA a fissare obiettivi di performance più alti e ad intensificare gli sforzi (Saridakis *et al.,* 2023). Nel caso del le attività sociali, un feedback di performance sociale positivo accresce la fiducia degli stakeholder nel CdA, mentre aumenta il loro scetticismo qualora l'impresa decidesse di ridurre gli investimenti in attività sociali (Lee e Yang 2022). Il CdA potrebbe pertanto mantenere questi investimenti costanti e puntare a una performance sociale elevata per non intaccare la legittimità dell'impresa (Lee e Yang 2022). Pertanto, la seguente ipotesi è avanzata:

Ipotesi 3b: Il feedback di performance sociale positivo aumenta la performance sociale.

2.3 L'interazione tra la qualità del CdA e il feedback di performance sociale

Considerati l'effetto della qualità del CdA sulla performance sociale (Uyar *et al.,* 2020; Giannarakis *et al.,* 2023) e l'effetto distinto del feedback di performance sociale negativo e positivo sulla performance sociale (Xu e Zeng 2021; Saridakis *et al.,* 2023), ipotizziamo che la relazione tra la qualità del CdA e la performance sociale dipenda dal tipo di feedback di performance sociale che

si materializza. In particolare, avanziamo l'idea che di fronte a un feedback di performance sociale negativo o positivo, un CdA "di qualità" mostra capacità superiori in termini di:

- capacità di valutare la situazione in modo approfondito. Ciò consente di analizzare adeguatamente il feedback di performance sociale e le sue conseguenze e di attuare le misure correttive che si rendono eventualmente necessarie;
- capacità superiori di decision making e formulazione della strategia. Ciò favorisce discussioni approfondite e la formulazione di strategie adeguate che consentano di affrontare le sfide o cogliere le opportunità associate al feedback di performance sociale emerso;
- migliore esecuzione e monitoraggio delle strategie. Ciò consente che le strategie vengano implementate efficacemente e monitorate meticolosamente.

Grazie a queste capacità, un CdA "di qualità" è in grado di affrontare al meglio sia un feedback di performance sociale negativo sia un feedback di performance sociale positivo. Di seguito, il ruolo di CdA "di qualità" è discusso nel dettaglio.

Feedback di performance sociale negativo. Un feedback di performance sociale negativo genera una pressione sulla performance e risposte diverse a seconda della gravità del feedback (Audia e Greve 2006).

Feedback di performance sociale negativo "grave". Un feedback di performance sociale negativo "grave" minaccia la sopravvivenza e la legittimità dell'impresa, richiedendo un'azione immediata (Audia e Greve 2006). Questo scenario di solito induce stress psicologico, ansia e un approccio rigido e avverso al rischio (Audia e Greve 2006). Di conseguenza, gli investimenti in attività sociali vengono ridotti poiché possono intaccare la performance finanziaria e impongono costi nel breve periodo (Price e Sun 2017; Zhong *et al.*, 2022). Un CdA "di qualità" potrebbe contrastare queste tendenze, favorendo una migliore comprensione della situazione e facilitando decisioni bilanciate. In particolare: il comitato CSR agisce rapidamente per evitare le ripercussioni di comportamenti irresponsabili e di una scarsa performance sociale (Endrikat *et al.*, 2021); le amministratrici, le riunioni frequenti del CdA e l'alta partecipazione alle riunioni del CdA favoriscono lo scambio di idee e informazioni (Arayakarnkul *et al.*, 2022; Giannarakis *et al.*, 2023); gli amministratori indipendenti e le amministratrici utilizzano la loro esperienza per fornire raccomandazioni informate (Shahbaz *et al.*, 2020; Abdullah *et al.*, 2024); il comitato CSR e la non-dualità del CEO proteggono gli interessi degli stakeholder (Ananzeh *et al.*, 2022); gli amministratori e le amministratrici indipendenti e il comitato CSR lavorano per raggiungere un equilibrio tra obiettivi finanziari e non finanziari (Endrikat *et al.*, 2021; Kwarteng *et al.*, 2023). In questo modo, la qualità del CdA consente di gestire efficacemente un feedback di performance sociale negativo "grave" e di mitigare il suo effetto negativo sulla performance sociale.

Feedback di performance sociale negativo "minore". Un feedback di performance sociale negativo "minore", percepito come un divario riparabile (Audia e Greve 2006), spinge il CdA a intensificare gli sforzi e promuovere gli investimenti in attività sociali (Lee e Yang 2022; Zhu e Zhang 2024). In questa situazione, un CdA "di qualità" assicura che le iniziative sociali vengano eseguite in modo efficace e che il management venga monitorato. In particolare: gli amministratori indipendenti, le amministratrici e la non-dualità del CEO lavorano per mitigare il rischio di opportunismo manageriale (Beji *et al.*, 2021; Lin e Nguyen 2022); il comitato CSR, riunioni frequenti del CdA e una alta partecipazione alle riunioni del CdA facilitano l'esecuzione e la supervisione delle attività sociali (Uyar *et al.*, 2020; Kwarteng *et al.*, 2023); il comitato CSR monitora continuamente i risultati ottenuti e il rispetto delle politiche CSR (Baraibar-Diez e Odriozola 2019). Per questi motivi, un CdA "di qualità" è in grado di compensare facilmente il feedback di performance sociale negativo "minore", amplificando il suo effetto positivo sulla performance sociale.

Sulla base di quanto discusso, viene avanzata la seguente ipotesi:

> *Ipotesi 4: La qualità del CdA mitiga l'effetto negativo di un feedback di performance sociale negativo "grave" sulla performance sociale, mentre amplifica l'effetto positivo di un feedback di performance sociale negativo "minore".*

Feedback di performance sociale positivo. In presenza di un feedback di performance sociale positivo, la qualità del CdA ha un effetto diverso a seconda che il feedback di performance sociale riduca o migliori la performance sociale.

Effetto negativo sulla performance. Un feedback di performance sociale positivo indica che non sono necessari cambiamenti immediati (Cyert e March 1963). Il CdA è soddisfatto della performance sociale registrata (Hu *et al.*, 2023) e può decidere di ridurre gli investimenti in attività sociali a favore di opportunità non sfruttate o attività secondarie (Greve 2008; Xu e Zeng 2021; Saridakis *et al.*, 2023). Tuttavia, un CdA "di qualità" potrebbe continuare a promuovere le attività sociali grazie a una valutazione della situazione accurata. In particolare: gli amministratori indipendenti e le amministratrici mantengono l'attenzione del CdA alle questioni sociali (Shahbaz *et al.*, 2020; Cabral e Sasidharan 2021); la non-dualità del CEO e le riunioni frequenti del CdA promuovono la considerazione degli interessi degli stakeholder (Kwarteng *et al.*, 2023); gli amministratori indipendenti mantengono l'attenzione sui benefici a lungo termine di tali attività (Biswas *et al.*, 2018; Endrikat *et al.*, 2021); il comitato CSR protegge il valore per gli azionisti attraverso gli investimenti in attività sociali (Endrikat *et al.*, 2021). Per questi motivi, la qualità del CdA mitiga gli effetti negativi sulla performance sociale associati a un feedback di performance sociale positivo. Pertanto, viene avanzata la seguente ipotesi:

> *Ipotesi 5a: La qualità del CdA mitiga l'effetto negativo di un feedback di performance sociale positivo sulla performance sociale.*

Effetto positivo sulla performance. Un feedback di performance sociale positivo può incoraggiare il CdA a fissare obiettivi di performance più elevati e a raggiungere una performance sociale superiore (Saridakis *et al.*, 2023). In questa situazione, la qualità del CdA gioca un ruolo cruciale nel migliorare la performance sociale, tramite il suo supporto all'esecuzione e al monitoraggio delle attività sociali. In particolare: gli amministratori indipendenti, le amministratrici e la non-dualità del CEO riducono il rischio di opportunismo manageriale (Disli *et al.*, 2022; Lin e Nguyen 2022); il comitato CSR, le riunioni frequenti del CdA e l'alta partecipazione alle riunioni del CdA consentono una supervisione efficace delle attività sociali (Uyar *et al.*, 2020; Kwarteng *et al.*, 2023); il comitato CSR aiuta a individuare nuove opportunità per iniziative sociali (Abdullah *et al.*, 2024). Pertanto, in presenza di un feedback di performance sociale positivo, la qualità del CdA contribuisce a migliorare ulteriormente la performance sociale. Pertanto, viene avanzata la seguente ipotesi:

> *Ipotesi 5b: La qualità del CdA amplifica l'effetto positivo di un feedback di performance sociale positivo sulla performance sociale.*

3. Metodologia

3.1 Dati

Questo studio utilizza dati provenienti da LSEG Data & Analytics, precedentemente noto come Refinitiv Eikon Datastream. Si tratta di un database contenente informazioni sulla performance sociale, ambientale e di governance delle imprese, ampiamente utilizzato da investitori professionisti e ricercatori accademici (Fernandes *et al.*, 2023; Giannarakis *et al.*, 2023). LSEG Data & Analytics offre informazioni su oltre 15.500 imprese pubbliche e private in tutto il mondo (LSEG Data & Analytics 2023) ed è riconosciuto come il più grande database sui temi della CSR (Uyar *et al.*, 2020).

In questo studio, il database LSEG Data & Analytics è stato usato per raccogliere dati sulla performance sociale, le caratteristiche del CdA e altre caratteristiche dell'impresa.

Il dataset usato nell'analisi è non bilanciato e comprende dati riguardanti 1.299 imprese quotate operanti nei seguenti Paesi europei: Austria (3,107%), Belgio (4,539%), Cipro (0,488%), Danimarca (4,913%), Finlandia (4,620%), Francia (14,397%), Germania (15,845%), Grecia (2,928%), Irlanda (5,043%), Italia (7,581%), Lussemburgo (2,164%), Malta (0,277%), Paesi Bassi (6,361%), Polonia

(4,213%), Portogallo (1,383%), Repubblica Ceca (0,358%), Romania (0,114%), Slovenia (0,065%), Spagna (6,800%), Svezia (14,153%), Ungheria (0,651%).

Le osservazioni coprono il periodo dal 2014 al 2023.

3.2 Metodo

Le ipotesi sono testate tramite un'analisi di regressione panel multivariata ad effetti fissi.

In particolare, sono stati stimati due modelli. Il Modello 1 valuta gli effetti della qualità del CdA, del feedback di performance sociale negativo e del feedback di performance sociale positivo sulla performance sociale, controllando per la dimensione del CdA, la dimensione dell'impresa, l'età dell'impresa, il ROE e il leverage. Il Modello 2 include l'effetto di interazione tra la qualità del CdA e il feedback di performance sociale (negativo e positivo).

Per differenziare gli effetti del feedback di performance sociale negativo e positivo, è stato utilizzato l'approccio della funzione *spline* (Greve 2003). Tale approccio consiste nell'uso di variabili distinte per il feedback di performance sociale negativo e positivo e consente di valutare le differenze strutturali nei loro effetti (Zhu e Zhang 2024). Inoltre, l'effetto curvilineo del feedback di performance sociale negativo è stato testato tramite l'inclusione di un termine quadratico (Xu e Zeng 2021).

È stato applicato un lag di un anno a tutte le variabili indipendenti al fine di rimuovere eventuali problemi di endogeneità e per catturare gli effetti ritardati delle variabili indipendenti sulla performance sociale (Ben Selma *et al.*, 2022). Infine, sono stati inclusi gli effetti fissi per l'industria, il paese e l'anno per controllare l'eterogeneità non osservata e invariabile nel tempo (Hu *et al.*, 2023).

Formalmente, i modelli empirici stimati sono i seguenti:

Modello 1:
$$\textit{Performance sociale}_{t,i} = f(\textit{Qualità del CdA}_{t-1,i}, \textit{Feedback di performance sociale negativo}_{t-1,i}, \textit{Feedback di performance sociale negativo}^2_{t-1,i}, \textit{Feedback di performance sociale positivo}_{t-1,i}, \textit{Dimensione del CdA}_{t-1,i}, \textit{Dimensione dell'impresa}_{t-1,i}, \textit{Età dell'impresa}_{t-1,i}, \textit{ROE}_{t-1,i}, \textit{Leverage}_{t-1,i}, \textit{Industria, Paese, Anno})$$

Modello 2:
$$\textit{Performance sociale}_{t,i} = f(\textit{Qualità del CdA}_{t-1,i}, \textit{Feedback di performance sociale negativo}_{t-1,i}, \textit{Feedback di performance sociale negativo}^2_{t-1,i}, \textit{Feedback di performance sociale positivo}_{t-1,i}, \textit{Qualità del CdA}_{t-1,i} \times \textit{Feedback di performance socialenegativo}_{t-1,i}, \textit{Qualità del CdA}_{t-1,i} \times \textit{Feedback di performance sociale negativo}^2_{t-1,i}, \textit{Qualità del CdA}_{t-1,i} \times \textit{Feedback di performance sociale positivo}_{t-1,i}, \textit{Dimensione del CdA}_{t-1,i}, \textit{Dimensione dell'impresa}_{t-1,i}, \textit{Età dell'impresa}_{t-1,i}, \textit{ROE}_{t-1,i}, \textit{Leverage}_{t-1,i}, \textit{Industria, Paese, Anno})$$

dove *t*, *t-1*, e *i* rappresentano l'impresa *i* al tempo *t* o *t-1*.

3.3 Variabili

Le variabili utilizzate nell'analisi sono descritte nella Tabella 1.

Tab. 1: Variabili

Variabile	Descrizione	Fonte
Variabile dipendente		
Performance sociale	Punteggio tra 0 e 100, misura la performance sociale dell'impresa in quattro aree: forza lavoro, diritti umani, comunità e responsabilità di prodotto	LSEG Data & Analytics
Variabili indipendenti		
Qualità del CdA	Rapporto tra il numero di caratteristiche di qualità del CdA che l'impresa possiede e il numero di caratteristiche per le quali sono disponibili informazioni	Elaborazione personale
Feedback di performance sociale negativo	Differenza tra l'obiettivo di performance sociale e la performance sociale raggiunta, se la performance raggiunta è inferiore all'obiettivo di performance; 0 altrimenti	Elaborazione personale
Feedback di performance sociale positivo	Differenza tra la performance sociale raggiunta e l'obiettivo di performance sociale, se la performance raggiunta è superiore all'obiettivo di performance; 0 altrimenti	Elaborazione personale
Variabili di controllo		
Dimensione del CdA	Logaritmo del numero di amministratori e amministratrici	LSEG Data & Analytics
Dimensione dell'impresa	Logaritmo del totale attivo	LSEG Data & Analytics
Età dell'impresa	Logaritmo del numero di anni dalla fondazione dell'impresa	LSEG Data & Analytics
ROE	Return on equity	LSEG Data & Analytics
Leverage	Rapporto tra debito e capitale proprio totale	LSEG Data & Analytics
Industria	Variabile dummy pari a 1 se l'impresa opera in una data industria, 0 altrimenti	LSEG Data & Analytics
Paese	Variabile dummy pari a 1 se l'impresa è localizzata in un dato Paese, 0 altrimenti	LSEG Data & Analytics
Anno	Variabile dummy per ogni anno dal 2014 al 2023	LSEG Data & Analytics

Fonte: Elaborazione personale

Performance sociale. La performance sociale è misurata utilizzando il *Social pillar score* fornito da LSEG Data & Analytics. Esso valuta la performance sociale in quattro aree: forza lavoro, diritti umani, comunità e responsabilità del prodotto (LSEG Data & Analytics 2023). Il *Social pillar score* varia da 0 (performance peggiore) a 100 (migliore performance) ed è calcolato sulla base del numero di imprese con un valore inferiore rispetto a quella in esame, il numero di imprese con un valore identico e il numero totale di imprese per cui sono disponibili dati.

Qualità del CdA. L'indice è stato sviluppato in due fasi. Nella prima fase è stato valutato se l'impresa soddisfa i seguenti criteri di qualità del CdA:

1. indipendenza sufficiente del CdA, definita come la presenza di almeno il 50% di amministratori e amministratrici indipendenti sul totale dei componenti del CdA (Abdullah *et al.*, 2024);
2. la presenza di un comitato CSR;
3. la non-dualità del CEO;
4. l'esistenza di politiche volte ad assicurare una buona struttura del CdA;
5. un'adeguata diversità di genere nel CdA, con almeno il 33,33% di amministratrici, riflettendo la necessità di raggiungere una massa critica che consenta alle donne di contribuire efficacemente alle discussioni e decisioni del CdA (Kanter 1977);
6. una frequenza sufficiente delle riunioni del CdA, con un minimo di dieci riunioni all'anno, superiore alla media del campione;
7. un'alta partecipazione degli amministratori e delle amministratrici alle riunioni del CdA, con una partecipazione media di almeno il 90% all'anno, superiore alla media del campione.

Nella seconda fase, la qualità del CdA è stata calcolata come il rapporto tra il numero delle caratteristiche di qualità del CdA sopra menzionate che l'impresa possiede e il numero di caratteristiche per le quali sono disponibili informazioni. L'indice di qualità del CdA varia da 0 (bassa qualità del CdA) a 1 (ottima qualità del CdA).

Feedback di performance sociale negativo e Feedback di performance sociale positivo. Il feedback di performance sociale negativo e positivo è dato dalla differenza tra la performance registrata e l'obiettivo di performance (Hu *et al.*, 2023). Il calcolo, basato sulla variabile *Performance sociale*, è avvenuto in due fasi.

Nella prima fase, l'obiettivo di performance è calcolato sulla base di due componenti: l'obiettivo di performance storico, basato sulla performance passata dell'impresa, e l'obiettivo di performance sociale, basato sulla performance registrata delle imprese simili (Greve 2003). In particolare, l'obiettivo di performance storico è una combinazione dell'obiettivo di performance passato

dell'impresa e della sua performance passata; l'obiettivo di performance sociale è dato dalla performance media delle altre imprese dello stesso settore durante un anno specifico (Greve 2003). Formalmente, l'obiettivo di performance è calcolato come segue:

$$\textit{Obiettivo di performance}_{t,i} = \alpha_1 \times \textit{Obiettivo di perf. sociale}_{t,i} + (1-\alpha_1) \times \textit{Obiettivo di perf. storico}_{t,i}$$

Dove

$$\textit{Obiettivo di performance sociale}_{t,i} = (\sum_{j \neq i} \textit{Performance sociale}_{t,j}) : (n_t - 1)$$

$$\textit{Obiettivo di performance storico}_{t,i} = \alpha_2 \times \textit{Obiettivo di perf.}_{t-1,i} + (1 - \alpha_2) \times \textit{Performance sociale}_{t-1,i}$$

con *i* e *j* che rappresentano le imprese e n_t che denota il numero di imprese nel campione durante l'anno *t*. In questo studio: $\alpha_1 = 0{,}5$, ovvero è assegnato lo stesso peso all'obiettivo di performance storico e all'obiettivo di performance sociale; $\alpha_2 = 0{,}25$, ovvero è assegnato un peso maggiore alla performance passata dell'impresa rispetto al suo obiettivo di performance passato.

Nella seconda fase, il feedback di performance sociale è calcolato come una funzione *spline*, che consente di separare la componente negativa e quella positiva per esaminare i loro effetti diversi sulla performance sociale (Xu e Zeng 2021; Zhu e Zhang 2024). Formalmente, il *Feedback di performance sociale negativo* e il *Feedback di performance sociale positivo* sono stati calcolati come segue:

$$\textit{Feedback di performance sociale negativo}_{t,i} =$$

$$= \textit{Obiettivo di performance sociale}_{t,i} - \textit{Performance sociale registrata}_{t,i} \textit{ se Performance sociale registrata}_{t,i} < \textit{Obiettivo di performance}_{t,i}$$

$$= 0 \textit{ se Performance sociale registrata}_{t,i} \geq \textit{Obiettivo di performance sociale}_{t,i}$$

$$\textit{Feedback di performance sociale positivo}_{t,i} =$$

$$= \textit{Performance sociale registrata}_{t,i} - \textit{Obiettivo di performance sociale}_{t,i} \textit{ se Performance sociale registrata}_{t,i} > \textit{Obiettivo di performance sociale}_{t,i}$$

$$= 0 \textit{ se Performance sociale registrata}_{t,i} \leq \textit{Obiettivo di performance sociale}_{t,i}$$

dove *i* rappresenta l'impresa e *t* l'anno.

<u>*Variabili di controllo*</u>. La *Dimensione del CdA*, misurata come il logaritmo del numero totale di amministratori e amministratrici, è considerata poiché influenza positivamente la performance sociale (Ananzeh *et al.*, 2022). La *Dimensione dell'impresa*, misurata come il logaritmo del totale attivo, tiene conto della tendenza delle imprese più grandi a essere più sensibili alle questioni sociali e a registrare performance sociali superiori (Cabral e Sasidharan 2021). L'*Età dell'impresa*, calcolata come il logaritmo degli anni dalla fondazione dell'impresa, è inclusa poiché la maturità dell'impresa influisce positivamente sulla performance sociale (Biswas *et al.*, 2018). Il *ROE*, ovvero il return on equity, è incluso poiché influisce sulla capacità finanziaria dell'impresa di investire in attività sociali e di registrare una performance sociale superiore (Ananzeh *et al.*, 2022). Il *Leverage*, misurato come il rapporto tra debito e capitale proprio totale, è incluso poiché le imprese più indebitate dispongono di minori risorse da destinare alle attività sociali (Baraibar-Diez e Odriozola 2019). L'*Industria* è considerata poiché le sue caratteristiche possono influenzare la performance sociale (Giannarakis *et al.*, 2023). Il *Paese* in cui opera l'impresa è considerato per catturare l'influenza del contesto nazionale sulla performance sociale (Ardito *et al.*, 2020). Infine, l'*Anno* è incluso per controllare gli effetti temporali (Biswas *et al.*, 2018).

4. Risultati e discussione

4.1 Risultati descrittivi

Le statistiche descrittive indicano che la performance sociale media è buona e pari a circa 63,8 su 100, con una varianza significativa tra le imprese (Tabella 2). In media, le imprese registrano una performance sociale in linea con l'obiettivo di performance sociale, come mostrato dai valori medi bassi riguardanti il feedback di performance sociale negativo e positivo. Nel complesso, la qualità del CdA appare buona.

4.2 Risultati empirici

La Tabella 3 mostra i risultati delle regressioni, mentre la Figura 1 mostra i grafici di interazione.

Tab. 2: Statistiche descrittive

	Media	Deviazione standard	Valore minimo	Valore massimo
Performance sociale	63.867	21.985	0.235	98.311
Qualità del CdA	0.705	0.185	0	1
Feedback di performance sociale negativo	3.079	6.393	0	54.548
Feedback di performance sociale positivo	7.848	7.502	0	53.313
Dimensione del CdA	2.306	0.406	0.693	3.526
Dimensione dell'impresa	22.507	1.972	14.253	28.611
Età dell'impresa	1.549	0.345	0.477	2.481
ROE	7.006%	0.550	-29.914	2.484
Leverage	1.067	1.719	0	55.770
Agricoltura	0.195%	0.044	0	1
Estrazione e attività minerarie	2.147%	0.145	0	1
Manifattura	39.206%	0.488	0	1
Elettricità e gas	4.539%	0.208	0	1
Acqua	0.537%	0.073	0	1
Costruzioni	4.197%	0.201	0	1
Commercio	6.101%	0.239	0	1
Trasporti	4.002%	0.196	0	1
Alloggio e ristorazione	0.944%	0.097	0	1
Tecnologia dell'informazione (IT)	10.981%	0.313	0	1
Finanza e assicurazioni	14.950%	0.357	0	1
Immobiliare	4.360%	0.204	0	1
Professioni	3.612%	0.187	0	1
Amministrazione	2.278%	0.149	0	1
Sanità	0.781%	0.089	0	1
Arte	0.748%	0.086	0	1
Altri servizi	0.423%	0.065	0	1
Austria	3.107%	0.174	0	1
Belgio	4.539%	0.208	0	1
Cipro	0.488%	0.070	0	1
Danimarca	4.913%	0.216	0	1
Finlandia	4.620%	0.210	0	1
Francia	14.397%	0.351	0	1
Germania	15.845%	0.365	0	1
Grecia	2.928%	0.169	0	1
Irlanda	5.043%	0.219	0	1
Italia	7.581%	0.265	0	1
Lussemburgo	2.164%	0.146	0	1
Malta	0.277%	0.053	0	1
Paesi Bassi	6.361%	0.244	0	1
Polonia	4.213%	0.201	0	1
Portogallo	1.383%	0.117	0	1
Repubblica Ceca	0.358%	0.060	0	1
Romania	0.114%	0.034	0	1
Slovenia	0.065%	0.026	0	1
Spagna	6.800%	0.252	0	1
Svezia	14.153%	0.349	0	1
Ungheria	0.651%	0.080	0	1

Fonte: Elaborazione personale

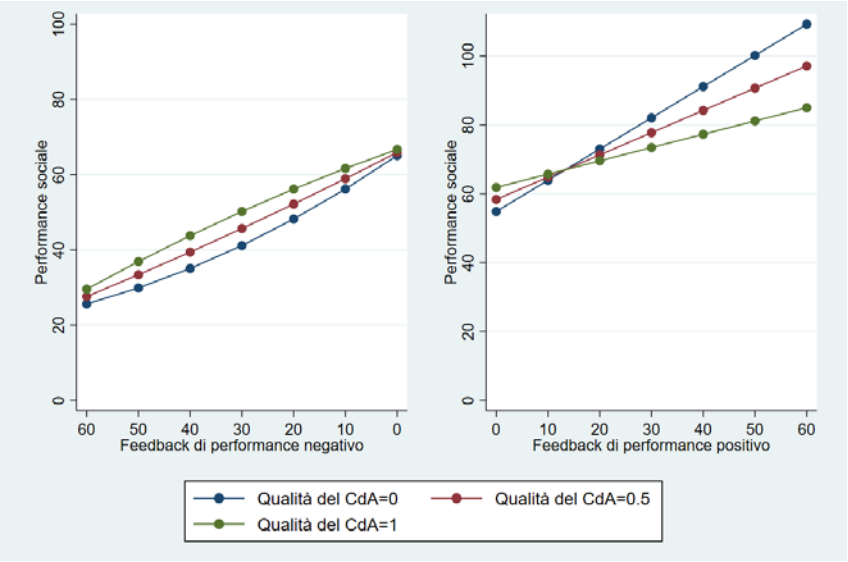
Tab. 3: Risultati delle regressioni

Variabili	**Modello 1**	**Modello 2**
Qualità del CdA	2,574** (1,299)	5,880*** (1,727)
Feedback di performance sociale negativo	-0,688*** (0,085)	-0,937*** (0,300)
Feedback di performance sociale negativo^2	0,000 (0,004)	0,005 (0,013)
Feedback di performance sociale positivo	0,545*** (0,023)	0,907*** (0,082)
Qualità del CdA × Feedback di performance sociale negativo		0,457 (0,455)
Qualità del CdA × Feedback di performance sociale negativo^2		-0,007 (0,019)
Qualità del CdA × Feedback di performance sociale positivo		-0,521*** (0,109)
Dimensione del CdA	1,570 (1,153)	1,573 (1,161)
Dimensione dell'impresa	1,307** (0,642)	1,339** (0,644)
Età dell'impresa	13,05*** (4,400)	12,320*** (4,408)
ROE	-0,492 (0,500)	-0,468 (0,479)
Leverage	0,190 (0,187)	0,185 (0,182)
Constante	-5,348 (16,090)	-7,3760 (16,300)
Effetti fissi - Industria	Sì	Sì
Effetti fissi - Paese	Sì	Sì
Effetti fissi - Anno	Sì	Sì
R^2	0,519	0,524
Numero di osservazioni	6.147	6.147
Numero di imprese	1.299	1.299

*Errori standard robusti tra parentesi. *** p<0,01, ** p<0,05, * p<0,10*

Fonte: Elaborazione personale

Fig. 1: Grafici di interazione



Fonte: Elaborazione personale

Nel Modello 1, la variabile *Qualità del CdA* presenta un coefficiente positivo e significativo, indicando che la qualità del CdA migliora la performance sociale, a supporto dell'Ipotesi 1. Questo risultato conferma l'idea che la qualità del CdA-definita come una struttura, composizione e funzionamento efficaci del CdA sulla base dell'indipendenza del CdA, della presenza di un comitato CSR, della non-dualità del CEO, dell'esistenza di politiche volte ad assicurare una buona struttura

del CdA, della diversità di genere nel CdA, della frequenza delle riunioni del CdA e della partecipazione degli amministratori e delle amministratrici alle riunioni del CdA-contribuisce al miglioramento della performance sociale (Shahbaz *et al.,* 2020; Kwarteng *et al.,* 2023). Questo risultato è inoltre in linea con gli studi precedenti secondo cui le caratteristiche del CdA sopra menzionate hanno un impatto positivo sulla performance sociale (e.g., Shahbaz *et al.,* 2020; Cabral e Sasidharan 2021; Endrikat *et al.,* 2021; Ananzeh *et al.,* 2022; Kwarteng *et al.,* 2023).

La variabile *Feedback di performance sociale negativo* presenta un coefficiente negativo e significativo, mentre la variabile *Feedback di performance sociale negativo*^{2} presenta un coefficiente nullo non significativo. Un feedback di performance sociale negativo non esercita pertanto un effetto a forma di U sulla performance sociale come suggerito dalla letteratura sul tema (Audia e Greve 2006); pertanto, l'Ipotesi 2 è respinta. Questo risultato suggerisce che un feedback di performance sociale negativo non induce il CdA ad adottare un approccio più rigido e avverso al rischio, spingendolo a ridurre gli investimenti in attività sociali. Al contrario, un feedback di performance sociale negativo induce il CdA ad intensificare gli sforzi in iniziative sociali per migliorare la performance e rafforzare la legittimità dell'impresa (Saridakis *et al.,* 2023; Zhu e Zhang 2024).

La variabile *Feedback di performance sociale positivo* presenta un coefficiente positivo e significativo, indicando che un feedback di performance sociale positivo migliora la performance sociale; pertanto, l'Ipotesi 3b è supportata mentre l'Ipotesi 3a è respinta. Questo risultato conferma gli studi precedenti secondo cui un feedback di performance sociale positivo motiva il CdA a mantenere gli investimenti in iniziative sociali per soddisfare le aspettative degli stakeholder (Lee e Yang 2022). Inoltre, questo risultato mette in discussione gli studi secondo cui un feedback di performance sociale positivo riduce l'attenzione alle questioni sociali perché la performance sociale registrata è soddisfacente (Hu *et al.,* 2023).

Osservando i risultati del Modello 2 e i grafici di interazione nella Figura 1, emerge che in presenza di un feedback di performance sociale negativo e a prescindere dalla sua entità, un CdA "di qualità" consente di registrare una performance sociale superiore rispetto a quella che si registra se il CdA non è "di qualità". L'Ipotesi 4 è pertanto respinta. Questo risultato suggerisce che la qualità del CdA migliora costantemente la performance sociale grazie a una comprensione più completa della situazione, decisioni rapide e un'esecuzione e monitoraggio efficaci delle iniziative sociali. In particolare, una struttura, composizione e funzionamento efficaci del CdA assicurano che venga data priorità agli interessi degli stakeholder, che vengano sviluppate strategie efficaci e che il raggiungimento degli obiettivi di performance venga facilitato (Govindan *et al.,* 2021; Disli *et al.,* 2022).

In presenza di un feedback di performance sociale positivo, la qualità del CdA riduce l'effetto positivo di questo feedback sulla performance sociale; pertanto, le Ipotesi 5a e 5b sono respinte. L'impulso motivazionale associato a un feedback di performance sociale positivo, che spinge il CdA a sostenere le iniziative sociali e a raggiungere una performance sociale più elevata (Lee e Yang 2022), non è rafforzato in presenza di un CdA "di qualità". Questo risultato potrebbe essere dovuto alle scelte di un CdA "di qualità", che affronta un feedback di performance sociale positivo in modo più razionale, giudicando gli investimenti precedenti nelle iniziative sociali come ottimali e decidendo di riallocare risorse in surplus per esplorare opportunità al di fuori delle iniziative sociali (Xu e Zeng 2021; Saridakis *et al.,* 2023).

Riassumendo, i principali risultati dell'analisi sono i seguenti. Primo, la qualità del CdA aumenta la performance sociale. Secondo, un feedback di performance sociale negativo ha sempre un effetto positivo sulla performance sociale, a prescindere dall'entità del feedback. In presenza di un feedback di questo tipo, un CdA "di qualità" consente di registrare una performance sociale superiore. Terzo, un feedback di performance sociale positivo migliora la performance sociale. Tuttavia, in presenza di un feedback di questo tipo, un CdA "di qualità" riduce l'effetto positivo di questo feedback sulla performance sociale.

4.3 Controlli di robustezza

Per convalidare i risultati ottenuti, sono state condotte due analisi aggiuntive. Primo, il lag applicato a tutte le variabili indipendenti è stato esteso a due anni in quanto le variabili indipendenti potrebbero avere un effetto potenzialmente più lento sulla performance sociale. Secondo, l'analisi è stata ripetuta escludendo le imprese manifatturiere dal campione per eliminare potenziali bias derivanti dalla sovra-rappresentazione di queste imprese nel dataset e per migliorare la generalizzabilità dei risultati. I risultati di queste analisi, disponibili su richiesta, confermano i risultati principali.

5. Conclusioni

Questo studio ha esaminato l'impatto della qualità del CdA sulla performance sociale e come questa relazione sia moderata dal tipo di feedback di performance sociale negativo o positivo ricevuto.

Questo studio contribuisce alla letteratura sulle caratteristiche del CdA e sulla performance sociale (Disli *et al.,* 2022; Fernandes *et al.,* 2023) come segue. Primo, questo studio indaga come la qualità del CdA-definita come la struttura, la composizione e il funzionamento efficace del CdA, evidenziati da varie caratteristiche del CdA-influenza la performance sociale e suggerisce meccanismi plausibili che portano a un contributo positivo. Secondo, questo studio dimostra come questa relazione sia moderata dal feedback di performance registrato, aggiungendosi ai pochi studi esistenti (Xu e Zeng 2021; Lee e Yang 2022; Hu *et al.,* 2023; Saridakis *et al.,* 2023; Zhu e Zhang 2024) sul tema. A tal fine, questo studio collega la *behavioral theory of the firm* (Cyert e March 1963) con altri quadri teorici adottati per spiegare l'effetto del CdA sulla performance sociale dell'impresa, ovvero la *agency theory* (Jensen e Meckling 1976), la *stakeholder theory* (Freeman 1984), la *resource dependence theory* (Hillman and Dalziel 2003) e la *upper echelons theory* (Hambrick and Mason 1984). Terzo, questo studio si focalizza sulla dimensione sociale della CSR, dato che le questioni sociali e ambientali spesso differiscono e richiedono approcci strategici distinti (Radu *et al.,* 2022). Inoltre, la dimensione sociale è meno studiata rispetto alla dimensione ambientale o alla CSR nel complesso.

Lo studio offre importanti implicazioni manageriali e politiche. I risultati di questa analisi confermano l'importanza del CdA nel guidare la performance sociale e mettono in evidenza la necessità di un CdA "di qualità"-ovvero un CdA caratterizzato da una struttura, composizione e funzionamento efficaci-per gestire le situazioni in cui la performance supera o non raggiunge gli obiettivi. Un CdA "di qualità" è essenziale per superare al meglio una situazione critica data dall'emergere di un feedback di performance sociale negativo. Inoltre, un CdA "di qualità" consente di riconoscere quando ulteriori iniziative sociali sono superflue. A tal fine, le imprese dovrebbero essere supportate nella creazione di un CdA di alta qualità, con i decisori politici che giocano un ruolo chiave nel fornire indicazioni e supporto.

Questo studio presenta alcune limitazioni. La qualità del CdA potrebbe essere misurata con metodologie quantitative più sofisticate o metodologie qualitative. Inoltre, questo studio non ha esplorato i meccanismi specifici attraverso i quali la qualità del CdA consente di affrontare un feedback di performance sociale positivo o negativo. Studi futuri dovrebbero approfondire questo aspetto.

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Scoring Environmental Social Governance Ability: A model of sustainability assessment in the blue economy

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Abstract

Frame of the research. *ESG scores primarily evaluate sustainability performance but fail to incorporate firms' strategic orientation toward sustainability. This limits the understanding of the key drivers behind successful ESG transitions within the blue economy.*

Purpose of the paper. *The study aims to develop and test the ESG Ability Score, a novel measurement model that assesses both ESG performance and sustainability orientation, offering a holistic evaluation of firms' sustainability responsiveness in the blue economy.*

Methodology. *The ESG Ability Score is developed through content analysis of sustainability reports of 22 Italian shipyards and shippers. It is based on the ESG score, quantified using a machine-learning web application, and the Sustainability Orientation Index (SOI), determined by the inclusion of ESG content in the corporate identity and strategic direction.*

Results. *Neither industry reaches low ESG ability, but a greater number of shipyards exhibit medium-high levels of ESG ability compared to shippers, with shipbuilders outperforming shippers in the SOI overall.*

Research limitations. *The study is limited to Italian firms and relies on secondary data. ESG Ability Score should be validated across different geographical and industry settings.*

Managerial implications. *The ESG Ability Score acts as a diagnostic and strategic tool to identify sustainability gaps, align strategies with ESG goals, and support informed decision-making.*

Originality of the paper. *A robust methodological framework is proposed for developing an ESG Ability Score. It uniquely integrates sustainability orientation with ESG performance to comprehensively evaluate the sustainability approach of maritime firms.*

Keywords: *ESG score; sustainability orientation; ESG Ability score; shipbuilding; shipping firms; blue economy*

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1. Introduction

The blue economy is considered of significant interest in global economic growth for both developed and developing countries, as well as a strategic sector in achieving sustainability goals within the European Union (European Commission, 2024). The blue economy includes activities focused on the extraction and use of ocean resources, along with the utilization of coastal and marine areas for industrial and recreational purposes. It encompasses not only established industries - such as maritime transport, shipping, fisheries, and tourism - but also rapidly growing sectors that focus on deep-sea mineral mining, ocean renewable energy, offshore aquaculture, and blue biotechnology, driven by research and innovation (KPMG, 2021).

The blue economy will face three main challenges in the coming years: global competition, innovation, and sustainability (Martínez-Vázquez *et al.*, 2021). In this regard, long lasting stresses exerted by the human activities on the aquatic environment have led to acidification, pollution, ocean warming, fisheries collapse, loss of marine species, destruction of breeding grounds, and ecosystem instability. This issue requires an urgent response, as the negative effects will have long-term implications for the planet's health (Agarwala, 2025). Thus, sustainability is central to the blue economy, signifying a paradigm shift away from solely extractive and exploitative methods. A truly sustainable blue economy aspires to achieve "*effective protection, sustainable production, and equitable prosperity*" in ocean-related activities (Stuchtey *et al.*, 2020, p.83).

To achieve a sustainable blue economy, proper management strategies must be implemented (Elegbede *et al.*, 2023). In this ongoing transition towards sustainability, Environmental Social Governance (ESG) pillars significantly impact the maritime sector's activities (Koilo 2019; Nõmmela and Kõrbe Kaare, 2022). Moreover, there is a significant emphasis on ESG criteria, which have emerged as central components for assessing corporate sustainability and social responsibility.

Existing ESG scores focus on measuring the performance of implemented ESG actions, neglecting aspects such as the orientation of the management team to incorporate ESG factors into corporate strategy. However, the integration of ESG into business strategy should not be seen as a mere compliance mechanism but rather as a dynamic input-transformation-output process, where resources are strategically optimized to drive sustainability (Dong *et al.*, 2025). This narrow focus results in inconsistencies and hinders the development of a reliable knowledge base. Indeed, while existing research has predominantly examined the most visible aspects of ESG implementation, it is the underlying, less visible processes - such as strategic decision-making, organizational alignment, and cultural integration - that shape and give meaning to ESG initiatives. Addressing these foundational elements becomes critical, particularly when ESG outcomes deviate from expectations. Currently, the literature lacks a unified methodological framework to assess both performance (measured outcomes) and strategic orientation (management's proactive engagement), despite their combined influence on effective sustainability management. This gap limits a comprehensive understanding of the key drivers behind successful ESG transitions.

With this background, the study aims to design, construct, and evaluate a unified and tailormade tool to comprehensively assess the sustainability approach in the blue economy. Thus, the research question (RQ) arising is the following:

RQ: *How can a measurement model be developed to integrate sustainability orientation and ESG performance for evaluating the responsiveness of maritime firms to sustainability?*

To answer this question, we introduce the concept of ESG ability (that integrates orientation and performance) by proposing a specific score for its measurement. To operationalize this concept, we propose the ESG Ability Index, a tailored composite measurement tool that assesses both the strategic intent behind ESG adoption and its measurable impact. The ESG Ability Score is composed of two main components. The first component is the ESG score, determined using a web application (http://www.sustainableentrepreneurship.org/) developed by Mansouri and Momtaz (2022), which employs a machine learning approach. The second component is the Sustainability Orientation Index, which is based on the inclusion of ESG content in corporate identity - such as vision, mission, and

values - and in strategic direction, reflected in the company's goals. The ESG Ability Score, as designed, provides a dynamic and multidimensional evaluation, enabling a more accurate understanding of how maritime firms internalize, implement, and sustain ESG principles.

The score is tested on a sample of 22 Italian firms in the shipbuilding and shipping (i.e., maritime transport) industries. They are known for being heavy polluting and both energy- and material intensive industry (Önal *et al.*, 2021; Zhou *et al.*, 2023). In particular, most shipyards are located near urban areas, thereby affecting the sustainability of cities and society with a significant environmental footprint (Vakili *et al.*, 2022). Likewise, the shipping industry is responsible for a significant portion of air pollutants and impacts marine environments through harmful aquatic organisms in ballast water, oil spills, and ship recycling (Felício *et al.*, 2021). As a result, these industries are embracing sustainability: on one hand, by innovating vessel design and construction, adopting advanced and clean technologies, enhancing eco-friendly products and services, and decarbonizing transportation (Salas and Arenas, 2024); on the other hand, by optimizing cargo loading and transportation distance through slow-steaming and speed limitations, which are options for ship operators (Tran *et al.*, 2020).

The proposed approach is distinguished by its integration of dynamic and measurable parameters of ESG Ability applicable across diverse economic contexts. In contrast to existing models, the ESG Ability Score not only evaluates the current positioning of companies in terms of ESG orientation and performance but also identifies critical areas for intervention. This model is particularly relevant for SMEs, as it offers an accessible and adaptable solution to bridge the gap in ESG transitions. Of note is its introduction of a holistic perspective, emphasising the interplay between organisational orientation and the achievement of measurable impacts, thereby supporting sustainable transitions at scale.

The remainder of the paper is structured as follows: Section 2 reviews the literature on relevant topics. Section 3 presents the methods employed for the model development. Section 4 presents the results of the tool testing. Finally, Section 5 discusses the results and emphasizes the contributions to knowledge and industry, as well as the limitations of the study.

2. Theoretical background

2.1 ESG performance through scores

The ESG concept is one of the modern methods of evaluating a company's sustainability aspects through ESG performance indicators (dos Santos and Pereira 2022). ESG scores were initially developed to fulfill investors' need for identifying top performers based on three key criteria: environmental concerns, which include ecological impact, resource consumption, effects on biodiversity, and waste management; social concerns, encompassing community and supplier impact, working conditions, and other social implications; and governance concerns, related to the organization's transparency, its relationships with shareholders and the board of directors, executive compensation, and board diversity (Ribando and Bonne, 2010). Nevertheless, ESG scores quickly gained traction by aiding companies in boosting their reputation, easing regulatory pressures on their operations, lowering financial risks, and attracting more investment (Serafeim *et al.*, 2019). Thus, businesses are now requested to demonstrate their improved performance in environmental, social, and governance aspects.

The necessity to find a universal metric for ESG performance has led to the development of a vast literature on ESG scores, which brings to light various issues. The first main issue is the lack of a uniformed framework for reporting, which is instead done on a voluntary basis. In the shipping industry, in particular, the lack of a unified methodological framework has led to the creation of various forms of ESG reports. These reports attempt to address this gap by incorporating recommendations and initiatives from major international organizations (i.e., UN Global Compact, UN SDGs), as well as private proposals (i.e., SASB, GRI). Unfortunately, these initiatives often

remain generic, with overlapping metrics and a systematic omission of specific parameters. Moreover, ESG reporting and rating models in the shipping industry typically adopt approaches from other industries, such as mining, oil, and gas. This practice, however, is broadly "*incompatible, inconvenient, and inadequate*" (Tsatsaronis *et al.*, 2024, p. 699) given that ESG reporting and implementation constitute a consistent competitive advantage for firms in the blue economy. Such advantage is recognized by shareholders and stakeholders alike, fostering innovation and making risk prevention easier (Kannellopulos, 2024).

The lack of an ESG index that could universally apply and compare the performance of different firms is another limitation found within the literature. When comparing a company's results across multiple indicators, significant discrepancies emerge concerning the measures utilized, information overload, and the manual entry of certain data in the databases, along with the lack of coverage for all the measured variables (Kotsantonis and Serafeim, 2019). The priorities on ESG can vary greatly depending on the specifics of an industry and the size of each firm, which can lead to skewed results (Dimson *et al.*, 2020). Furthermore, the environmental and governance components of ESG scores significantly influence their outcomes, whereas the social indicator has a lesser effect on the final score's value (Escrig-Olmedo *et al.*, 2019). In sum, these aspects limit the scope and representativity of the findings based on ESG scores.

Another crucial and often underestimated drawback of existing ESG scores is that they do not help to understand what lies behind them; in fact, ESG scores represent more than just specific elements (Clément *et al.*, 2023). ESG scores are not a holistic measure of a company's ESG performance (Berg *et al.*, 2022) and therefore, they do not provide a complete representation of the business. The scores are also influenced by the organizational culture, values, orientation to sustainability or CSR, but their ability to capture philosophical concepts will always be questioned (Clément *et al.*, 2022). Thus, academic focus could be centered on the development of new and customized methodologies for a more accurate measurement of ESG issues.

2.2 Sustainability orientation

Research on corporate sustainability and business orientation has grown significantly since the introduction of the UN Sustainable Development Goals (SDGs) (Di Vaio *et al.*, 2020). Consequently, the existing literature is rich with diverse concepts addressing social and environmental issues at a strategic level.

There is considerable scholarly confusion regarding the conceptualization of firms' orientation towards sustainable development. The literature on sustainability orientation has framed it as a strategic orientation, representing a firm-level capability encompassing a philosophy, principles, and guidelines that shape the nature and scope of an organization's activities and policies (Amankwah-Amoah *et al.*, 2019). Earlier research has recognized sustainability orientation as either a firm's strategic asset or a dynamic capability that contributes to achieving a competitive edge and enhanced firm performance (Claudy *et al.*, 2016).

In contrast, another stream of scholars examines sustainability orientation at an individual level, attributing it to personal values and beliefs (Kuckertz and Wagner, 2010). The lack of a unified conceptualization of sustainability orientation is evident through the various terminologies used to describe it. These include sustainable development orientation (Heikkurinen and Bonnedahl, 2013), sustainable orientation (Shou *et al.*, 2019), sustainable management orientation (Seidel *et al.*, 2018), strategic sustainability orientation (Hong *et al.*, 2019), and ESG orientation (Momtaz and Mansouri, 2022; Li, 2024). However, this study places the concept of sustainability orientation under the umbrella term of strategic orientation. Thus, sustainability orientation demonstrates the readiness of a firm to implement sustainability-related initiatives (Tata and Prasad, 2015) reflecting its long-term internal commitment to incorporating social, environmental and governance concerns into its decision-making processes (Shou *et al.*, 2019). Additionally, previous researchers have struggled to reach a consensus on the measurement of sustainability orientation due to its multidimensional nature.

A recent literature review (Khizar *et al.*, 2022) identifies 20 scales/models to measure sustainability orientation. However, the Kuckertz and Wagner (2010) scale, which pioneered the operationalization of sustainability orientation in terms of social responsibility and environmental protection, is widely acknowledged and utilized by scholars in this field (Sung and Park, 2018).

Scholars have focused on the antecedents and outcomes of sustainability orientation. In particular, micro factors (e.g., owner/entrepreneur's personal, psychological, and socio-demographic) are considered as individual-level antecedents (Eijdenberg, 2019); firm-level internal factors (e.g., resources, strategic management, philosophy, and culture) represent the organizational level antecedents (Obal *et al.*, 2020); and, macro-level contextual and institutional factors (e.g., legislation, economic factors, and environmental conditions) are the environmental-level antecedents (Danso *et al.*, 2020). Regarding the outcomes of sustainability orientation, literature has found a positive impact at individual level in terms of managerial sensemaking, opportunity recognition, green entrepreneurship inclination, and sustainable entrepreneurial intention (Busch *et al.*, 2020).

Sustainability orientation also leads to firm-level outcomes. Its connection to company performance has been thoroughly examined, with significant focus on financial results such as cost reduction and resource efficiency, mitigation of supply chain risks, and enhanced collaboration (Croom *et al.*, 2018). Moreover, sustainability orientation exhibits a positive association with nonfinancial outcomes such as organizational and technological innovation, sustainable procurement and design, and the success of new product development (Zhao *et al.*, 2021). Furthermore, a company's sustainability orientation positively influences its legitimating behavior, carbon strategy, and social impact in terms of value generation and community engagement (de Menezes *et al.*, 2021).

2.3 ESG in blue economy

The maritime industry lacks sufficient understanding of CSR activities (Fjørtoft *et al.*, 2020), that typically form the foundational benchmark for evaluating ESG ratings (Clementino and Perkins, 2021). Anyway, blue economy companies are encouraged to develop and implement management methods and tools to measure ESG performance goals (Egorova *et al.* 2021). For instance, the Norwegian Shipowners' Association (2021) has published guidelines for ESG reporting in the shipping and offshore industries, offering indicators to assess operational performance. Similarly, dos Santos and Pereira (2022) have proposed a methodology to quantify the ESG performance of international ports, incorporating over 20 metrics to evaluate port ESG scores. On the contrary, many shipyards, particularly small and medium-sized ones, have yet to adopt appropriate measures (Vakili *et al.*, 2021). Scholars have largely overlooked sustainability principles in shipbuilding and the limited existing studies have primarily taken a one-dimensional perspective (Vakili *et al.*, 2022). Among the three ESG, environmental and social ones have garnered the most attention in literature, driven by numerous regulations from international bodies aimed at protecting the environment and the proximity of ports and maritime services to urban areas (Lee *et al.* 2019). Nevertheless, governance aspects also demand greater attention as the governance of the maritime industry has undergone significant transformations over recent decades (Nõmmela and Kõrbe Kaare, 2022). In the shipping industry, most leading container shipping companies focus more on disclosing economic or environmental sustainability information, rather than social sustainability (Vural *et al.*, 2021). Conversely, passenger shipping companies emphasize environmental, social, and philanthropic activities (Greets and Dooms, 2020). Furthermore, research has identified gaps in data, relevance, and comparability within the corporate reporting system of the shipping industry (Fasoulis and Kurt, 2019; Di Vaio *et al.*, 2021).

3. Method

3.1 Research setting and sample

The Italian maritime sector is crucial to the country's economy, especially in industries such as shipbuilding and shipping. These industries not only play a central role in the Blue Economy but also drive the growth of other industries, creating a significant economic impact. The Italian shipbuilding and shipping industries contribute substantially to the European maritime economy, accounting for 19% and 8% of the added value, respectively, and positioning Italy in third and fourth place (Unioncamere-Tagliacarne, 2024).

Through the AIDA database of Bureau Van Dijk, we identified the Italian companies belonging to the maritime industry and the related data used to describe the sample. The research included two filters: the first retained only active companies, while the second included only those companies classified under ATECO 2007 economic activities as 301200 - Construction of recreational and sport boats, 301102 - Shipyards for metal and non-metal constructions (excluding ship seats), 331500 - Repair and maintenance of commercial ships and recreational boats (excluding engines), 501000 - Maritime and coastal passenger transport, and 502000 - Maritime and coastal freight transport. A total of 218 companies, including 154 shipyards and 64 shipping firms, were identified.

3.2 Data collection

In December 2024, secondary data was collected, offering the primary advantages of saving time and accessing a large volume of data that would be challenging to gather independently (Johnston, 2017). Furthermore, secondary data are frequently utilized to develop models within the organizational sustainability field (Barletta *et al.*, 2021).

Specifically, official documents like the sustainability report were collected from the corporate websites of the firm sample. Reports were selected based on two inclusion criteria: public accessibility and publication in 2023. By adhering to these criteria, input data, characterized by relevance and homogeneity, were obtained. The application of these criteria to the entire dataset yielded 22 usable documents from the companies shown in Table 1.

Tab. 1: The companies investigated

Shipyards	Shipping firms
1. Sanlorenzo SpA	1. D'Amico Group
2. Cantiere del Pardo SpA	2. Costa SpA
3. Besenzoni SpA	3. Gruppo Caronte & Tourist
4. Ferretti Group	4. Grimaldi SpA
5. Cantiere Rossini	5. Grandi Navi Veloci SpA
6. Amico Group	6. Fratelli Neri SpA
7. Groupe Beneteau Italia	7. Tarros SpA
8. De Wave Group	8. D'Alessio Group
9. The Italian Sea Group	9. Cosiarma SpA (Orserio)
10. Fincantieri	10. Carbonor SpA (Carboflotta)
11. Palumbo SY	11. Britoil Srl

Source: our elaboration

Information from the sustainability reports was integrated and cross-referenced with other reliable sources, including annual reports (specifically management reports), social, and integrated reports, and non-financial statements (NFSs) (individual or consolidated NFSs in the case of groups). Additionally, environmental statements, quality and environmental policies, and code of ethics were reviewed. Furthermore, specialized press and top management magazines, including Economia del Mare and Il Sole 24 Ore, served as additional data sources. Triangulation was employed to examine the phenomenon from various perspectives, enrich our understanding of the issue under investigation, and assess the convergence of evidence.

3.3 Data analysis

Collected data was analyzed through a content analysis as a research technique for "making replicable and valid inferences from texts to the context of their use" (Krippendorff, 2004, p. 18). It is also recognized as one of the most appropriate methods in sustainability reporting and disclosure research (Du and Primec, 2024). The content analysis was performed according to a procedure that encompasses three crucial steps.

The first step involved measuring ESG performance of sample firms through a web application (http://www.sustainableentrepreneurship.org/) that utilizes a machine learning approach, as proposed by Mansouri and Momtaz (2022) to assess ESG properties from textual data. This application relies on word counts based on a topic-specific dictionary to construct ESG ratings, generating an overall ESG score and individual scores for each pillar from text data (e.g., whitepapers, pitch decks, blog posts, Tweets). We upload the documents in their entirety to the web application, as the qualitative information to be interpreted was highly heterogeneous and not always present in the standard sections of the analysed reports (Montera and Esposito De Falco, 2024). If in Italian, the documents are translated into English, the language in which the dictionary was created.

The results provided by the web application proved to be too similar and too low to be analysed properly. Therefore, the ESG scores were amplified using a square root transformation (n^0.5) to highlight differences while maintaining a fixed distance between values. This is common in the literature to normalize data when all numbers are either in a 0-1 interval or all larger than 1 (Osborne, 2010). Moreover - as the data must be skewed to justify a transformation - a test was carried out to certify a skewness level higher than 0.5. Given that our data respects both parameters, we proceed with the normalization process.

The second step is focused on the measurement of the sustainability orientation by examining textual data on vision, mission, values, and goals, grouped under corporate identity and strategic direction. We have focused on these elements because vision, mission, values, and goals are often explicitly documented and articulated by the company, making them easier to identify and analyse. Moreover, we maintained consistency and comparability with previous research (Du and Primec, 2024; He *et al.*, 2024). Instead, we chose to exclude corporate purpose, which, while important for the sustainability approach, can be more abstract and less consistently defined across companies (Esposito De Falco *et al.*, 2024). It often overlaps with other elements like vision and mission, making it harder to analyse as a separate entity without redundancy.

To minimize subjectivity in identifying items within the documents, we utilized a keyword list constructed from an ESG word list by Baier *et al.* (2020). Thus, a manual content analysis was run manually through a keyword search within the sections of the documents related to the description of the firm and its sustainability strategy was implemented. The keyword list was then updated after a first reading session of the reports to integrate missing terms.

To assure the accuracy and reliability of the content analysis, the reports were analysed separately by two coauthors, the results were compared and discussed, and a shared coding frame was identified. The latter was further checked by a colleague of the authors, who has expertise in this research field. In his opinion, our coding frame fairly represents the sustainability orientation and therefore our coding frame was considered sufficiently valid (Schreier, 2012). The final coding frame is presented in Table 2.

Tab. 2: Coding frame of the sustainability orientation

Dimensions	**Items**	**Keywords for E**	**Keywords for S**	**Keywords for G**
Corporate identity	Vision	Climate change, Climate mitigation, Ecosystem, Emissions, Biodiversity, Water, Biofuels, Pollution, Waste, Recycling	Human rights, Labor standards, Community relations, Health and safety, Society, Education, Employment, Diversity, Inclusion, Equity, Minority	Audit and control, Board structure, Shareholder rights, Disclosure and reporting, Whistle-blowing, Transparency, Compliance, Remuneration, Bribery and corruption, Stakeholder engagement, Business ethics
	Mission			
	Values			
Strategic direction	Goals			

Source: our elaboration

Performed the content analysis, the sustainability orientation of sample firms is measured by developing a specific index called the *Sustainable Orientation Index* (SOI), calculated as follows[6]:

$$SOI = \frac{\sum \text{Number of keywords for ESG in each item}}{(\text{Total number of keywords for ESG} \times \text{Total number of items} = 32 \times 4 = 128)}$$

Given the low skewness of the data (0.09), a square root transformation of the SOI data and a consequent normalization process were not required.

Finally, the third step of the data analysis involved determining the ESG Ability Score, as described below:

$$ESG\ Ability\ Score = \frac{ESG\ Score + SOI}{2}$$

The sum of ESG Score and SOI is divided by two to keep the final score in scale, as these two indices were already computed within a 0-1 interval. After calculating the ESG Ability Score, it is clustered into grades according to dos Santos and Pereira (2022), who graded the ESG score of international ports. Thus, the grades of the ESG Ability Score are the following: low ability (less than 0.25); lower-middle ability (between 0.25 and 0.50); upper-middle ability (between 0.51 and 0.75); and, high ability (between 0.76 and 1).

4. Findings: Testing the ESG Ability Score

The investigated firms show an ESG Ability Score that ranges from lower-middle to high ESG ability, with the latter only reached by Fincantieri. The scores of all companies can be found in Table 3.

[6] For instance, Carbonor's vision includes 5 keywords from the list for E, 3 keywords from the list for S, and 2 keywords from the list for G, totaling 10 identifiable ESG keywords in the vision. The company's mission contains 6 keywords from the list for E, 5 keywords from the list for S, and 6 keywords from the list for G, adding up to 17 identifiable ESG keywords in the mission. Carbonor's values comprise 7 keywords from the list for E, 0 keywords from the list of for S, and 2 keywords from the list for G, resulting in 9 identifiable ESG keywords in the values. Lastly, the company's goals contain 7 keywords from the list for E, 6 keywords from the list for S, and 5 keywords from the list for G, making a total of 18 identifiable ESG keywords in the goals. By summing the number of ESG keywords identified in each item (10 keywords in the vision + 17 keywords in the mission + 9 keywords in the values + 18 keywords in the goals), we obtain a total of 54 keywords. This total is then divided by 128 to calculate the company's sustainable orientation value, which is 0.42.

Tab. 3: ESG Ability Score of firms

Shipyards	ESG Ability Score
Sanlorenzo SpA	0.55
Cantiere del Pardo SpA	0.33
Besenzoni SpA	0.41
Ferretti Group	0.55
Cantiere Rossini	0.31
Amico Group	0.33
Groupe Beneteau Italia	0.58
De Wave Group	0.32
The Italian Sea Group	0.56
Fincantieri	0.76
Palumbo SpA	0.42
Shippers	**ESG Ability Score**
D'Amico Group	0.33
Costa SpA	0.37
Gruppo Caronte & Tourist	0.53
Grimaldi SpA	0.40
Grandi Navi Veloci SpA	0.31
Fratelli Neri SpA	0.40
Tarros SpA	0.38
D'Alessio Group	0.27
Cosiarma SpA	0.40
Carbonor SpA	0.49
Britoil Srl	0.31

Source: our elaboration

The score shows an overall average level of ESG Ability, with most companies being placed in the "lower-middle" bracket. There are a few clear outliers, in the shipyards industry, with Fincantieri scoring significantly higher than all others. The same does not apply to the shipping sector, as Gruppo Caronte & Tourist is the only one to get a score in the "upper-middle" bracket. These results show that there is a basic level of ability in both sectors - with shipbuilders having a slight edge over shippers - although potential room for improvement remains.

To gather more information, we then analysed the two individual components of the ESG Ability Score. For what concerns the specific results of the investigated firms in terms of ESG Score - which are exemplified in Figure 1 - the two groups achieved a similar mean score (49% for shipbuilders and 48% for shippers). The results did not show strong negative outliers for shipbuilders, while Fincantieri established itself as a positive example with a score of 78%. The same can be said for shippers, which achieved consistently average scores, with the lowest being 36% and the highest being 66%.

Fig. 1: ESG Score of the firms

Source: our elaboration

The results for the SOI (Fig. 2) showed a more significant gap between shipbuilders - which averaged at 44% - and shippers, with a 36% mean SOI.

Fig. 2: SOI of the firms

Source: own elaboration

To provide a deeper insight on the composition of the SOI, Table 4 shows the frequency of each keyword, divided into pillars (i.e.: Environment, Social, Governance) and items (i.e.: Vision, Mission, Values, Goals).

Tab. 4: Keywords number by pillars and items

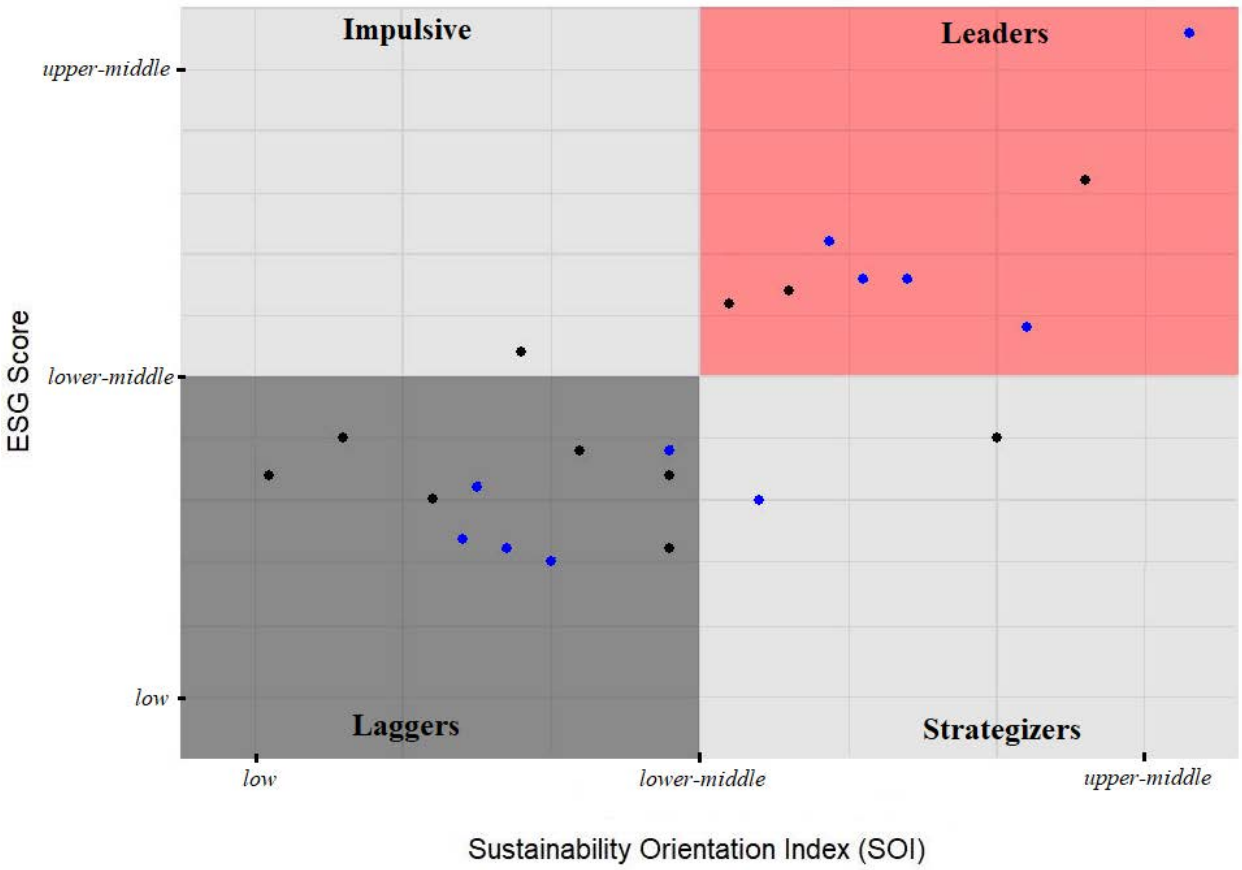
	Shipyards			**Shippers**		
	E	**S**	**G**	**E**	**S**	**G**
Vision	61	47	51	48	46	39
Mission	53	37	50	39	39	31
Values	59	52	57	49	42	37
Goals	53	39	54	60	40	40

Source: our elaboration

The main focus for shipyards is on vision-related keywords, and especially on the E pillar. In particular, keywords such as “emissions”, “water”, and “pollution” were mentioned more often. This outcome might have been influenced by the existing regulations at the national and international level, which are also mostly focused on these topics. However, results drop significantly for the S pillar, for both mission and goals items. This is true for both groups, potentially showing limitations in including social elements in their core purpose (mission), and consequently creating a path from orientation to practical outcomes (goals). Moreover, shippers’ results for the G pillar for all items is significantly lower than the ones for shipyards.

Finally, a more comprehensive interpretation is provided in a four-quadrant matrix, named Sustainability Navigator Matrix, showing the performance of firms for both the ESG Score (y-axis) and the SOI (x-axis) (Fig. 3).

Fig. 3: The Sustainability Navigator Matrix



Legend: blue = shipyards; black = shippers

Source: our elaboration

The matrix enables cross-referencing the ESG Score and the Sustainability Orientation Index (SOI) of companies, classifying them into four distinct categories: *leaders*, *laggers*, *strategizers*, and *impulsive*. The upper-right quadrant includes *leaders*, characterized by high ESG performance and strong integration of sustainability principles into their strategic identity. This group represents the optimal condition, suggesting that the ability to translate sustainability orientation into concrete and measurable actions is a determining factor in achieving high ESG performance. These companies can serve as benchmarks within the sector, demonstrating best practices in ESG strategy implementation. To maintain their competitive advantage, it is crucial for *leaders* to consolidate their ESG governance structures, enhance transparency in sustainability reporting, and invest in continuous innovation in product and process design to further strengthen their sustainability credentials.

The lower-left quadrant comprises *laggers*, which exhibit low scores in both indicators. This configuration suggests a reactive or marginal approach to sustainability, indicating deficiencies in both the definition of a strategic ESG orientation and its operational implementation. These companies are more exposed to regulatory and financial risks associated with the sustainability transition, as well as pressures from stakeholders, including investors and customers. Given the increasing scrutiny on ESG compliance, firms in this category should prioritize the progressive integration of ESG principles into corporate decision-making. A structured roadmap should be developed to incorporate sustainability into business processes, while managerial training programs should focus on raising awareness of ESG-related risks and opportunities. Furthermore, the adoption of ESG performance measurement tools would enable these companies to identify specific areas for improvement and track progress over time.

The lower-right quadrant, identifying *strategizers*, includes organizations that, despite developing a strong strategic sustainability orientation, have not yet achieved high levels of ESG performance. The presence of firms in this category reflects potential obstacles in the practical implementation of ESG strategies, which may stem from resource constraints, operational inefficiencies, or delays in impact measurement. While these companies demonstrate a commitment to sustainability in their corporate identity, they may struggle to convert this into measurable outcomes. To bridge this gap, they should focus on defining clear ESG key performance indicators (KPIs) that align with their strategic objectives, strengthen collaborations with sustainability-driven stakeholders, and leverage financial incentives to accelerate the transition towards more sustainable practices. By integrating ESG into supply chain processes and adopting technology-driven sustainability solutions, they can enhance their performance and position themselves as emerging leaders in sustainable business transformation.

Finally, the upper-left quadrant, representing the *impulsive* group, consists of a single company with a high ESG Score but a low SOI. This result can be interpreted as indicative of a non-systematic approach to sustainability, where ESG performance is the outcome of isolated interventions or reactive actions to external pressures rather than an organic and structured strategy. Such companies may be exposed to the risk of misalignment between their ESG profile and their actual capacity to integrate sustainability principles into corporate culture and governance, increasing the likelihood of being perceived as engaging in *greenwashing*. To mitigate this risk, firms in this category should transition from a tactical to a strategic ESG approach, embedding sustainability into core decision-making processes rather than treating it as an external compliance requirement. A more structured governance framework should be established to ensure that ESG considerations are deeply embedded in corporate strategy, while sustainability initiatives should be designed to generate long-term impact rather than short-term reputational benefits.

The quadrant analysis reveals a distribution in which most firms fall into the *leaders* and *laggers* categories, with a minority belonging to the *strategizers* and *impulsive* groups. The concentration of firms in these two extremes suggests a positive correlation between sustainability orientation and ESG performance, indicating that companies with low sustainability integration tend to achieve lower ESG results, whereas those with a strong strategic sustainability orientation are more likely to translate this orientation into measurable performance. However, the presence of *strategizers* suggests that achieving high ESG performance requires an evolutionary process, where sustainability orientation must be progressively translated into concrete and measurable initiatives through effective governance and structured resource management.

The interpretation of this matrix thus provides a reference model for companies in the maritime and shipbuilding sectors, enabling them to identify their positioning and define targeted strategies to enhance their *ESG Ability*. The need for the progressive integration of ESG principles into corporate governance and operational processes emerges as a key element for the sustainability transition, emphasizing the importance of consistent and long-term strategic approaches. By utilizing this matrix as a diagnostic tool, companies can refine their sustainability strategies, align their ESG commitments with business objectives, and enhance their ability to respond proactively to emerging environmental, social, and governance challenges.

5. Discussion and Conclusion

The blue economy calls for an innovative and cutting-edge ESG score to seamlessly measure and evaluate the ESG performance of companies within a holistic, comparable and adaptable tool for long-term use. The paper responds to this demand by creating a robust methodological framework for developing an ESG Ability Score designed for companies in the shipbuilding and shipping industries.

Some intriguing pieces of evidence are uncovered by testing the proposed new measurement model. Neither industry investigated reaches low levels of ESG ability by demonstrating that the ESG transition has been undertaken, as suggested by other scholars (Egorova *et al.* 2021; Vakili *et al.*, 2022), with promising results. However, we observe significant room for improvement in the ESG ability of both shipyards and shippers, especially concerning the governance pillar of ESG score, also noted in other studies in maritime field (Nõmmela and Kõrbe Kaare, 2022), and the integration of ESG into companies' mission. The more frequent incorporation of ESG into corporate values and vision can be interpreted as evidence that sustainability is often perceived as aspirational and desirable, particularly in smaller organizations. Moreover, a greater number of shipyards exhibit medium-high levels of ESG ability compared to shippers, with shipbuilders outperforming shippers in the SOI overall. This denotes that the top management's commitment to ESG is propelling the existing efforts 'to do good' more than a mere need to comply with the national and international regulations, which are exerting real pressure on naval sector to be both green and socially responsible in its sourcing, logistics, distribution, and operations practices (Para-González and Mascaraque-Ramírez, 2020).

Our study uncovers key findings that provide a deeper understanding of sustainability approaches within the blue economy. To begin, the organisations' sustainability orientation serves as a significant predictor of their ESG score. This evidence aligns with recent research exploring the various factors influencing ESG performance and identifying those that enhance ESG outcomes (Besley and Persson, 2023). Policies and regulations are no longer the primary drivers of ESG transformation, while intangible 'soft assets' - such as corporate culture, shared values, and business philosophy - play a pivotal role in driving performance within the realm of ESG (Clément *et al.*, 2022; Bai *et al.*, 2024). These soft assets, in fact, have the potential to shape strategic directions and behaviors, decision-making processes, and overall organizational performance (Marshall *et al.*, 2015). This implies the significance of deeply embedding ESG principles into the company's culture and identity, potentially resulting in more stable and profound impacts on ESG performance.

Thus, for the first time, a soft asset - such as the organization's sustainability orientation - is being considered alongside ESG performance to establish the ESG Ability score, a novel metric for measuring the responsiveness of maritime firms to sustainability. In essence, ESG ability reflects the organisational capacity to translate sustainability aspirations into measurable, significant impacts. This echoes studies focused on how sustainability can become a capability, enabling an organization to adapt, change, and innovate toward sustainable paradigms (Schrettle *et al.*, 2014; Leonidou *et al.*, 2015). Such dynamism is inherent in the concept of ESG ability, according to which sustainability should be viewed as an evolving capability rather than a fixed set of sustainable practices. These practices are often static, limited, and may even become obsolete in the competitive landscape of sustainability within the blue economy, especially in the shipping industry (Yuen *et al.*, 2019).

Thus, ESG Ability is tied to the human aspect of sustainability management (Jackson *et al.*, 2011; Renwick *et al.*, 2016), which indicates that changing cultures and behaviors is essential to encourage managers to adopt attitudes that result in actions promoting the company's sustainability efforts.

This study addresses the industry's sustainability challenges, which would be valuable for academics and practitioners.

From a theoretical viewpoint, our study contributes to the debate on ESG scores and their current shortcomings in adequately capturing a firm's sustainability characteristics. This paper appears to be the first known systematic attempt to integrate the sustainability orientation into the computation of the ESG performance in the blue economy domain. Sustainability orientation is evaluated as a prerequisite, while ESG performance is defined as the measurable realisation of ESG outcomes. In sum, the ESG Ability Score marks a significant advancement in existing methodologies by improving them upon both the general scores created by large providers (e.g., LSEG ESG, S&P) and the industry-specific scores developed for the shipping and port sectors (dos Santos and Pereira, 2022; Tsatsaronis *et al.*, 2024).

From a managerial perspective, the ESG Ability Score acts as a diagnostic and strategic tool offering significant benefits for various players in the blue economy. The dual perspective of the ESG Ability Score ensures that potential discrepancies between sustainability orientation and ESG performance are explicitly discernible. Thus, firms can adopt the proposed tool for self-assessment to better comprehend their sustainability profile, financial requirements, and necessary actions to facilitate the sustainability transition. A good practice is to compare the ESG ability score obtained by applying our proposed methodology with the sustainability rating calculated by external providers, if available. This comparison helps to reduce the bias related to the content analysis of the sustainability reports reviewed: if a company has used the 'right' keywords, it can achieve a high ability score even with behaviors that are far from ethical. In our sample, only Fincantieri has high sustainability ratings calculated by external providers that align with the high ESG ability score. If there is a discrepancy, the ESG ability score would become a diagnostic tool for identifying ESG washing practices.

Moreover, the ESG Ability Score can be incorporated into toolboxes used by companies for internal benchmarking and sustainability roadmapping. The tool also indirectly guides production systems towards being better prepared for sustainable development. Furthermore, the iterative nature of the ESG Ability Score allows companies to track progress over time, facilitating continuous improvement. Additionally, banks can use the tool to analyse the overall sustainability of their customers, and tailor green and social credit products (i.e., green loans, sustainability-linked loans, social loans) to meet the needs of firms. Finally, supply chain leaders can leverage the tool to ensure a sustainable supply chain and assist supplier firms in achieving a swift and effective transition process.

Despite the contributions of this study, there are a few limitations. First, the results may only be applicable to the context of Italy. Future research can consider cross-validating the ESG Ability Score with samples collected from other countries to extend the generalisability of the results. Second, the effective application of the innovative score is subject to rich datasets, and large numbers of sample observations, running over long time-horizons. In contrast, our sample comprises a reduced number of shipyards and shipping firms because there is no comprehensive data on them apart from scattered information in the media and reports on certain activities or from certain entities operating on the market. In the future studies, the usefulness of the tool could be evaluated based on survey respondents' feedback. Third, this study concerns the use of a prepackaged ESG score, whose machine-learning algorithm could be modified in future research to measure more granular components of ESG tailored to the specificities of the sample analysed. For instance, size is one of the most recurring biases when it comes to measuring ESG performance, as larger firms are automatically favoured over SMEs as the former can afford to invest more resources in sustainability (Pagano *et al.*, 2018).

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Bridging Digital Technologies and Environmental Sustainability at Firm and Ecosystem Levels: The Mediating Role of Innovation

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Abstract

Frame of the research. *Increasing concerns regarding environmental sustainability (ES) have positioned digital technologies (DTs) as critical enablers of sustainable practices. This study explores how digital technologies (DTs), including artificial intelligence (AI), the Internet of Things (IoT), blockchain, and big data analytics, enable sustainability initiatives at the firm and ecosystem levels. While existing literature acknowledges the role of DTs in enhancing ES, a structured approach to identifying key mechanisms and measurable indicators remains limited.*

Purpose of the paper. *We propose a conceptual framework where innovation acts as a mediator, helping organizations in actualizing operational digital capabilities leading to operational environmental performance.*

Methodology. *The study employs a conceptual approach, integrating findings from prior literature in digital transformation, innovation, and sustainability. It synthesizes these insights to develop a framework highlighting how DTs influence ES outcomes via innovation as a mediating mechanism.*

Results. *The framework suggests that DTs enhance firm-level sustainability by improving resource efficiency, reducing carbon footprints, enabling sustainable production, and improving waste management. At the ecosystem level, DTs support urban sustainability, pollution control, and circular economy practices through data-driven decision-making and cross-sector collaboration.*

Research limitations. *As a conceptual paper, empirical validation is not provided. Future research should test the proposed framework using case studies, surveys, or sectoral comparisons to assess its practical relevance.*

Managerial implications. *The framework guides managers on how to align digital innovation with sustainability goals. It also informs strategic investment in DTs and highlights the importance of fostering innovation capabilities and cross-sector partnerships for long-term sustainability impact.*

Originality of the paper. *This study uniquely integrates innovation as a mediating factor in the DT-ES relationship and extends the discussion beyond the firm to the ecosystem level, offering a structured framework for assessing DTs' environmental contributions.*

Key words: *digital technology; environmental sustainability; innovation; business model; ecosystem; circular economy.*

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Introduction

Digital technologies (DTs) such as artificial intelligence (AI), the Internet of Things (IoT), blockchain, and big data analytics are emerging as powerful tools to promote environmental sustainability (ES) at an organizational and systemic level (Mondejar *et al.*, 2021). They support long-term sustainability objectives by reducing environmental impact and encouraging use of resources (Guan *et al.*, 2023). Environmental sustainability focuses on protecting natural ecosystems and limited resources to ensure the durability of ecological and human systems (Wang *et al.*, 2023).

At various levels, DTs facilitate sustainability by enhancing resource efficiency, reducing emissions and also increasing transparency in production and supply chains. IoT sensors and AI-driven analytics enable firms to monitor and optimize energy and material consumption, while blockchain ensures traceability and accountability in sustainable sourcing (Singh *et al.*, 2022; Hong & Xiao, 2024). On a larger scale, digital platforms and data-driven networks foster collaboration among industries to support sustainable urban development, regenerative production systems and waste reduction strategies (Rosário & Dias, 2022; Trevisan *et al.*, 2021).

Innovation mediates the relationship between DTs and ES, where product, process, and business model innovations serve as the transformation for the effective conversion of DTs potentials to tangible results (Bresciani *et al.*, 202). Investments in DTs serve as key drivers of innovation, and when firms adopt a strategic, long-term approach to such investments, they can use the resulting innovations to advance sustainability objectives (Cricelli & Strazzullo, 2021). Organizations can build a more sustainable future, increasing both environmental and economic value while solving key global issues through digital tools and innovation (Rosário & Dias, 2022).

Until now, and as emphasized by various authors, the causal relation between DT factors and environmental sustainability has not been deeply and empirically investigated. Therefore, a framework for measuring and testing the causal effects of eco-factors on eco-output is the central focus and contribution of our study. This paper is oriented towards critically set DT factors and environmental sustainability dimensions proposed by the extant literature and exploring some indicators that measure them. In the following sections, the literature on DTs, ES and innovation is presented. Then, the measuring framework for variables is provided. In the discussion section we discuss about the impact of DTs on ES and the role of innovation, also barriers and challenges that exist. We conclude the paper by commenting on the framework and suggesting their possible future uses.

The aim of this study is to explore the mechanisms in which DTs positively affect ES, but more importantly, to investigate the mediating role of innovation in that relationship. It highlights how organizations and stakeholders can use digital capabilities to achieve environmental goals. By addressing the question of how DTs do, through the mediating role of innovation, drive environmental sustainability at the firm and ecosystem levels, the study contributes to a deeper understanding of how technological and innovative practices intersect to create sustainable value.

1. Digital Technologies for firm sustainability: artifacts, infrastructures, and platform

Digital technologies (DTs) are essential for firms, since they offer significant advantages and creative capabilities that improve efficiency, flexibility, and competitiveness (Martínez-Caro *et al.*, 2020). Improving resource utilization and supporting environmental sustainability (ES) now rely critically on advanced technologies, including artificial intelligence (AI), the Internet of Things (IoT), blockchain, and big data analytics (Nižetić *et al.*, 2019). Vial (2019) advocates that DTs such as AI, IoT, big data analytics, and social platforms are creating positive developments for society and industry. Guan *et al.* (2023) discuss that DTs present both opportunities and challenges for environmental sustainability. Liu *et al.* (2022) argue that AI, blockchain, and IoT have the potential to reduce resource consumption, improve energy efficiency, and facilitate the transition to circular

economy models. Predictive analysis based on DT improves the sustainability and efficiency of the supply chain (Li *et al.*, 2020). In addition, Schneider (2019) emphasized that IoT and blockchain manage closed-loop material systems while facilitating resource traceability and transparency. These tools transform operations and organizational structures, allowing firms to streamline processes, make smarter decisions, and drive innovation (Schneider, 2019).

In the existing literature, digitalization is more than just adopting new technologies; it is a comprehensive transformation that changes the way firms operate, compete, and communicate with their stakeholders (Warner *et al.*, 2019). Several streams of research have emerged to analyze this phenomenon as a transformative force in business operations and stakeholder communication.

Stormer *et al.* (2016) define digital artifacts as specific digital elements-applications or multimedia content-that offer unique features to users and are often used in new products or services. Saeed and Sidorova (2023) emphasize that digital artifacts are not just digital objects, but they are indeed complex information systems covering multiple layers of architecture and extending beyond basic data structures. They also describe digital artifacts as characterized by two factors: artifact delineation, which allows them to provide the interface and functionality for different users and artifact coalescence, which allows the artifact to merge multiple layers of IT architecture such that an end user isn't burdened with the complexity of such integration. Grave *et al.* (2021) describe that digital artifacts, in the form of enterprise architecture (EA) models, organize and structure many aspects of the strategic transformation process for the decision maker. It identifies 15 key EA artifacts used by organizations that support the initiation and navigation of digital change, though they note the actual implementation waves significantly between organizations. AI-powered tools in production planning, predictive maintenance, and equipment failure prevention can improve production efficiency and reduce training costs (Foresti *et al.*, 2020). Innovations such as 3D printing facilitate on-demand production and reduce excess inventory and material waste while enabling modular designs that support repair and recycling (Eshbayev *et al.*, 2024). Rosário & Dias (2022) argue that big data technologies enhance firms' ability to track environmental impacts, optimize supply chain management, and refine business strategies.

Another perspective highlights that digital infrastructures are the fundamental systems and tools that enable communication, collaboration, and computation among digital systems, such as cloud computing that reduces the need for physical data centers and maximizes the use of IT resources to reduce the carbon footprint of IT operations (Pedram, 2010). Singh *et al.* (2022) argue that some advanced manufacturing tools, AI applications, and IoT sensors enable firms to realize considerable environmental advantages. IoT sensors track real-time material flows, water usage, and energy use, which helps firms to find inefficiencies, reduce waste, and optimize resource use (Singh *et al.*, 2022).

Another stream of literature explores the role of digital platforms in reshaping firm structures and competitive dynamics; Sharma *et al.* (2024) argue that digital transformation drives firms away from traditional linear value chains toward platform-based ecosystems, where multiple stakeholders engage in co-creation processes. These platforms serve as facilitators of collaboration, allowing firms to leverage external technological capabilities and innovation (Hydle *et al.*, 2021). Calabrese *et al.* (2021) discuss that digital platforms shared environments for interaction between several stakeholders that host complementary services and foster innovation ecosystems and they encourage recycling, resource sharing, and transparency in supply chains. Blockchain-based platforms track the origin of materials, ensuring responsible sourcing and reducing the risk of "greenwashing" (Park & Li, 2021). They also connect businesses for resource sharing, renewable energy trading, and collaborative waste reduction efforts (Kristoffersen *et al.*, 2020). These DTs collectively improve the operational agility of firms, promote innovation, and enable their integration into ecosystems that stimulate sustainable environmental and economic growth. Another perspective considers implications of digitalization for firm boundaries and business models; Baronian (2020) argues that digital platforms redefine firms by challenging traditional firm and market distinctions and also introducing new forms of coordination and value allocation. Accordingly, as firms move to digital platforms, their business models evolve

to emphasize continuous market interaction, reduce dependence on intermediaries, and increase data-driven decision-making (Baber *et al.*, 2019).

2. The Role of Firms in Shaping Ecosystem-Level Sustainability: Digital Business Ecosystems (DBEs)

DTs enable firms to achieve environmental outcomes not only in their own operations but also in broader ecosystems (Geissdoerfer *et al.*, 2017). Firms are encouraged to adopt sustainability as a corporate strategy to recognize the value of ecosystem services that can create shared value and support biodiversity conservation (Ghosh, 2018). Pirzada *et al.* (2023) argue that firms can significantly shape sustainability practices and policies by aligning their activities with the global environmental objectives like the United Nations Sustainable Development Goals (SDGs); following that, to achieve these goals, businesses are often encouraged to share best practices and make changes to the system (Porter & Kramer, 2011).

The business ecosystem perspective has attracted considerable attention in both research and business, driven by the increasing penetration of DTs (Yoo *et al.*, 2010), which has transformed the way firms interact and operate in their environment. Senyo *et al.* (2019) advocate that Digital Business Ecosystems (DBEs) are networks of interconnected firms that leverage DTs to co-create value, foster innovation, and adapt to rapid environmental changes. On the other hand, they are characterized by their adaptability, scalability, and resilience, enabling businesses to collaborate effectively and respond to change market conditions. (Tan *et al.*, 2020; Aksoy, 2023; Senyo *et al.*, 2019). Corallo *et al.* (2007) discuss that digital business ecosystems operate as dynamic, decentralized networks where businesses, governments, and other stakeholders collaborate to reach common goals, including sustainability. A literature review of ecosystems and information systems, which analyzed 42 relevant peer-reviewed articles, emphasized the importance of considering three components: actors, resources, and value exchange when looking at a digital business ecosystem (Nischak *et al.*, 2017). Arifin (2024) note that firms engage in sustainability promotion at the ecosystem level significantly by utilizing digital channels, enabling collaborative innovation, and adopting data-driven approaches. By including environmental goals in their digital transformation initiatives, DBEs provide a structure by which firms take responsibility for sustainability (Arifin, 2024).

Literature highlights that firm performance on the environment is facilitated by transparency and traceability in the supply chain through the use of digital platforms. Chen *et al.* (2023) argue that blockchain-based systems enable real-time monitoring of raw materials and carbon footprints, ensuring alignment with sustainability goals. Sautter (2021) discussed that by participating in DBEs, firms collaborate with governments and industries to advance renewable energy, resource efficiency and circular economy models.

Another perspective focuses on firm's use of AI, IoT and big data analytics to optimize sustainability across the entire ecosystem and expand their influence beyond organizational boundaries. Romanelli (2018) discussed that AI and IoT enable firms to make data-driven decisions, optimize energy use, forecast resource requirements and reduce waste through analytics. Another stream of literature explores that firms are using digital platforms to advance the principles of the circular economy by reducing waste and virgin materials dependency. Kristoffersen *et al.* (2020) argue that collaborative tools allow firms to close material loops across sectors, thereby improving resilience and resource efficiency. Advanced waste-to-energy systems reduce landfill dependency while generating renewable energy (Tang & Zhou, 2012). Firms are participating in blockchain-based platforms that improve transparency and accountability, ensuring that environmental claims are verifiable (Saberi *et al.*, 2018). Blockchain allows firms to track the environmental credentials of raw materials, thereby ensuring that suppliers avoid deforestation and reduce carbon emissions (Park and Li, 2021). According to Shrivastava (1995), firms have a significant impact on urban sustainability through DTs such as smart grids, energy-efficient buildings, and intelligent transportation systems.

These initiatives optimize the use of urban resources, minimize emissions and integrate urban planning with ecosystem objectives (Shrivastava, 1995; Bouncken & Kraus, 2021).

3. Environmental Sustainability

One of the main aspects of sustainability is environmental sustainability; it guarantees that the quality of the environment is not compromised by meeting our present needs and that ecosystems are sustainable enough to support future generations (Kaswan *et al.*, 2019). ES is the development of "meeting the resource and service needs of current and future generations without compromising the health of the ecosystems that provide them" (Keeble, 1987; Morelli, 2011). Existing literature indicates that the challenge of environmental sustainability is not only a corporate responsibility but also a common challenge that calls for action at ecosystem levels. From the firm perspective Boiral *et al.* (2012) argue that firms are responsible to reduce their environmental impacts by improving energy efficiency, reducing waste, and also making supply chains more sustainable. Many firms follow standardized models (e.g., ISO 14001) that help them to create organized systems for managing and minimizing their environmental footprint (Boiral & Henri, 2012). According to Ukko *et al.* (2019), incorporating environmental sustainability principles into operations can increase the value of organizations and make digitalization more valuable. Rockström *et al.* (2009) advocate that sustainability at the ecosystem level requires preserving biodiversity and protecting natural systems, as well as addressing the environmental damage caused by human activities. Energy and agriculture are industries that sometimes have major effects, including habitat loss, deforestation, and pollution (Rockström *et al.*, 2009). Using a systems-thinking approach allows firms to see their dependence on ecosystems and develop plans that align environmental stewardship with financial objectives (Bocken *et al.*, 2014).

The 2030 agenda for sustainable development is urging the industry to reduce the environmental impact of manufacturing activities to meet the United Nations Sustainable Development Goals (United Nations, 2015). Aligning firm-level initiatives with global frameworks, such as the UN Sustainable Development Goals (SDGs), not only increases the impact of their efforts but also contributes to broader positive change (United Nations, 2015).

4. The mediator role of Innovation

Innovation transforms digital capabilities into practical and effective solutions, allowing firms to optimize their DT investments to achieve sustainable results (Khin & Ho, 2019). Attitudes towards technological innovation play an important role in organizational innovation, digital entrepreneurship, and environmental sustainability (Xiao & Su, 2022). Uber and Airbnb are two such companies that have revolutionized the industry by using advanced technologies (Bresciani *et al.*, 2021).

In the literature, innovation is recognized as a complex phenomenon that is categorized into product, process, and business model innovation (BMI) (Bucherer *et al.*, 2012; Markides, 2006; Wang *et al.*, 2015). Eshbayev *et al.* (2024) discuss that each of these innovations provide environmental and economic opportunities and benefits that ultimately contribute to sustainability challenges. From a sustainability perspective, it can be argued that innovation in business models is essential to move towards sustainable production and consumption, despite ongoing debates about the appropriateness of sustainable economic growth or alternative perspectives on sustainable development and the best forms of governance to achieve it (Schiederig *et al.*, 2012; Boons *et al.*, 2013; van Zeijl-Rozema *et al.*, 2013).

Zhang *et al.* (2020) define product innovation as the development of sustainable product life-cycles with an emphasis on design that ensures superior functionality along with reduced environmental

impact. Thus, to achieve product innovation, firms often draw on specialist knowledge and proprietary technologies that protect their ideas through patent rights while achieving productive efficiencies (Patel & Pavitt, 1997; Teece, 1986). According to Wang & Han (2024), AI enables data-driven product design, ensuring optimal use of materials and reducing waste, while 3D printing enables modular designs that improve repairability and recyclability. Furthermore, industries that use simulation tools to design environmentally friendly products report measurable improvements in material efficiency and life cycle sustainability. Despite these advances, Sarfraz *et al.* (2022) mention barriers such as high initial costs of adopting 3D printing technology that limit the implementation of this strategy.

In contrast, Damanpour (2010) emphasizes that process innovation is centered on optimizing internal operations along with a combination of manufacturing capabilities and technological competencies, in order to achieve energy efficiency and resource optimization. Digital innovation optimizes production processes and reduces energy consumption and waste generation, which promotes the green sustainable development of the manufacturing industry (Wang & Han, 2024). De Carvalho and Walker argue that incrementally innovative strategies for enhancing sustainability in the supply chain may involve supplier management and development approaches which seek to improve the sustainability performance of existing supply chain through managing risks and performance levels (De Carvalho *et al.*, 2012; Walker *et al.*, 2012).

BMI frequently involves comprehensive changes to the value chain, reshaping the structure and governance mechanisms of different activities (Afuah, 2014; Gambardella & McGahan, 2010; Lawton & Michaels, 2001). Hernández-Chea *et al.* (2021) discuss that firms create business model innovations for system-level transformation towards sustainability through shared vision, strategic dialogues, green supply chain networks, and collaboration with stakeholders. DTs help address major challenges such as climate change and promote sustainable development through innovative approaches by entrepreneurial organizations (George *et al.*, 2020). Blockchain is one of those technologies that helps firms monitor raw materials along their manufacturing processes and recycling strategies, therefore ensuring sustainable resources with less impact on the environment (Huang *et al.*, 2022). In addition to that, enhanced resource-sharing networks established on these platforms facilitate collaboration between stakeholders to improve the integration of renewable energy into the networks (Chivot, 2023).

Saqib & Qin (2024) highlight that digital tools at the firm level are applied to improve operational efficiency by minimizing waste, optimizing energy use, and facilitating data-based decision-making. Liu *et al.* (2023) discuss that platforms lead the collaboration across the sectors on knowledge resources and best practices at the ecosystem level. Such systems enable collaboration between renewable energy developers and manufacturing enterprises to promote cleaner production processes, thereby reducing environmental footprints (Liu *et al.*, 2023). However, overcoming interoperability challenges and establishing common governance frameworks is essential for these collaborations to scale effectively. Despite the enormous potential of DTs to foster eco-innovation, Tomar (2024) argue that firms face a variety of market barriers, such as technology interoperability, regulatory fragmentation, and high adoption costs. In order to address these barriers, a strategic combination of technologies will be necessary; for example, the synergies of AI, IoT, and blockchain are expected to enhance sustainability outcomes (Tomar, 2024).

In the light of our considerations, we can hypothesize a causal relation between DT and ES. DTs can be considered as the independent variable able to have an impact on ES, as the dependent variable and innovation as the mediating variable. Below is the framework with the two levels of analysis, firm-level and ecosystem-level (Fig. 1).

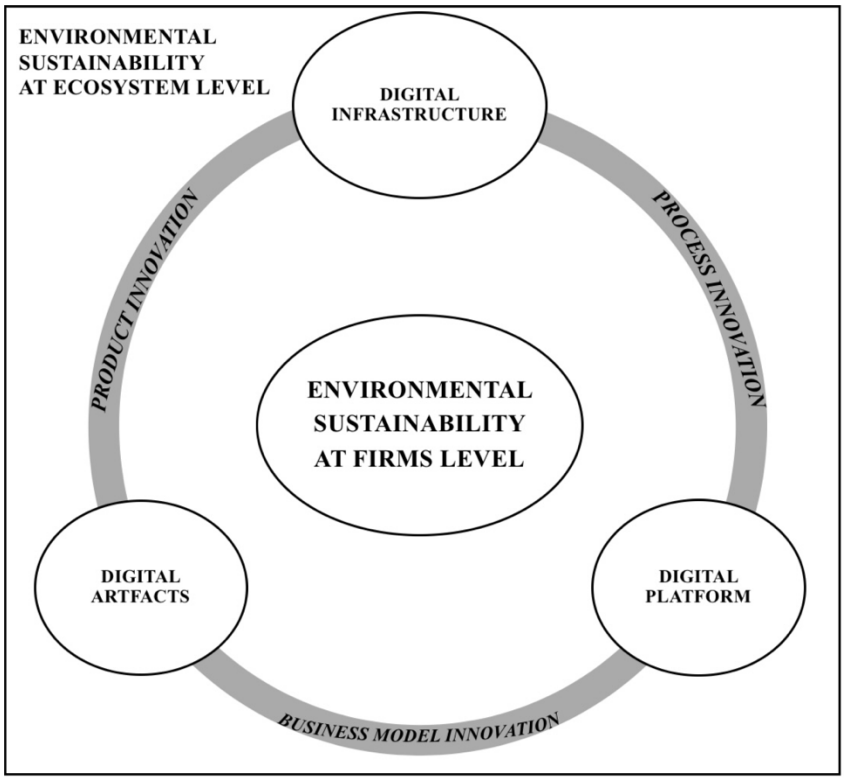
From this, three propositions emerge:

1.1 The greater the stock of digital infrastructure at the firm level, the higher the level of product, process, and business model green innovation.

1.2 The greater the stock of digital artifacts at the firm level, the higher the level of product, process, and business model green innovation.

1.3 Firms engaged in digital platforms exhibit higher levels of product, process and business model green innovation compared to their competitors.
2. The higher the level of product, process, and business model green innovation at the firm level, the greater the firm's sustainability performance.
3. The greater firm sustainability performance positively impacts ecosystem sustainability performance.

Fig. 1: Conceptual Framework



Source: Our elaboration

Measurement and Description of variables

Understanding the contribution of digital technologies to environmental sustainability requires the use of flexible indicators and well-defined metrics at both firm and ecosystem level. These metrics allow firms to measure the adoption, performance, and environmental impact of DTs, then they can refine their strategies to achieve sustainability goals (Cricelli and Strazzullo, 2021). In this study, we selected indicators based on their alignment with the study objectives and their relevance in the academic literature for further analysis.

Independent Variable: Digital Technologies

We discuss about DTs which are a set of tools, systems, and infrastructure that leverage advanced technologies such as IoT, AI, cloud computing, and blockchain to promote innovation, connectivity, and optimization in operations. In this study, the indicators used to measure DTs were identified based on their relevance to the dimensions of digital artifacts, infrastructure, platforms and digital business ecosystems as they are also practical for measuring digital tranformation in firms and ecosystems.

Prior studies suggest that the adoption of digital solutions correlates with improved energy efficiency and waste reduction in industrial operations. More recently, Chen *et al.* (2023) argue that through analytics software deployment, firms have been able to make data-driven decisions that lead to better operational efficiency. Li *et al.* (2022) highlight that the number of digital tools deployed in

operations and the percentage of employees using them properly are commonly used metrics to capture the extent of digital adoption.

Li *et al.* (2020) describe the number of patents filed for digital innovations and the proportion of R&D investment in DTs as key indicators of an organization's innovation capacity. Studies show that sustained investment in DTs such as IoT and AI significantly enhances resource optimization and sustainability outcomes (Demartin *et al.*, 2019). Han *et al.* (2024) argue that substantial investments in DTs, such as IoT, AI, and cloud computing, enhance operational efficiency and environmental performance. According to Korada (2024), digital transformation and Industry 4.0 adoption are evaluated using financial indicators such as technology investment levels and IT spending on infrastructure.

Zarra *et al.* (2019) argue that firms with higher digital maturity are better positioned to leverage IoT-enabled systems for environmental monitoring and sustainable resource management. Almeida & Simões (2023) discuss that assessments of digital transformation include IoT system adoption rates and broadband penetration, both of which are strong predictors of digital maturity. Hadizadeh *et al.* (2024) emphasize that integrating digital platforms across supply chains facilitates seamless data sharing, reducing inefficiencies and environmental waste. Research on digital ecosystems highlights that API integration and the extent of business processes managed through digital platforms are crucial indicators of digital connectivity and interoperability (Shishmano *et al.*, 2021).

Prior studies indicate that the level of platform adoption within organizations determines the extent to which digital capabilities influence decision-making processes. Calabrese *et al.* (2021) highlight that metrics such as the percentage of decisions supported by analytics platforms and the number of active platform users indicate how effectively firms use digital platforms for data-driven decision-making. Empirical studies suggest that firms by using predictive analytics through high digital platform adoption rates achieve higher sustainability performance (Baig & Yadegaridehkordi, 2023). In another stream of literature, beyond firm-level digital adoption, digital business ecosystems (DBEs) emphasize network-level collaboration through DTs and research also suggests that firms embedded in highly collaborative digital ecosystems are more likely to implement sustainable practices with shared data. Romanelli (2018) defines collaboration density as the level of interaction, innovation, and cooperation among ecosystem stakeholders. Lee & Ha (2018) show that API-driven collaboration is a fundamental metric for measuring digital ecosystem integration, as organizations increasingly rely on shared digital infrastructure and APIs to co-develop solutions. The Table 1, indicate the summary of DTs category with indicators (Tab. 1).

Tab. 1: Summary of DTs variable with indicators

DTs Category	Focus Area for ES	Indicators & Metrics	Source
Digital Artifacts	- Resource Optimization - Process Automation - Sustainable Manufacturing	Adoption of digital tools - Number of digital tools deployed in operations - Percentage of employees using them properly Digital innovation efforts - Number of patents filed for digital innovations - Proportion of R&D investment in DTs	Chen et al. (2023) Li et al. (2020) Li et al. (2022)
Digital Infrastructures	- Energy Efficiency - Environmental Monitoring & Smart Decision-Making - Renewable Integration	Investment in digital infrastructure - Total annual expenditure on IoT, AI and cloud computing - Proportion of IT budget allocated to infrastructure upgrades Infrastructure readiness - Proportion of IoT-enabled systems deployed for environmental monitoring - Digital maturity scores - Boardband or 5G penetration rate within operations	Demartin et al. (2019) Han et al. (2024) Zarra et al. (2019)
Digital Platforms	- Circular Economy Models - Supply Chain Transparency - Sustainability Marketplaces	Platform integration - Percentage of supply chain managed through digital platforms - Number of APIs integrated across the ecosystem Platform adoption - Percentage of business decisions supported by analytics platforms - Number of active platform users	Calabrese et al. (2021)
DBEs	- Collaborative innovation for sustainability - Resource sharing and optimization - Collective environmental responsibility	Collaboration density - Number of partnerships enabled by digital tools - Number of co-developed projects - Number of APIs shared across stakeholders	Romanelli (2018)

Dependent Variable: Environmental Sustainability

ES is a dynamically developing term that is commonly used to describe strategies and practices aimed at limiting environmental impacts, making efficient use of accessible resources, reducing emissions, and protecting ecosystems for future generations (Elleuch *et al.*, 2018; Khanna, 2024; Tvaronavičienė, 2021).

In this study, ES is examined through various environmental dimensions at the firm and ecosystem levels, and we address domains across the ES spectrum where DTs impact the ways and mechanisms by which resources, carbon emissions, waste, pollution, production, urbanization, and the circular economy are managed and controlled.

Li *et al.* (2020) emphasize that carbon footprint reduction is a fundamental indicator of environmental sustainability that is often measured by the annual reduction in CO_2 emissions, which

reflects improvements in energy efficiency and operational sustainability. More recently, Contini and Peruzzini (2022) emphasized carbon intensity as an essential metric, quantifying emissions per unit of production or revenue to assess operational efficiency gains. Chen *et al.* (2023) highlight the importance of tracking the adoption rate of digital solutions for carbon reduction, such as IoT-based energy management and AI-powered logistics, as a novel metric to evaluate the role of digitalization in emissions control.

Han *et al.* (2024) argue that energy efficiency, commonly measured in kilowatt-hours consumed per unit of production, reflects an organization's ability to optimize energy consumption using digital solutions like IoT-based monitoring and AI-driven optimization tools. Water efficiency is evaluated by the percentage reduction in water usage for industrial processes, highlighting the role of digital water-tracking systems and digital twins in monitoring and optimizing consumption (Chen *et al.*, 2023). Material efficiency is measured by tons of raw materials used per final product that captures improvements in waste reduction and sustainable resource utilization, which blockchain-enabled supply chain transparency and digital twin applications significantly increase (Romanelli, 2018). More recently, Calabrese *et al.* (2021) identified the percentage of total waste recycled annually and the amount of waste diverted from landfills through digital tracking and IoT-enabled networks as key indicators of recycling efficiency that these metrics allow firms to assess their waste reduction strategies and the effectiveness of digital solutions in minimizing landfill contributions.

According to Hadizadeh *et al.* (2024), monitoring pollutant concentrations in the air and tracking liters of untreated wastewater released are essential metrics. These indicators provide insight into firms' abilities to manage emissions and wastewater discharge effectively, particularly through digital environmental monitoring systems that enhance real-time tracking and compliance. Miehe *et al.* (2021) argue that sustainable production is evaluated through the percentage of production processes that adopt green technologies, such as digital twins and AI-based energy optimization systems. Contini and Peruzzini (2022) highlight that tracking the share of total production using recycled materials is crucial in assessing sustainable manufacturing practices. Oyelakin and Johl (2022) emphasize compliance with sustainability certifications like ISO 14001, which further strengthens this evaluation and provides a benchmark for measuring a firm's environmental commitments. According to Elefsiniotis and Wareham (2005), the integration of ISO 14001 with green production strategies ensures continuous progress in environmental management and regulatory compliance. Arghavani *et al.* (2020) and Daraojimba *et al.* (2024) propose using square meters of green space per capita as a measure of urban sustainability, reflecting biodiversity support and urban heat mitigation efforts. These indicators align with smart city initiatives, where DTs optimize energy distribution, improve public transportation systems and enhance urban infrastructure resilience. Romanelli (2018) argue that circular economy adoption is a growing focus in sustainability research, measured by the number of materials reused or recycled in circular supply chains and the reduction in virgin material consumption through circular initiatives. These metrics capture the extent to which firms integrate circular economy principles into their operations, emphasizing digital tools' role in enabling resource regeneration and waste minimization (Romanelli, 2018). The table below indicates the summary of ES dimensions with indicators (Tab. 2).

Mediator Variable: Innovation

Digital transformation leads to product, process, and business model innovations, providing advantages for firms of all sizes and across a variety of industries (Bresciani *et al.*, 2021). Wang & Su (2022) underscores the importance of integrating environmental considerations into the product development cycle, with highlighting that eco-friendly products contribute to reduced ecological footprints. García-Granero *et al.* (2018) claim that the percentage of new products designed with sustainability in mind reflects a firm's commitment to minimizing its environmental impact and meeting consumer demand for more sustainable offerings. The number of patents filed for eco-friendly products further demonstrates a firm's dedication to creating innovative solutions that advance sustainability (Barbieri & Santos, 2020). According to Barbieri *et al.* (2020), patents are

widely regarded as a tangible measure of a company's technological and innovation efforts, especially in the context of sustainability, and thus provide valuable insights into a firm's environmental commitment.

In the context of processes, the adoption of environmentally optimized procedures is critical to improving operational efficiency and reducing resource consumption. Scholars argue that measuring the percentage reduction in energy or resource usage due to new processes is an effective way to capture the environmental benefits of process innovation driven by DTs (Baldassarre *et al.*, 2020). According to Geissdoerfer *et al.* (2018), through process redesigns, firms are able to improve efficiency, reduce waste, and optimize resource use and also the number of processes redesigned to enhance environmental performance has been cited as an essential metric for understanding how firms innovate their operations to mitigate environmental impacts.

Tab. 2: Summary of ES variable with indicators

ES Dimensions	Indicator & Metrics	Source
Carbon Footprint	CO_2 emissions reduction - Annual reduction in CO_2 emissions (tons CO_2/year) - Carbon intensity (emissions per unit of production) - Adoption rate of carbon reducing digital solutions	Li et al. (2020) Contini & Peruzzini (2022) Chen et al. (2023)
Resource Efficiency	Energy efficiency (kWh consumed per unit of production) Water efficiency (percentage reduction in industrial water usage) Material efficiency (tons of raw materials used per finished product)	Han et al. (2024) Chen et al. (2023) Romanelli (2018)
Waste Management	Recycling performance - Percentage of total waste recycled annually - Amount of waste diverted from landfills through digital tracking systems	Calabrese et al. (2021) Hadizadeh et al. (2024)
Sustainable Production	Sustainable manufacturing practices - Percentage of production processes adopting sustainable tech - Share of total production using recycled materials - Compliance with sustainability certifications (ISO 14001)	Miehe et al. (2021) Contini & Peruzzini (2022) Elefsiniotis & Wareham (2005)
Pollution Control	Air pollution levels (concentration of pollutants) Water pollution levels (liters of untreated wastewater released)	Hadizadeh et al. (2024)
Urban Sustainability	Urban livability and efficiency - Square meters of green space per capita - Implementation of smart city solutions	Arghavani et al. (2020) Daraojimba et al. (2024)
Circular Economy	Adoption of circular economy principles - Volume of materials reused or recycled in circular supply chains (tons/year) - Reduction in virgin material consumption through circular initiatives (kg/year)	Romanelli (2018)

The literature emphasizes the significance of sustainability-oriented business models as a key factor in driving environmental sustainability within organizations. Minatogawa *et al.* (2019) claim that organizations with a higher proportion of revenue generated from sustainable practices or circular economy models tend to be more aligned with sustainability goals. Moreover, they argue that circular economy practices help firms reduce waste and decrease their reliance on virgin materials. Additionally, Rossi *et al.* (2020) discuss that increasing adoption of business models based on product-as-a-service or pay-per-use frameworks reflects a shift towards reducing resource consumption and promoting longer product life cycles. This approach has been supported by several studies as an effective strategy for lowering the environmental impact of consumption while simultaneously offering new business opportunities. Whalen (2019) suggests that firms adopting these models are better equipped to create value while simultaneously contributing to environmental sustainability. The table below indicate the summary of innovation's role with indicators and metrics (Tab. 3).

Tab. 3: Summary of innovation variable with indicators

Innovation Category	Role of Innovation	Link between DTs and ES	Indicators & Metrics	Source
Product	- Develops eco-friendly products through data-driven design and advanced materials. - Enables customization to reduce resource waste.	- Digital technologies like loT and Al allow lifecycle analysis and eco- friendly design. - Leads to products with lower carbon footprints and extended lifecycles.	Eco-innovation - percentage of new products designed for ES. - Number of patents field for eco-friendly products.	García-Granero et al. (2018) Barbieri et al. (2020)
Process	- Optimizes production processes for energy and material efficiency. - Reduces emissions through real-time monitoring and control.	- Technologies like sensors, Al, and automation identify inefficiencies and enable greener manufacturing practices. - Supports waste reduction and energy conservation.	Green process adoption - Percentage reduction in energy or resource use due to process innovation. - Number of processes redesigned for environmental performance, ...	Geissdoerfer et al. (2018)
Business Model	- Enables circular economy practices - Promote servitization	- Platforms and blockchain foster transparency and accountability in supply chains, supporting sustainable practices. - Digital marketplaces encourage sustainable consumption and resource-sharing models.	Sustainability-oriented business model - Proportion of revenue from circular economy practices. - Number of pay-per-use or product-as-a-service offerings implemented	Minatogawa et al. (2019) Rossi et al. (2020)

Discussion

This study highlights how DTs are transforming the various aspects of environmental sustainability. We also examine how DTs impact the methods and mechanisms by which resources, carbon emissions, waste, pollution, production, urbanization and circular economy are managed and controlled in alignment with environmental sustainability. Therefore, our discussion focuses on these

effects at both the firm and ecosystem levels. In addition, in this section we mention some of the barriers faced in the adoption of these technologies. Moreover, we examine which types of innovations are relevant to specific areas of the impacts that DTs have on environmental sustainability.

Impacts at the firm level

DTs have become a crucial driver for sustainability and resource efficiency in business processes that lead firms to enhance environmental performance through digital products and platforms. AI and IoT tools enable real-time monitoring and optimization of energy, water and material use, while IoT-powered smart grids adjust electricity consumption to meet demand (Vazhenina *et al.*, 2023). IoT systems also track usage, diagnose inefficiencies, and reduce waste as well as operational costs (Demartini *et al.*, 2019). Furthermore, digital asset management improves resource distribution, lowering production waste (Setiawan *et al.*, 2024).

Beyond resource optimization, digitalization helps reduce carbon footprints, especially in logistics and supply chains. Cloud computing reduces energy use by shifting data storage to efficient infrastructures, while AI optimizes transportation routes to reduce fuel consumption and greenhouse gas emissions (Lutfiani *et al.*, 2024). Digital transformation enhances firms' carbon performance by improving energy efficiency and supporting low-carbon technologies, with research emphasizing its role in reducing carbon intensity through green innovation (Guo & Huang, 2023). Advanced monitoring tools, track and manage emissions to strengthen long-term sustainability (Chen, 2022).

Integrating DTs into production systems fosters cleaner, more sustainable manufacturing. Smart manufacturing-encompassing green and zero-waste production as well as efficient supply chains-is enabled by IoT, cloud computing, AI, and digital twins (Liu *et al.*, 2020; Mao *et al.*, 2019; Kerdlap *et al.*, 2019; Wang *et al.*, 2018). Zhang *et al.* (2017) proposed a cleaner production model that merges product lifecycle management with big data analytics to optimize resource use and minimize waste. Blockchain enhances supply chain transparency by allowing businesses to track environmental impacts and verify ethical sourcing at every production stage (D'Amico *et al.*, 2021). In food production, big data analytics assesses carbon footprints and traces sustainability practices more accurately, offering valuable insights for both consumers and businesses (Weersink *et al.*, 2018). Blockchain further extends product lifecycles, optimizes resource use, and cuts emissions (Leng *et al.*, 2020; Esmaeilian *et al.*, 2020).

Prior studies have shown that the adoption of IoT and AI-powered waste tracking systems represents an advanced tool in waste management. Di Vaio *et al.* (2024) discuss that firms in the cruise industry have adopted innovative digital waste-tracking technologies to ensure proper waste disposal, reduce dependency on landfills and improve compliance with sustainability goals. Similarly, Ming *et al.* (2024) argue that AI-based sorting systems reduce operational inefficiencies by automating waste classification and separating material inputs to increase recycling rates. Bułkowska *et al.* (2023) argue that the use of blockchain in waste management improves traceability and facilitates incentives for responsible waste disposal practices.

Impacts at the ecosystem level

The application of DTs has greatly improved pollution control initiatives. Given complex, evolving environmental challenges, AI is widely regarded as an effective tool for real-time pollution monitoring and control (Ye *et al.*, 2020), while big data analytics plays a key role in quantifying carbon emissions and devising reduction strategies (Roman Pais Seles *et al.*, 2018).

Smart city development relies on IoT, cloud computing, AI, and big data to optimize resources and ensure real-time connectivity, as well as improving air quality and reducing energy consumption (Sun & Zhang, 2020). Honarvar and Sami (2019) demonstrated that big data can predict and monitor air pollution at a fraction of the cost of traditional methods. Such technologies enable sustainable urban planning and the integration of green spaces-thereby aiding urban ecosystems and climate adaptation.

IoT, blockchain, AI, and digital platforms facilitate real-time tracking of materials, enhancing resource traceability and lifecycle monitoring (Wegner-Kozlova & Guman, 2020). According to Bułkowska *et al.* (2023), blockchain improves supply chain traceability by providing transparency throughout manufacturing and distribution-thus ensuring efficient reuse and recycling. Moreover, digital platforms support collaborative circular business models that allow firms to share, repurpose, and redistribute resources, minimizing waste (Trevisan *et al.*, 2021). AI-driven predictive analytics optimize material use and waste reduction strategies, thereby promoting closed-loop production systems (Wilson *et al.*, 2024).

Gamidullaeva *et al.* (2021) argued that a cross-sectoral digital ecosystem platform-by fostering transparency and open knowledge transfer-can enable self-organization and sustainable innovation. In this context, Industry 4.0 technologies such as IoT, blockchain, and cloud systems facilitate collaboration in circular supply chains and support the circular economy (Gebhardt *et al.*, 2021).

The present study examines three types of innovations that ensure that the adoption of DT brings measurable sustainability contributions. DTs support eco-design practices to increase resource efficiency and reduce the carbon footprint of production (AbdulAzeez *et al.*, 2024). Rosário & Dias (2022) argue that AI, big data analytics, IoT, and mobile technologies drive ES through solutions for urban development, production, and pollution control. Eshbayev *et al.* (2024) claim that smart grids and blockchain promote sustainable development and environmental monitoring through the enhanced performance and adoption of green technologies. George *et al.* (2020) highlight that IoT sensors provide real-time monitoring of water, energy, and material consumption, allowing firms to identify and address inefficiencies. AI-based predictive models in smart grids balance energy supply and demand, generating significant savings through energy redistribution (Singh *et al.*, 2022). AI and big data analytics provide opportunities for firms to optimize logistics and energy consumption in real-time, thereby reducing costs and emissions (Saqib & Qin, 2024). Circular economy principles are embedded in product innovation to support the design of products for reuse, recycling and extended lifespans (Pieroni *et al.*, 2019).

Process innovation-selecting improved operational methods to maximize efficiency-is facilitated by DTs through real-time IoT and AI analytics, thus impacting resource efficiency and waste management in energy, water, and raw materials (Baldassarre *et al.*, 2020). It also enhances pollution control by enabling firms to monitor and manage air and water quality in real time (Hadizadeh *et al.*, 2024). Furthermore, practices such as energy optimization, waste heat recovery, and AI-based logistics reduce greenhouse gas emissions during operations (Geissdoerfer *et al.*, 2018). Business model innovation-by embedding sustainability principles into practices-addresses trade-offs between economic growth and environmental degradation by shifting value creation toward less harmful activities (Bradley *et al.*, 2020). Digital platforms powered by blockchain enable circular economy models in which materials are reused, recycled, and shared (Rossi *et al.*, 2020), while reverse logistics coupled with pay-per-use and product-as-a-service models reduce the need for raw materials (Pathan & Kesavaraj, 2024). We present the summary of the discussion section in Table 4 (Tab. 4).

Tab. 4: Impact of DTs on ES and role of innovation

Level	Final Impacts (ES Dimensions)	Role of DTs	Role of Innovation
Firm	Resource Efficiency	loT and Al for energy monitoring, water management, and material optimization	Optimizes resource use through process improvements and eco-product designs, through: - Product Innovation - Process Innovation
Firm	Carbon Footprint Reduction	Al-powered logistics and loT-enabled energy systems to reduce emissions	Creates low-emission products and streamlines operations to reduce CO_2 emissions, through: - Product Innovation - Process Innovation
Firm	Sustainable Production	Digital twins and blockchain to improve production transparency and enable greener practices	Incorporates recycled materials and green tech into products and processes, through: - Product Innovation - BMI Innovation
Firm	Waste Management	IoT and AI-powered waste tracking systems and blockchain for waste traceability	Improves waste disposal, increases recycling rates, through: - Process Innovation - BMI Innovation
Ecosystem	Pollution Control	loT-based monitoring systems and digital platforms for tracking air and water quality	Facilitates systemic reduction of pollutants across shared ecosystems, through: - Process Innovation
Ecosystem	Urban Sustainability	Smart city technology adoption (loT sensors and Al) to optimize urban energy use and monitor air quality	Encourages urban liveability improvements and energy-efficient urban systems, through: - BMI Innovation
Ecosystem	Circular Economy	Blockchain and loT for material traceability and resource-sharing platforms	Drives collaborative resource-sharing models and closed-loop supply chains, through: - BMI Innovation

Source: Our elaboration

Barriers

Despite all the discussions presented above, there are significant barriers to widespread adoption of such technologies. Adopting DTs for sustainability in firms typically entails substantial initial investment in infrastructure, including IoT sensors, AI tools, and blockchain systems, which SMEs often cannot afford. Constraint of financial resources also prohibits firms to investments in long-term R&D for scaling sustainable innovations (Guo & Huang, 2023). Integrating new digital systems with existing legacy infrastructure is one of the biggest challenges. Many corporations are running old systems that are not fit with digital progressive tools; for which implementation takes a long time also creating inefficiencies. Overcoming the lack of interoperability between systems translates to additional costs because it often involves either development of customized solutions or significant changes to existing systems (Chen, 2022). The adoption of DTs is often impeded by cultural and organizational inertia. Resistance from employees and management to changing long-established workflows, especially if they believe that digital transformation won't benefit them or feel threatened by automated processes. Resistance is more likely in organizations with traditional hierarchical structure, in which decision-making is slower and risk-averse (Gao *et al.*, 2023).

Cross-sector collaborations are as challenging as they are vital and require a multilevel systems approach and both quantitative and qualitative methods for effective implementation (Bryson *et al.*, 2015). Collaboration is challenging, as digital ecosystems require extensive sharing of data among the stakeholders. Besides these concerns are exacerbated by the absence of standardized data security protocols across industries, both of which restrict trust and transparency in sustainability initiatives that span the entire ecosystem (Saberi *et al.*, 2018). Different standards and fragmented regulation in various regions are among the major challenges to the adoption of a common sustainability approach. Such differences make it more complex for multinational firms to raise operational costs while compromising cross-border cooperation in pursuit of environmental sustainability (Zhou *et al.*, 2024).

Research Agenda

R&D investment broadly supports technological advancements that can be helpful, but strategic investment in digital innovation directly focuses on aligning financial and technological resources with sustainability goals. Future research should examine the cost-benefit dynamics of investing in DTs for sustainability, including funding mechanisms, policy incentives, and the long-term return on investment for sustainable digital transformation.

Although DTs, e.g., IoT, AI, big data, cloud, and blockchain, can offer significant opportunities for innovation in ES, it is important to note that these are not useful to independently reach sustainability goals without the organizational capabilities to utilize them. These capabilities are critical to value creation and digital transition across industries and they need to be dynamic to facilitate an organization to initiate the necessary changes after continuous assessment of an environment (Mele *et al.*, 2023; Ellström *et al.*, 2021). Dynamic capabilities, mainly knowledge-based ones, should be built by organizations to adapt and innovate effectively in the digital era. Future research should explore how firms can develop dynamic capabilities and integrate sustainability-focused digital skills across industries.

Schöggl *et al.* (2023) highlight that the impact of DTs in promoting sustainability enhanced through collaborative ecosystems that facilitate knowledge exchange, shared digital infrastructures and collective sustainability efforts. Future works of research are to study models of governance or effects of various governance structures on the decision-making processes and engagement of stakeholders. Another aspect of research attention will be to see how standard protocols or seamless integration of digital platforms with data-sharing frameworks can facilitate cross-sector collaboration.

Conclusions

The present study emphasized that the opportunities offered by DTs to reduce environmental impact are unique and have not been possible in the past. Consequently, the present study proposed a conceptual framework to examine the role of DTs in promoting environmental sustainability (ES), which also emphasized innovation as an important mediating factor. The framework provides a measurement framework for variables and presents the ways in which DTs reshape sustainability practices by combining the lenses of firm-level and ecosystem-level perspectives. These technologies enhance resource efficiency, reduce carbon emissions, support sustainable production, and improve waste management at the firm level by enabling real-time monitoring, optimizing energy use, and increasing supply chain transparency. At the ecosystem level, DTs must be used to contribute to pollution control, urban sustainability, and circular economy adoption by facilitating environmental monitoring, supporting smart infrastructure, and enabling cross-sector collaborations.

This study highlights the importance of innovation as a bridge between DTs and sustainability outcomes by maximizing the environmental benefits of digitalization in terms of product, process, and business model innovations. Overall, organizations need long-term success, so addressing concerns about data privacy, technological infrastructure, and equitable access to DTs will be

essential for them. A systemic innovation-driven approach to digital transformation can help firms and ecosystems respond more effectively to global environmental challenges, resulting in a sustainable and resilient future for all stakeholders.

Policymakers and governments can support this transformation by offering incentives-such as subsidies, grants, and tax relief-that encourage firms to adopt DTs and sustainable innovation. In addition, regulatory frameworks should include strategies for aligning sectoral standards related to data privacy and ownership, encouraging ecosystem-level collaboration, and ensuring the responsible use of DTs in addressing environmental challenges.

Future research should explore empirical methods to validate this framework, such as case studies, surveys, or cross-sector comparisons, to assess its applicability across different contexts.

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Guilt, goals, and green choices: understanding sustainable fashion app usage through goal-framing theory

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Abstract

Frame of the research. *This study employs Goal-Framing Theory to investigate how goals influence the use of apps for sustainable fashion, while evaluating the impact of perceived risks and Eco-guilt on usage behavior.*

Purpose of the paper. *This research investigates the influence of hedonic, gain, and normative goals on the use of apps for sustainable fashion. Moreover, it assesses whether perceived social and performance risks negatively affect their usage. The Eco-guilt is assumed to affect the actual use of apps for sustainable fashion positively and to play a moderating role on the relationship between the Hedonic Goals (HG) and the Actual use of apps for ethical and sustainable fashion (AU).*

Methodology. *A quantitative approach was adopted, utilizing survey data collected from 615 respondents. Structural Equation Modeling (SEM) was applied for analysis, including an interaction term to assess moderation effects.*

Results. *Goals positively influence the usage of apps for sustainable fashion. Perceived risks do not deter their usage. Eco-guilt does not positively affect AU but was found to moderate the relationship between HG and AU.*

Research limitations. *The analyzed sample is exclusively Italian, which may limit the generalizability of the results.*

Managerial implications. *To effectively utilize mobile applications as strategic tools, managers should align with consumers' hedonic, gain, and normative goals, while also leveraging Eco-guilt through marketing campaigns.*

Originality of the paper. *To the best of our knowledge, this is the first study to investigate the effects of goal-framing on sustainable fashion apps, while also integrating the moderating role of Eco-guilt.*

Key words: *Mobile Applications; Sustainable Fashion; Goal-framing Theory; Eco-guilt; Hedonic Goals; Perceived risks*

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1. Introduction

The Fashion Industry has established itself as one of the most polluting industries in the World (Niinimäki *et al.*, 2020). During the last few years, Fast Fashion and Ultra-fast Fashion have been ruling the industry in response to consumers' demand for faster and cheaper offerings of garments. The development of these phenomena has contributed to the worsening of the fashion industry's footprint, but the green transaction towards more sustainable solutions has already started. Indeed, it is now possible to talk about slow fashion and sustainable fashion, the new fashion paradigm that gives importance to quality, durability, and respect for the environment (Shirvanimoghaddam *et al.*, 2020).

These trends are growing because consumers' awareness and engagement towards sustainability are rising (Fischer *et al.*, 2017; Shamsi *et al.*, 2022), but also thanks to the contribution of digital transformation bringing disruptive technologies into the landscape of sustainable practices. The mobile applications are of particular interest: software available on mobile devices can engage consumers through numerous features like gamified elements and feedback. Many applications were born to promote more sustainable practices and engage users in making the right choice for the environment (Fuentes *et al.*, 2021). Among them, several mobile applications were born to raise awareness and prompt more ethical and sustainable fashion consumption (Bonafix *et al.*, 2023). Therefore, given the growing interest in sustainable fashion practices and mobile applications for sustainable fashion, it is important to better understand what drives and deters consumers in the usage of such apps.

Early studies on mobile applications for sustainable practices have primarily focused on the food and transportation sectors. Research has examined how mobile applications promote sustainable food consumption, such as encouraging the reduction of food waste or giving real-time transparency information about products (e.g., Olio, Buycott apps). Similarly, studies on sustainable transportation have explored the role of mobility apps in fostering eco-friendly habits, such as ride-sharing and carbon-footprint tracking, such as Oroeco app. However, these studies often focus on the design of apps (e.g., gamified elements), their classifications, and the adoption intentions and overlook broader behavioural dynamics, assuming that providing information and incentives are sufficient to drive long-term sustainable habits (D'Arco & Marino, 2022). Moreover, the focus on food and transportation has limited the exploration of other key industries, such as fashion, where consumption practices are changing, and digital tools could play a crucial role in promoting sustainability

Recently, interest in sustainable fashion apps has been rising, given the growing number of new apps aimed at promoting more environmentally conscious consumption (e.g., Good On You, Vinted, Vestiaire Collective). These apps cover various aspects of sustainable fashion, from helping consumers make informed decisions about eco-friendly clothing brands to promoting second-hand shopping (Bastone *et al.*, 2024). While these apps have gained significant interest in recent years, the literature surrounding this emerging field remains in its early stages, with a particular focus on app design and only a little understanding of the motivators driving their usage and the barriers preventing consumer engagement in the behavior.

The intended contribution of this research is to extend knowledge about the use of mobile applications in ethical and sustainable fashion, providing a deeper understanding of the factors driving their usage. By adopting the framework of Goal-Framing theory by Lindenberg and Steg (2013), this study posits itself among the first to investigate the influence of hedonic goals, gain goals, and normative goals in driving the usage of mobile applications for ethical and sustainable fashion consumption. Additionally, by integrating perceived performance and social risks, this research aims to assess if consumers' perceived risks may act as deterrents to the usage of such apps. Moreover, in light of the rising interest in the role played by emotional appeals in green purchase decisions (Wang *et al.*, 2017), it aims to understand if Eco-guilt positively influences the usage of apps for sustainable fashion and if this emotion plays a moderating role on the relationship between the Hedonic Goals and the actual use of apps for ethical and sustainable fashion.

Findings suggest that goals play a significant role in influencing consumers when they use sustainable fashion apps. Perceived risks do not negatively affect their usage and so Eco-guilt. However, Eco-guilt was found to moderate the relationship between hedonic goals and the actual use of apps for ethical and sustainable fashion, strengthening it. These results have practical implications for management, as mobile applications are often employed as strategic tools in the customer journey for supporting value-generating activities (e.g., purchasing), communication, and customer engagement (Stocchi *et al.*, 2022).

2. Theoretical background and hypoteses

2.1 Mobile apps for sustainable fashion consumption

Mobile applications have established themselves as powerful tools for engaging customers in value-generating activities, such as purchasing and accessing information (Stocchi *et al.*, 2021). Apps have changed the way consumers purchase (Liu *et al.*, 2019) and play a significant role in enhancing awareness about sustainability and promoting changes towards environmental citizenship behaviors (D'Arco & Marino, 2022). A notable body of research on mobile applications for sustainable consumption focuses on apps enhancing sustainable food choices (e.g., Too Good To Go) and apps for sustainable transportation choices, since the food and mobility industries are among the most wasteful and polluting (Hong *et al.*, 2024, Marquart & Schuppan, 2021). Using features like gamified approaches- real-life prizes anchored to a point-based rewarding system, goal setting, challenges, and eco-feedback (Cellina *et al.*, 2023)- these apps succeed in the main goals of reducing waste, generating awareness on sustainable products and leading to more sustainable choices (Fuentes *et al.*, 2021; Vo-Thanh *et al.*, 2021; Weber, 2021).

The fashion industry is renowned for being one of the most polluting industries in the World, but new production paradigm and consumption practices emerged: first the slow fashion challenging fast fashion, and then sustainable fashion as part of the slow fashion movement, highlight sustainability values and ethical conducts (Henninger *et al.*, 2016). Online shopping is becoming increasingly popular, and one of the fastest growing segments is online second-hand shopping, which involves buying goods previously owned by others via online platforms (Padmavathy *et al.*, 2019). There is a growing demand for online C2C platforms, acting as intermediaries between sellers and buyers of used garments (Padmavathy *et al.*, 2019), and even new goods retailers adapted to this trend to acquire and retain customers, such as Zara- one of the giants of fast fashion- and its “Zara pre-owned” resell platform (Li & Sundararajan, 2024).

Recently, greater interest has been paid to mobile apps for sustainable fashion consumption, such as the Vinted application, a C2C platform that allows users to buy and sell second-hand clothing, whose goal is to establish a globally recognized sustainable model of consumption, positioning used garments as the first choice universally (Bastone *et al.*, 2024). Several scholars have delved into the motivations behind consumers' choices in the online second-hand fashion market. According to Aycock *et al.* (2023), young adults not only prioritize novelty and fashionability but also the environmental and social impacts of pre-owned products over affordability and price. While, according to Srividya *et al.* (2024), consumers prefer online second-hand shopping as it is cheaper, more affordable and easier. Consumers' desire to make environmentally friendly and wise shopping decisions seems to be among the drivers of the usage of online platforms for ethical and sustainable fashion consumption (Ki *et al.*, 2024). Although there is a rising interest in the topic, still little is known about the motivations and barriers affecting the usage of such apps for sustainable fashion consumption, ranging from utilitarian and social motives to economic and safety motives (Michalak *et al.*, 2022; Palomo-Domínguez *et al.*, 2023).

2.2 The Goal-framing Theory

The Goal Framing Theory, by Lindenberg and Steg (2013), is a conceptual model that focuses on how the presentation and formulation of goals influence people's behaviour and decisions. Lindenberg and Steg (2013) identify three general goals whose aim is to enable human beings to improve their condition: the goal of "improving the way one feels at the moment" (hedonic goal); the goal of "acting appropriately" for the group (normative goal) and the goal of "guarding and improving one's resources" (gain goal).

Previous studies have explored the relationships between these goals and the sustainable behavior (Liu *et al.*, 2012; Onel & Mukherjee, 2015; Peattie, 2010), but not always they are consistent with one another: while several academics have found that hedonic goals may play a role in enhancing environmental-friendly consumption (e.g., Schneider *et al.*, 2017), as people derive positive feelings from it, others have found no relationship or even a negative relationship between them (Chakraborty *et al.*, 2017; Steg *et al.*, 2014); some studies highlight the positive relationship between the gain goals and the sustainable bahaviour (Chakraborty *et al.*, 2017; Steg *et al.*, 2014), as it allows consumers to benefit from it (e.g, reaching a higher social status), but other studies disagree, finding a negative relationship between them as often eco-friendly products are associated with higher prices s (Evans *et al.*, 2013; Lindenberg *et al.*, 2018); studies on the normative goals are the most consistent, agreeing on the fact that people who feel part of a group/society with strong environmental values feel more encouraged in undertaking moral actions and sustainable behaviors (Chakraborty *et al.*, 2017; Hanss *et al.*, 2016).

Although there is a lack of information in the existing literature regarding sustainable fashion apps and the above-mentioned goals- a gap that this research aims to fill- there is a body of research that applies Lindenberg and Steg's Goal-framing Theory to the usage of mobile application. Most of the studies focus on hedonic motivation as a predictor of the adoption and usage of an app: the enjoyment component contributes to the perceived ease of use of the app as well as on the satisfaction of the person using the app (Byun *et al.*, 2018; Saheb, 2020; Tropp & Baetzgen, 2019; Zhang *et al.*, 2020). With regard to gain goals, gain motives may be predictors of the adoption intention of an app as it allows users to save time (Dastjerdi *et al.*, 2019), but according to Zhang *et al.* (2020), there are perceived costs negatively related to consumer satisfaction and through this to the continued use of an app for sustainable behaviour. According to Dastjerdi *et al.*, 2019, normative motives affect the usage of sustainable apps as it allows them to reduce their footprint.

Given the gap in the current literature, this study aims to investigate how normative goals, gain goals, and hedonic goals intervene in the use of apps for ethical and sustainable fashion consumption.

H1. Hedonic goals positively affect the actual use of apps for sustainable fashion
H2. Gain goals positively affect the actual use of apps for sustainable fashion
H3. Normative goals positively affect the actual use of apps for sustainable fashion

2.3 Consumers' perceived risks

When buying a second-hand garment, consumers consider social and performance risks, which could be obstacles to purchasing second-hand items through apps for ethical and sustainable fashion (Lang & Zang, 2019).

Social risks are the negative outcomes that purchasing decisions may have on a person's social standing. Users may perceive that their purchasing decisions or the use of a certain product will damage their social image and the way others look at them. Some individuals may fear that shopping second-hand clothes may make them appear economically disadvantaged or unable to afford new, trendy clothes (Lang & Zang, 2019). Silva *et al.* (2021) found that social embarrassment is one of the highest barriers when purchasing second-hand clothing. Consumers seek approval from the

group/society they belong to, the greater the risk that this approval will not be there, the less likely the behaviour will be engaged in (Kim *et al.*, 2021).

Performance risks consist of practical and functional concerns related to the quality and utility of the used clothes. Individuals might be concerned that second-hand garments are damaged and in need of repair or cleaning before they can be worn. Furthermore, the lack of detailed information on the history and past condition of used items could lead to uncertainties regarding their durability and suitability for personal needs (Lang & Zang, 2019). Cleanliness and hygiene may also be a significant concern (Hur, 2020). However, consistent with Kim *et al.* (2021), Koay *et al.* (2023) found that consumers of secondhand clothes do not consider functional risks when purchasing, as they expect the garment to be less durable than new clothing.

Moreover, if we add that the purchase of second-hand clothes takes place via an app, the consumer might perceive risks in using the software itself. The study by Kim *et al.* (2021) emphasizes the trust issues that can arise when purchasing second-hand clothes on online shopping platforms. Saheb (2020) notes, in fact, a negative relationship between perceived risk in app use, in particular data risk, and app adoption.

H4a. Social risks negatively influence the actual use of apps for ethical and sustainable fashion

H4b. Performance risks negatively influence the actual use of apps for ethical and sustainable fashion

2.4 The moderating effect of Eco-guilt

Guilt can be defined as a negative emotion, triggering action tendencies that include reparation, compensatory efforts, and apology following a failure or offense for which one feels responsible (Hurst & Sintov, 2022). Academics started to talk about Eco-guilt, referring to the guilt that originates when trying to reconcile discrepancies between environmental attitudes, beliefs, and values people feel and their actual environmental behaviour (Mallett, 2012).

Haj-Salem *et al.* (2022) suggest that people tend to avoid anticipated guilt and, therefore, adopt behaviours that minimise the likelihood of incurring it; this is why this emotion is often associated with pro-environmental behaviour, such as protecting the environment, buying fair trade or environmentally friendly products and recycling. The matter became of particular interest in the field of tourism, since academics found out that the hedonic component of tourism may lead individuals to feel justified in engaging in behaviours they might otherwise consider inappropriate or environmentally harmful. Therefore, guilt may play a role in preventing environmental harm (Bahja *et al.*, 2022). Moreover, Wang and Wu (2016) studied the relationship between anticipated guilt and the intention to use sustainable appliances, finding out that it positively predicted pro-environmental intentions of adopting appliances able to make people engage in more sustainable practices. Wang *et al.* (2017) also suggested that anticipated emotions- like guilt- are positively linked to intentions to purchase a green appliance and the guilty appeal was effective in promoting green purchase intentions.

Therefore, app users with high hedonistic goals might initially be attracted to apps for aesthetics and the shopping experience (Mettler *et al.*, 2014). However, if they also experience Eco-guilt, they may feel a greater emotional urge to translate their interest into concrete actions, such as responsible purchasing (Wang & Wu, 2016; Wang *et al.*, 2017). Eco-guilt can transform the simple pleasure of using mobile applications into actions more consistent with sustainable values, even prompting users to do so more frequently usage.

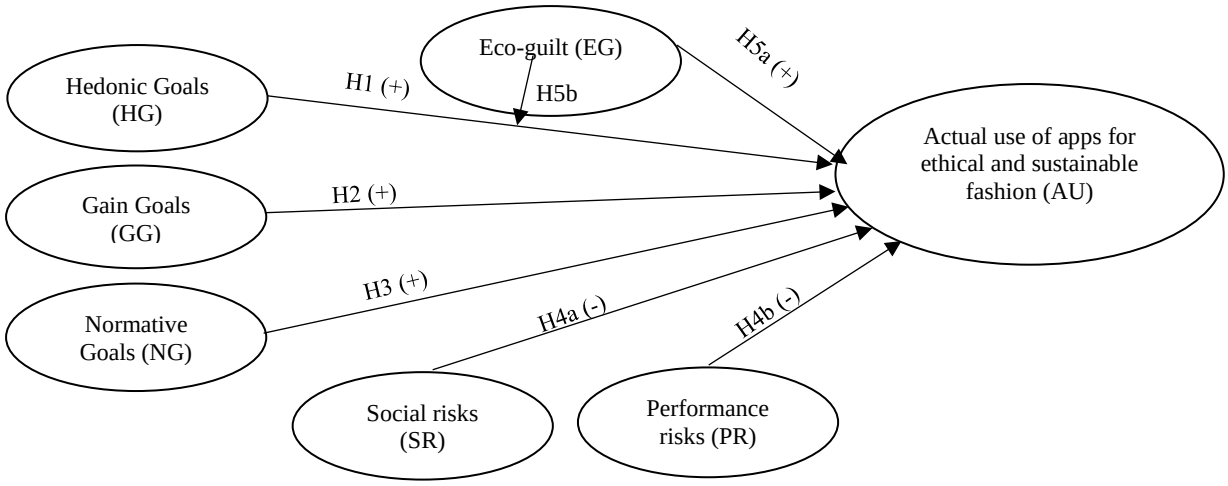
The current research is interested in the relationship between Eco-guilt and the actual use of apps for ethical and sustainable fashion and in the moderating effects of Eco-guilt on the relationship between hedonic goals and the actual use of apps for ethical and sustainable fashion.

H5a. The Eco-guilt positively affects the actual use of apps for ethical and sustainable fashion

H5b. The Eco-guilt moderates the relationship between the hedonic goals and the actual use of apps for ethical and sustainable fashion

Figure 1 shows the conceptual model investigated in this study.

Fig. 1: Conceptual model



Source: our elaboration

3. Research methodology

3.1 Measurements and data collection

An online questionnaire was submitted through *Google Forms* in the Italian context. The questionnaire was designed to collect participants' opinions, attitudes, and behavior regarding the use of apps for sustainable fashion in 23 items (Table 1). The respondents expressed their opinion on a Likert scale from 1 (corresponding to 'strongly disagree') to 7 (corresponding to 'strongly agree'). We collected 615 valid questionnaires, and respondents were all asked to specify the sustainable fashion app they use to buy clothes. As shown in Table 2, there is the prevalence of female respondents aged between 18 and 34; secondary school is the most common education level, and most of the respondents are employed or students; the sample seems to be very active in the usage of the apps, showing high frequencies in such sections. The most used application for sustainable fashion is Vinted, followed by Nuw and Vestiaire Collective.

3.2 Analysis approach

The data analysis was performed using *IBM SPSS Statistics 25* and *IBM SPSS AMOS 23.* To assess the extent to which the observed data correspond to the predetermined theoretical model that hypothesizes the causal relationships between the hidden factors and the observed variables (Mueller & Hancock, 2015) a Confirmatory Factor Analysis (CFA) was performed. After assessing the validity and reliability of the model, Structural equation modelling (SEM) was employed to test the hypotheses about the relationships explicated in Figure 1. Lastly, to assess whether there is a moderating effect of the Eco-guilt (EG) on the relationship between the Hedonic Goals and the actual use of apps for ethical and sustainable fashion (AU), the method of the interaction term was employed.

Tab. 1: Measurement items

Constructs	Items		Source
Hedonic goals	HG1	I could derive happiness and satisfaction when I use sustainable fashion apps.	Adapted from Tang *et al.*, 2020; Lang, & Zhang, 2019
	HG2	Compared to other consumption practices, sustainable fashion is more enjoyable.	
	HG3	Using sustainable fashion apps would be a great play activity.	
Gain goals	GG1	Sustainable fashion consumption practices are not too expensive.	Adapted from Barbopoulos & Johansson, 2017; Tang *et al.*, 2020
	GG2	Sustainable fashion consumption practices may improve my social status, making my life more decent.	
	GG3	Using sustainable fashion apps is not too complicated or strenuous.	
Normative goals	NG1	Using sustainable fashion apps is what my friends would expect me to do.	Adapted from Barbopoulos & Johansson, 2017; Tang *et al.*, 2020
	NG2	Using sustainable fashion apps does not violate my principles.	
	NG3	Using sustainable fashion apps is consistent with my personal and moral obligation.	
	NG4	Using sustainable fashion apps is liked by people who are important to me.	
Actual use of apps for ethical and sustainable fashion	AU1	How many times do you use sustainable fashion apps during a week? Where 1 = Not at all, 2 = Less than once a week, 3 = About once a week, 4 = 2-3 times a week, 5 = 4-5 times a week, 6 = About once a day, 7 = Several times each day.	Adapted from Moon & Kim, 2001
	AU2	How many hours do you use sustainable fashion apps every week? Where 1 = <1 h, 2 = 1-5, 3 = 5-10 h, 4 = 10-15 h, 5 = 15-20 h, 6 = 20-25 h, 7 = >25 h.	
	AU3	How frequently do you use sustainable fashion apps? Where 1 = Extremely infrequent, 2 = Quite infrequent, 3 = Slightly infrequent, 4 = Neither, 5 = Slightly frequent, 6 = Quite frequent, 7 = Extremely frequent.	
Social risks	SR1	I am worried about what others will think of the clothes that I buy on sustainable fashion apps.	Lang, & Zhang, 2019
	SR2	I am worried that my friends might think I look weird or funny in the clothes that I buy on sustainable fashion apps.	
	SR3	I will feel that the clothing I buy on sustainable fashion apps might not be in fashion.	
	SR4	I will not feel comfortable wearing the clothes that I buy on sustainable fashion apps in public.	
Performance risks	PR1	I am worried about the cleanness of clothing.	Adapted from Lang, & Zhang, 2019
	PR2	The quality of clothing will be poor.	
	PR3	I will not feel comfortable when wearing the clothing that has been worn by others.	
Eco-guilt	EG1	I want to hide my environmental impacts.	Bahja & Hancer, 2021.
	EG2	I feel worthless, powerless about my environmental impacts.	
	EG3	I feel humiliated, disgraced about my environmental impacts	

Source: our elaboration

Tab. 2: Sample profile

Sample profile (N= 615)	**Frequency**	**%**
Gender		
Male	185	30,1
Female	430	69,9
Age		
18-24	273	44,4
25-34	214	34,8
35-44	36	5,9
45-54	92	15
Education		
Secondary school	318	51,7
Bachelor's degree	115	18,7
Master's degree	169	27,5
Master (postgraduate program)	13	2,1
Occupation		
Student	268	43,6
Employee	303	49,3
Freelancer	36	5,9
Unemployed (looking for a job)	6	1
Others	2	0,3
Income per year (in Euro)		
No income	232	37,7
<10.000 euro	33	5,4
10.000,01 euro - 15.000 euro	4	0,7
15.000,01 euro- 20.000 euro	141	22,9
20.000,01 euro - 25.000 euro	65	10,6
25.000,01 euro - 30.000 euro	114	18,5
Not specified	26	4,2
Usage frequency		
1=never	0	0
2	0	0
3	0	0
4	3	0,5
5	80	13
6	141	22,9

7= always	391	63,6
During the week		
Never	0	0
Less than once a week	1	0,2
At least once a week	7	1,1
2-3 times a week	23	3,7
4-5 times a week	109	17,7
At least once a day	139	22,6
Many times during the day	336	54,6
Hours per week		
<1h	0	0
1-5h	2	0,3
5-10h	4	0,7
10-15h	20	3,3
15-20h	124	20,2
20-25h	181	29,4
>25h	284	46,2
Top 3 apps		
Vinted	179	29,1
Nuw	164	26,7
Vestiaire Collective	113	18,4

Source: our elaboration

4. Results

4.1 Descriptive statistics, CFA, Reliability and Validity analysis

Using *IBM SPSS Statistics 25*, we conducted the descriptive analysis first (mean, standard deviation, skewness, and kurtosis for each item), whose results are shown in Table 3. Skewness and kurtosis values for each item were between ±3 and ±10, respectively (Hair *et al.*, 2010). In detail, skewness values between -1.826 and 0.288 indicate a skewed distribution. The values lying between these ranges suggest that the distribution of the data may be skewed to the left (Arnold & Groeneveld, 1995). Kurtosis values between -1.890 and 2.846 indicate a change in the sharpness of the tails of the distribution. A kurtosis value around zero indicates that the distribution has tails similar to a normal distribution. Positive values indicate heavier tails and higher peaks than a normal distribution, while negative values indicate lighter tails and flatness (DeCarlo, 1997). These results are relevant to deciding whether a parametric or non-parametric test needs to be used (Orcan, 2020). Therefore, we opted for the Structural Equation Modelling (SEM).

Tab. 3: Descriptive analysis

Construct	Item	λ	Mean	Standard Deviation	Skewness	Kurtosis
Hedonic goals	HG1	0,93	5,79	1,379	-1,189	1,150
	HG2	0,935	5,88	1,341	-1352	1,737
	HG3	0,875	5,92	1,394	-1,480	2,015
Gain goals	GG1	0,73	6,62	0,675	-1,786	2,724
	GG2	0,745	6,52	0,807	-1,701	2,583
	GG3	0,779	6,62	0,695	-1,826	2,589
Normative goals	NG1	0,82	6,01	1,006	-0,603	-0,833
	NG2	0,808	6,26	0,764	-0,482	-1,144
	NG3	0,726	6,22	0,777	-0,413	-1,236
	NG4	0,652	6,29	0,750	-0,523	-1,059
Actual use of apps for ethical and sustainable fashion	AU1	0,676	6,5	0,735	-1,159	0,089
	AU2	0,741	6,25	0,969	-1,183	0,865
	AU3	0,644	6,16	0,938	-0,995	0,826
					-1,422	0,962
Social risks	SR1	0,65	4,09	1,074	-0,639	-0,872
	SR2	0,898	3,73	1,113	0,288	-0,745
	SR3	0,704	3,91	1,067	-0,329	-0,956
	SR4	0,835	3,66	1,012	0,267	-0,853
Performance risks	PR1	0,822	6,52	0,503	-0,127	-1,890
	PR2	0,839	6,33	0,763	-0,633	-0,622
	PR3	0,661	6,43	0,732	-0,878	-0,872
Eco-guilt	EG1	0,735	6,34	1,029	-1,692	2,686
	EG2	0,816	6,27	0,984	-1,550	2,846
	EG3	0,85	6,37	0,861	-1,080	-0,003

Source: our elaboration

Confirmatory Factor Analysis (CFA), a branch of SEM that focuses on measurement models, was employed to study how observed measures are related to latent variables. Performing the CFA, the goodness of fit of the model to the observed data is assessed (Brown & Moore, 2012). Table 4 shows the model fit indices: the Chi-square divided by the degrees of freedom (CMIN/df), the Goodness of Fit Index (GFI), the Incremental Fit Index (IFI), the Normed Fit Index (NFI), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA) and the p-value for Close Fit (PCLOSE) all matching the suggested values by Hair et al, 2010. Table 5 presents the results obtained by the convergent validity and discriminant validity assessments- on the main diagonal the Italic Values are shown. The values of the Cronbach's alpha, composite reliability (CR) and the average variance extracted (AVE) are all above the suggested threshold of 0.7, 0.6 and 0.5, respectively (Hair *et al.*, 2010). Even though the AVE of the actual use of apps for ethical and sustainable fashion registers a value of 0,473 which doesn't exactly match the threshold, it is still closer to the suggested value of 0,5 and, according to Fornell and Larcker (1981), if AVE is less than 0.5, but composite reliability is higher than 0.6, the convergent validity of the construct is still adequate. Therefore, it can be said that the reliability and validity of the model are assessed.

Tab. 4: model fit indeces

Model fit index	**Value**	**Suggested value (Hair *et al.*, 2010)**
CMIN	636,858	
df	276	
CMIN/df	2,307	≤ 3
GFI	0,926	> 0,90
IFI	0,957	> 0,90
NFI	0,927	> 0,90
CFI	0,957	> 0,90
TLI	0,949	> 0,90
RMSEA	0,046	≤ 0,08
PCLOSE	0,91	> 0,05

Source: our elaboration

Tab. 5: reliability and validity analysis

Constructs	**HG**	**GG**	**NG**	**EG**	**SR**	**PR**	**AU**
Hedonic Goals (HG)	*0,913*						
Gain Goals (GG)	0,346	*0,751*					
Normative Goals (NG)	0,667	0,36	*0,754*				
Eco-guilt (EG)	-0,071	0,086	-0,041	*0,801*			
Social risks (SR)	0,074	-0,011	0,091	0,045	*0,778*		
Performance risks (PR)	0,272	-0,018	0,268	0,037	0,023	*0,778*	
Actual use of apps for ethical and sustainable fashion (AU)	0,423	0,223	0,437	-0,007	0,067	0,16	*0,688*
Cronbach's alpha	0,937	0,791	0,834	0,837	0,872	0,795	0,774
CR*	0,938	0,795	0,839	0,843	0,857	0,82	0,729
AVE*	0,839	0,564	0,569	0,642	0,605	0,605	0,473

*CR= Composite reliability, AVE= Average variance extracted, Italic values= √AVE
Source: our elaboration

4.2 Hypoteses testing

The SEM analysis was performed using IBM SPSS AMOS 23 to test the relationship between the variables under investigation. To assess the statistical significance of the standardized regression weights (β), a bootstrap procedure was implemented with a bias-corrected interval of 95% (Hair *et al.*, 2014). Table 6 summarises the results obtained from the SEM. Not all hypotheses advanced proved to be significantly relevant. According to Hair *et al.*, 2014, only hypotheses registering a p-value below the threshold of 0,05 were accepted. Hedonic goals positively affect the actual use of sustainable fashion apps (β= 0.35, p-value <0.001). This is also true for gain goals (β= 0.127, p-value= 0.007). Normative goals show to positively affect the actual use of sustainable fashion apps as well (β= 0.343, p-value< 0.001). Consumers' perceived performance and social risks do not show

to negatively affect the usage of apps, as well as the Eco-guilt (p-values are greater than the suggested threshold of 0,05). Hence, H1, H2, H3 are supported, H4a, H4b, H5a are rejected.

To test the moderating effect of EG on the relationship between HG and AU, an interaction term was computed by multiplying the mean-centered variables. Following Schoemann & Jorgensen (2021), we first fitted the model without the interaction term to assess the model fit on this "main effects" model, and then we added the interaction term (interEGxHG), a function of the variables from the "main effects" model. Estimates were recalculated and a moderating effect of the EG on the relationship between HG and AU was found (β = 0,047, p- value = 0,006). The inclusion of the interaction term did not substantially alter the other model estimates (Table 7), but a higher R^2 in the presence of the interaction term- from an initial value of 0,18 to 0,52- suggests that the model could more effectively capture the complexities of the relationships among variables, leading to a better fit and more accurate predictions (Rubinfeld, 2000). Figure 2 and Figure 3 summarise the results. As Dawson (2014) suggested, Figure 4 shows the plot of this effect to enable an easier interpretation of the interaction.

Tab. 6: SEM results

Parameters			β	Lower	Upper	SE	P-value	Hypotesis
AU	←	HG	0,35	0,175	0,523	0,029	< 0,001	H1 supported
AU	←	GG	0,127	0,005	0,23	0,052	0,007	H2 supported
AU	←	NG	0,343	0,226	0,469	0,078	< 0,001	H3 supported
AU	←	PR	0,032	-0,041	0,105	0,028	0,407	H4a not supported
AU	←	SR	0,056	-0,031	0,149	0,053	0,185	H4b not supported
AU	←	EG	0,01	-0,065	0,078	0,032	0,808	H5a not supported

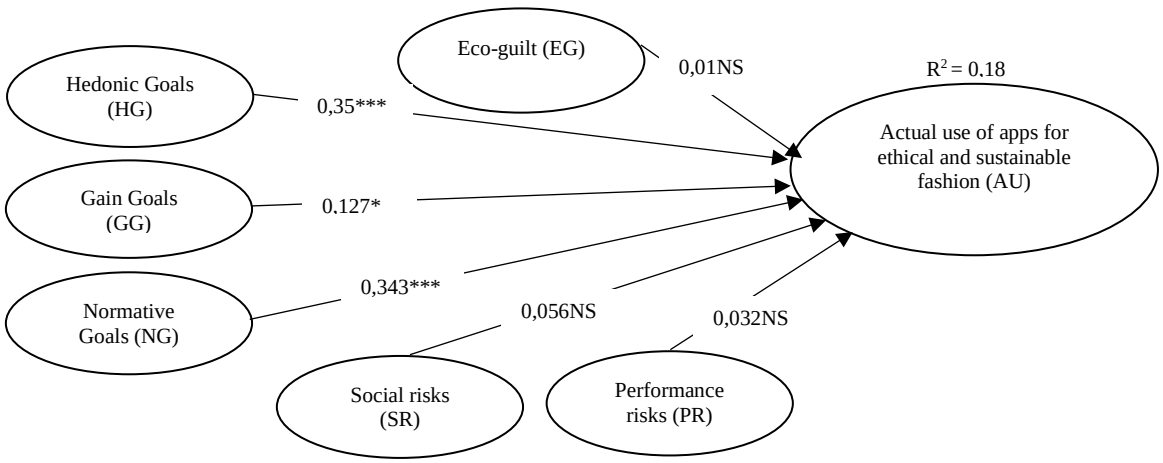
Source: our elaboration

Tab. 6: SEM results with interaction

Parameters			β	Lower	Upper	SE	P-value	Hypotesis
AU	←	HG	0,329	0,181	0,519	0,071	< 0,001	H1 supported
AU	←	GG	0,134	0,015	0,255	0,052	0,009	H2 supported
AU	←	NG	0,24	-0,008	0,493	0,109	0,027	H3 supported
AU	←	PR	0,052	-0,059	0,17	0,053	0,325	H4a not supported
AU	←	SR	0,016	-0,035	0,072	0,027	0,555	H4b not supported
AU	←	EG	0,01	-0,065	0,067	0,031	0,749	H5a not supported
AU	←	interEGxHG	0,047	0,005	0,1	0,017	0,006	H5b supported

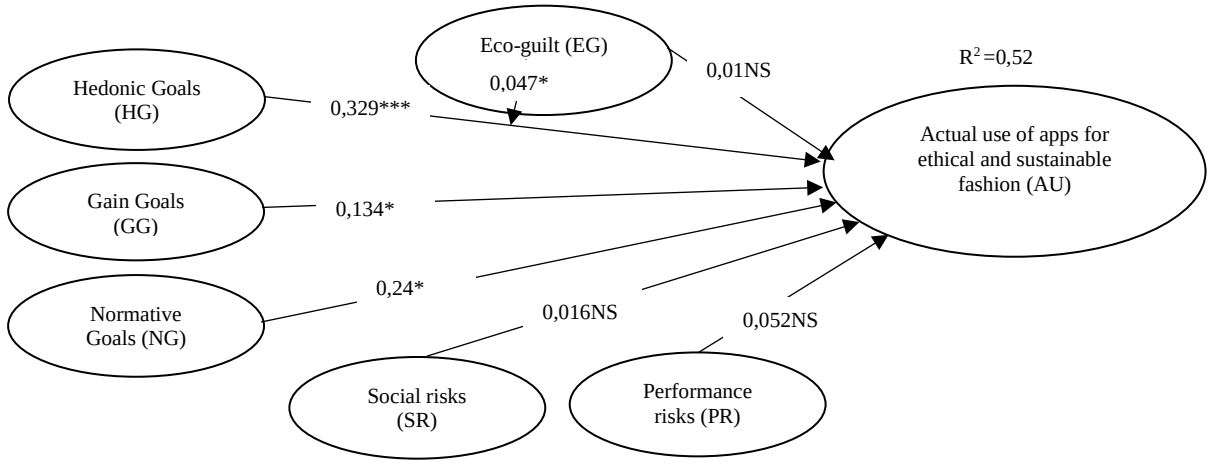
Source: our elaboration

Fig. 2: Results of hypotheses testing



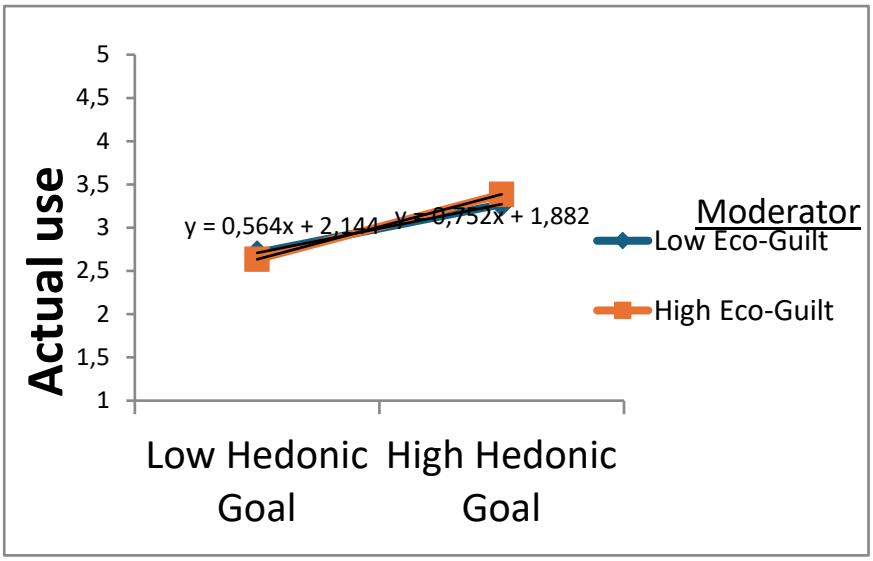
NOTE: *= p-value ≤ 0,05, ***= p-value ≤ 0,001, NS= Not significant
Source: our elaboration

Fig. 3: Results of hypotheses testing with interaction



NOTE: *= p-value ≤ 0,05, ***= p-value ≤ 0,001, NS= Not significant
Source: our elaboration

Fig. 4: Moderating effect



Source: our elaboration based on Dawson (2014)

5. Discussion

Our study contributes to extant literature on mobile applications for ethical and sustainable fashion practices by deepening the understanding on the factors influencing the usage behavior and developing the knowledge about the impact of emotions like Eco-guilt. From a theoretical point of view, recalling Lindenberg and Steg's Goal-framing Theory (2013), a normative perspective was adopted to identify the antecedents of the actual use of apps for ethical and sustainable fashion.

It was found that Hedonic Goals, Gain Goals and Normative Goals positively influence the actual use of apps for ethical and sustainable fashion. Consumers feel like they can derive happiness and satisfaction during ethical fashion consumption practices, they perceive benefits from using the app and they decide to use sustainable fashion apps because their friends and relatives expect them to adopt sustainable practices and, again, because sustainable fashion consumption practices are consistent with their personal and moral norms. According to Lindenberg's and Steg', pro-environmental behaviour must be guided by values and norms: the sample in this research is clearly guided by social norms, in other words by the goal of “acting appropriately” not only because the

reference group and society require it, but also because they have internalised (by embracing the principles of ethicality and sustainability) the need for everyone to work in the common interest. These scholars believe, in fact, that it is fundamental to give greater support to social motivations so that they are not overshadowed by hedonic or gain goals and to give greater stability to norm-guided behaviour. Greater stability of norm-guided behaviour translates into greater stability of pro-environmental behaviour: the more stable the social norms that guide respondents' behaviour, the greater the stability of the ethical and sustainable behaviour they adopt.

Surprisingly, and against previous research (e.g., Tang *et al.*, 2020), consumers do not perceive any risk preventing them from engaging in the use of the apps for sustainable fashion. Concerns regarding product quality (performance risks) or other people's negative opinions (social risks) are not significant barriers to the adoption of such apps. This could be explained by the fact that persuing a sustainable behavior consistent with one's own values and the values of the group could lead to minimize or ignore the perceived risks. Moreover, our sample mostly uses Vinted, Nuw and Vestiaire Collective, C2C platforms allowing users to interact between them through chats and blogs. Therefore, positive WOM received by another customer could be a factor contributing to higher trust and to the minimization of perceived risks (Söderlund & Rosengren, 2007).

The Eco-guilt does not positively affect the actual use of apps for ethical and sustainable fashion, but it was found to have a moderating effect on the relationship between the Hedonic Goals and the Actual use of apps. The lack of a direct positive effect of Eco-guilt on app usage challenges the assumption that guilt-based appeals drive sustainable behavior (Haj-Salem *et al.*, 2022; Mallett, 2012). Instead, its moderating role between hedonic goals and actual use suggests that while guilt alone does not push consumers to use these apps, it enhances the impact of hedonic experiences on behavior. Eco-guilt does not directly change the level of actual use, but it influences how the hedonic goal affects it. As shown in Figure 4, an increase in the hedonic goal leads to a greater increase in actual use among those with high Eco-guilt. In other words, when the pleasure or enjoyment associated with using the app increases, people with high Eco-guilt increase their usage more significantly compared to those with low Eco-guilt. This suggests that, in line with Wang & Wu (2016) and Wang *et al.* (2017), people with high Eco-guilt become more engaged when they perceive a higher hedonic benefit. For individuals with high Eco-guilt, pleasure becomes a stronger justification for increasing use, whereas for those with low Eco-guilt, the relationship between pleasure and use remains more linear.

These findings have practical implications for managers adopting mobile applications as marketing vehicles and promotional tactics. As pointed out by Stocchi *et al.*, (2022), mobile apps as strategic tools generate value by enhancing customer engagement through interactive experiences, real-time interactions, and personalized contents, influencing customer decisions and behavior. Additionally, apps collect valuable customer data, allowing businesses to refine strategies and offer hyper-personalized experiences. Ultimately, mobile apps create competitive advantages by improving customer journeys, fostering loyalty, and increasing brand visibility. Building on these insights, marketers should highlight not only the practical benefits of sustainable fashion apps, such as cost savings and access to eco-friendly products, but also the hedonic component they bring and the alignment with personal and collective ethical values they foster. Moreover, stated that consumers are not overly concerned about the potential risks, marketers can focus less on mitigating perceived risks and more on enhancing the perceived benefits of using sustainable fashion apps. Moreover, giving the results on Eco-guilt, marketers should blend emotional appeals with engaging, enjoyable features. Overall, these insights highlight the need for not only experience-driven design, but also value-driven incentives and emotional triggers to maximize app usage in sustainable fashion.

6. Conclusions and limitations

To summarize, the present study reveals that goals positively influence the usage of apps for ethical and sustainable fashion. Perceived risks do not prevent consumers' from engaging in their usage and Eco-guilt dos not positively affect the actual use of apps for ethical and sustainable fashion but was found to positively moderate the relationship between the hedonic goals and the actual use of apps.

this study is not without its limitations. First, the sample is exclusively Italian, limiting the generalizability of the findings across different cultural and economic contexts. Future research should explore cross-cultural comparisons to determine whether similar motivational patterns exist in other regions. Second, self-reported survey data may be subject to social desirability bias, as respondents might overstate their commitment to sustainability. A combination of qualitative approaches (such as interviews or behavioral tracking) could provide a deeper understanding of consumer motivations and actual app usage patterns. Lastly, while this study focuses on Goal-Framing Theory and Eco-Guilt, other psychological and behavioral factors-such as habit formation, trust in digital platforms, and peer influence-could further enrich our understanding of sustainable fashion app adoption. Future research should aim to expand the scope by incorporating longitudinal studies that track behavioral changes over time, investigating the long-term impact of goal-framing and guilt appeals. Additionally, exploring the effectiveness of app features (e.g., gamification, rewards, social sharing) in driving sustainable behaviors could offer actionable insights for industry practitioners. By deepening our understanding of the psychological mechanisms driving sustainable fashion app usage, this research contributes to both academic discourse and practical applications, paving the way for more effective strategies that align digital innovation with sustainability goals.

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Reducing Food waste through the secondary shelf life indication: exploring consumer motives and behaviors[1]

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Abstract

Frame of the research. *Food waste is an increasing issue worldwide and households are responsible for the majority of it. Notwithstanding scientific advancements in the understanding of the drivers of consumer food waste, much it is still to be explored.*

Purpose of the paper. *The paper explores the motives and behaviors of consumers in wasting food. In addition, the study focuses on the role of the secondary shelf life (SSL) - indicated on labels as 'best used within x days of opening' - and its awareness and use by consumers.*

Methodology. *The paper employs a qualitative approach based on in-depth interviews and the analysis of diaries hold by a sample of households involved in the study and related to a selected number of product categories.*

Results. *The analysis of the in-depth interviews and diaries indicates that consumers utilize sensory evaluation methods to assess product quality beyond the expiration date.*

Research limitations. *This paper describes the first explorative results of a wider project on the topic. The number of in-depth interviews should be increased. The diaries analysis should be more thorough.*

Managerial implications. *Producers and policy makers should be aware that the SSL is partly ignored by households: accordingly, the SSL rules should be revised in order to extend its length to the aim of reducing waste.*

Originality of the paper. *Despite the increasing number of studies on the roots of consumer food waste, the role of the SSL is not adequately investigated.*

Key words: *Food Waste; Secondary Shelf Life (SSL); consumer behaviour and motives; in-depth interviews; diaries.*

[1] Although the study is the result of the joint work of the authors, it can be analytically attributed to each of them in the following way: Elisa Martinelli authored parr. 4 and 6; Francesca De Canio extended parr 2 and 3; Elena Sarti developed parr. 1 and 5.

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1. Introduction

Food waste (FW) is an issue of increasing worldwide relevance. Globally, an estimated 19% of food is wasted at the retail and consumer levels (UNEP, 2024). In the EU, over 59 million tonnes of food waste (132 kg/inhabitant) are generated annually (Eurostat, 2024), with an associated market value estimated at 132 billion euros (SWD, 2023). This is a trend featuring also the national context: Waste Watcher report (2024) informs about an increase by 45.6% of the FW in Italy.

According to the Waste Framework Directive (2008/98/EC), food waste is: "any food and inedible parts of food, that has entered in the food supply chain, that then has been removed or discarded from the food supply chain or at the final consumption stage, that is finally destined to be processed as waste, either separately collected as food waste or collected in municipal waste; moreover, food waste is any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed". WRAP (2022) proposes a definition of consumer FW that differentiates it into the following three different groups:

a) Avoidable: food thrown by mistake but still completely edible;
b) Possibly avoidable: food that can be eaten if cooked differently or that one person cannot eat, but others can (such as bread crumps or potato peel;
c) Unavoidable: the part of our food that is not made for human consumption (meat bones, egg peels and so on).

FW has been included in the 2030 Agenda of the United Nations (UN) among the 12 goals aimed at assuring a more sustainable development. On the European side, in 2012 the FW issue became a political subject with a motion of the European Parliament planning a reduction of 50% of food losses by 2025 (Pelt *et al.*, 2020).

FW occurs in all stages of the food supply chain, but private households have been found to be responsible for a large part of it: in fact, households generate more than half of the total food waste (54%) in the EU (accounting for 72 kg per inhabitant) (Eurostat, 2024). Notwithstanding scientific advancements in the understanding of the drivers of consumer food waste (Vittuari *et al.*, 2023; Stangherlin and De Barcellos, 2018), much is still to be understood on the determinants of consumer food waste and the underlying factors that encourage, drive or impede food waste behaviours and practices (Graham-Rowe *et al.*, 2014, 2015). In particular, we aim at understanding the role of the secondary shelf-life (SSL) indication, defined as the period of time after opening the package during which the food product maintains a required level of sensory, hygienic and nutritional quality. The SSL, indicated on labels as 'best used within x days of opening', could lead to domestic food waste if not properly evaluated (Nicosia *et al.*, 2021). However, studies on the effect of the SSL indication on consumer behaviour lacks. The current paper addresses this issue, with the aim to explore the roots of consumer motives and behaviours in wasting food, with a special focus on the role of the SSL indication. This is performed adopting a qualitative approach. Considering that consumer behavior is related to the specificities of product categories, our work identified five food categories through an in-store census and then administered in-depth interviews and diaries to samples of consumers.

2. Household FW: A Literature Review

The household food waste is often the result of behaviours and habits which are difficult to analyse and reshape (Secondi, 2019; Pelt *et al.*, 2020). A growing stream of literature has been developing in order to better understand the drivers of food waste carried out by the households and the attitudes characterising these behaviours, analysing the food waste concept from two different perspectives (Schanes *et al.*, 2018). On the one hand, a more psychological approach looks at food waste as a behaviour, trying to investigate cognitive and individual factors that underlie it (e.g: Stefan *et al.*, 2013; Graham-Rowe *et al.*, 2015). This is the case of studies dealing with, among others, the Theory of Planned Behaviour (Ajzen, 1991), where attitude, subjective norms and perceived behavioural

control influence intention that directly affects behaviour. No clear results have been found regarding the relationship between intention not to waste food and the actual behaviour. While Graham - Rowe *et al.* (2015) highlight a significant correlation among the two variables, Stefan *et al.* (2013) identified the so-called "attitude behaviour gap", by which intention to reduce food losses are weakly linked to the effectual behaviour. In fact, despite consumers usually state a high intention to reduce their food waste, this will often does not translate into action (Stefan *et al.*, 2013). On the other hand, following a more sociological approach, food waste is driven by a complex of habits and practices put in place by the single, but affected by the society and the organizations that they are involved in (Cappellini and Parsons, 2012). In this case, studies focus the attention around the social practice theory, going beyond the individual motivation and analysing the everyday life in which they immerse themselves. Indeed, several reasons boosting food waste behaviour within households have been identified. Among them there is a lack of planning in groceries shopping and stocking, poor cooking skills, lack of leftovers management and overcooking and overbuying practices (e.g.: Farr-Wharton *et al.*, 2014; Priefer *et al.*, 2016; Ponis *et al.*, 2017; Gaiani *et al.*, 2018; Ellison and Lusk, 2018). Generally, consumers consider throwing away food as improper behaviour (Porpino *et al.*, 2015). Concern about food waste is a significant predictor of food waste reduction (Principato *et al.*, 2015) and plays an important role in the intention to reduce food waste (Mondejar-Jimenez *et al.*, 2016; Stancu *et al.*, 2016; Stefan *et al.*, 2013). Financial concerns associated with the money that is lost when throwing away food are commonly mentioned as the main motivation for minimizing food waste (Graham-Rowe *et al.*, 2014), stronger than environmental and social concerns (Graham-Rowe *et al.*, 2014; Stancu *et al.*, 2016; Principato *et al.*, 2015; Stefan *et al.*, 2013). Several studies also suggest that guilt may act as an important motivation underlying the reduction of food waste (Quested *et al.*, 2013), while self-affirmation has the potential to promote engagement with pro-environmental behaviour: Graham - Rowe *et al.* (2019) discovered that compared to their non-affirmed counterparts, participants in the standard self-affirmation condition wasted less fruit and vegetables.

Sociodemographic factors have been also studied, such as the level of education or age. Younger persons, for instance, focus more on the financial dimensions of food waste while older people indicate more concern about its social and environmental consequences (Blichfeldt *et al.*, 2015; Lanfranchi *et al.*, 2016). Some studies, however, show that people over 65 actually are less engaged with global environmental issues (e.g. Quested *et al.*, 2013). Subjective norms (commonly approved or disapproved behaviours in a culture) seem to have no influence on food waste behaviour per se (Graham-Rowe *et al.*, 2015; Stefan *et al.*, 2013; Visschers *et al.*, 2016). Personal norms (feeling obliged not to waste food), in contrast, turn out to be a significant direct predictor of the amount of food wasted, implying that if households hold strong personal norms that oppose food waste, they tend to waste less (Visschers *et al.*, 2016). On the contrary, perceived behavioural control has a strong impact: consumers who trust in their ability to reduce their waste and consider reducing food waste under their control, are more likely to reduce food waste directly or at least have a higher intention to do so (Graham-Rowe *et al.*, 2015; Mondejar-Jimenez *et al.*, 2016; Stancu *et al.*, 2016; Stefan *et al.*, 2013; Visschers *et al.*, 2016).

A growing body of literature has investigated food-related practices and routines - planning,

shopping, storing, cooking, eating, and managing leftovers - in the context of food waste generation. For instance, careful planning of grocery shopping has been found as an effective tool to prevent overbuying, and consequently, food waste (Secondi *et al.*, 2015). Overprovisioning of food seems to be one of the most prominent reasons leading to superfluous food and waste (Radzyminska *et al.*, 2016).

3. SSL and FW

Food labelling represents an important food strategy tool, acting as a referential point of information for customers. Some surveys indicate that the most important information for consumers

on food labelling is the date of food expiration (Nakov *et al.*, 2017). On the contrary, other works state that these types of food labelling concerning food shelf life are often confusing and probably leading to increased level of food waste (Anthesis *et al.*, 2018; Wilson *et al.*, 2017). Motivations linked to the lack of knowledge by consumers about expiring dates labelling and shelf life are also recognised as food waste drivers (e.g.: Hall-Phillips and Shah, 2017; Secondi, 2019). The food labelling confusion with 'use-by date (UBD)' and 'best before date (BBD)' falls into this context (Milne, 2012). Shelf life is the recommended length of time, after the production and the packaging, for which a product, that is stored in the right and suggested conditions, remains edible and maintains the minimum level of quality (Nicoli and Calligaris, 2018). Food companies are required by the European law to attribute a shelf life to their products under defined storage conditions. The European regulation 1169/2011 recognizes the date of minimum durability (or "best before" date) as the date "until which the food retains its specific properties when properly stored", specifying that in case of high perishable foods (as for example milk) it should be replaced by the "use by" date. Moreover, the EU, differently from the United States, has compulsory labelling requirements such as making labels understandable, legible, and indelible, following a precise date format (i.e., best before day/month/year or use by day/ month/year). However, extant literature has demonstrated how differences between indications written on labels are often ignored by consumers (e.g.: Hall-Phillips and Shah, 2017; Secondi, 2019). The qualitative study of Hall-Phillips and Shah (2017) found that no clear meaning of expiration dates emerged among the participants, who referred to the expiration dates as having arbitrary meanings, differing also in the perspectives about what expiration dates signify. To rend even more complex the expiring date labelling, we need to acknowledge the existence of the so-called secondary shelf-life, employed only for a restricted number of products, defined as the period of time after opening the package during which the food product maintains a required level of sensory, hygienic and nutritional quality. The SSL is indicated on labels as 'best used within x days of opening'.

Albeit researches have been focusing on the expiring dates such as "use by" and "best before", determining the factors underlying food waste behaviours, little attention has been given to the secondary life label. In particular, extant literature presents a few examples of studies analysing the SSL but from an industry viewpoint (Nicoli and Calligaris, 2018) and in order to model the dependence of the SSL on the residual shelf life (Del Nobile and Conte, 2023), while no studies analyse the topic from the consumer viewpoint. The reasons for the lack of interest on this topic could be related also to the absence of a specific regulation. The European law requires at the article 26 of the regulation 1169/2011 that the right instructions about the correct conditions of storing and the time length for the product consumption after it is opened are indicated, leaving the specific indications to the discretion of the producer without clear guidelines to be followed. The fact that the dates and the storage conditions are left to the producers and a strong regulation framework is lacking contributes to bring high variability in the indications which consumers can find on the labels. Considering the technologies of the supply chain allowing food to maintain its quality for a longer period of time after it is opened than how long it used to keep before (Nicoli and Calligaris, 2018), a focus on this topic appears crucial in order to face with food waste correlated problems and increase the consumer awareness.

4. Data Collection Methods

To study how consumers waste food and the reasons why, with a special focus on the SSL, a multi-steps approach has been employed.

First of all, considering that consumer behaviour differs per product category and in the lack of common regulation guidelines, we accomplished a census of products for which indications on the expiry date after opening (SSL) are given.

Second, in-depth interviews were performed in order to investigate consumption and waste behavior for the above product categories.

Third, 28 households were involved in keeping diaries of the above food bought, stored, cooked and wasted.

4.1 The census of SSL product categories

The census has been performed collecting information on five selected food product categories which have to display the SLL, namely the following:

- Tomato Sauce.
- Long-life cow milk.
- Long-life vegetable milk.
- Fresh Pasta sauce: "Pesto alla Genovese".
- Preserved Egg whites.

A skilled young researcher visited a number of supermarkets and hypermarkets of different Italian grocery retailers to identify the SKUs belonging to the categories analyzed in the project with the aim of collecting information on the labelling related to the method of use after opening, the expiry date and the format of the product, as well as the brand and positioning of the product in-store. The census identified a total of 190 SKUs. For many packaged products, the "storage methods" on the label suggest consumption within a few days of opening, which even becomes 48-72 hours for some more perishable products (egg whites), or 1-2 weeks for other product categories (Fresh pesto).

4.2 The in-depth interview design

Once identified the specific product categories of interest and the related SKUs featured by the SLL, the second phase of the research design took place.

In-depth interviews were administered to nine individuals: 8 female and 1 male, aged 23 to 60 years-old (average age equals to 41 years-old), 2 living alone and the rest in families composed by 2 to 6 people. The interviewees were recruited taking into consideration to select different socio-demographic features.

The interviews were recorded, then thoroughly transcribed and analyzed by 2 researchers. The interviews last from half- an hour to 1 hour, on average.

The protocol of the interview included the following main questions for each of the five-product categories investigated (in accordance with the use stated by the interviewee):

- How often do you consume the product "X"?
- Do you pay attention to the expiry date?
- Do you pay attention to the labelling: "Once opened, please consume in y days after opening"? Do you know its meaning?
- In which way do you store it after opening?
- Which uses do you make of the product "X"?
- Can you describe the procedure you apply when using the product "X"?
- How much time does the product "X" stay out of the fridge when in use?
- How do you dispose the product "X" when it is not finished but also not good enough for consumption?
- How do you dispose the packaging of product "X"?

As our study intends to understand in depth the overall process of use at the household of the products with SSL, we supported the interviews with some slides and cards reporting different processes of using them, in order to identify some "Routines of use", showed as follows:

a) Removal from the refrigerator, opening, product withdrawal, reclosing, repositioning in the refrigerator, consumption.

b) Removal from the refrigerator, opening, product removal, consumption, reclosing, repositioning in the refrigerator.
c) Removal from the refrigerator, opening, product removal, reclosing, consumption, repositioning in the refrigerator.

4.3 The diaries method

A subsequent analysis was executed to gain insights into consumer food waste at the household level. This investigation evaluates food consumption and waste patterns among a sample of consumers, relying on self-reported diary data. Diaries are frequently employed to gather data regarding household food waste (Quested *et al.*, 2020) as they tend to be more accurate and "real" than survey data (Giordano *et al.*, 2019).

The study emphasizes the identification of similarities and discrepancies in consumption and waste across the five food product categories previously identified. The methodology is grounded in a qualitative framework, utilizing content analysis of open-ended responses derived from the diaries. Participants (N. 28) were encouraged to document their food consumption and waste habits over a designated period on an excel file uploaded on their mobile for a 2-weeks period of time. The participants were skilled with an informal call and equipped with a diary protocol reporting the guidelines to follow. Specifically, participants were encouraged to report the expiry date of the product and the SSL, to describe in detail the behavior adopted if the product has exceeded the suggested SSL: do they throw it away? Do they smell it and if they don't smell any particular odors, do they use it? Do they boil it? Do they give it to their animals? The description of the sequence of actions with which the product is used was requested too, giving examples of possible sequences such as: e.g. sequence 1: take from the pantry; place near the stove; open and use for cooking; keep the product open for X minutes; put it in the fridge; e.g. sequence 2: take it out of the fridge, smell it to see if it is still good, open and pour it into the glass, drink it, put it back in the fridge straight away… etc.

Information concerning packaging types and waste disposal methods were also collected. Participants were asked to detail the reason why and where and how they dispose of it (sink, organic waste, unsorted waste collection). The same indication was asked for the packaging, as the disposal methods can be different: do they separate the cap and the glass? Do They wash the packaging or do they throw it away like that?

Table 6 delineates the demographic characteristics of the participants. The households involved in the study were selected on the basis of the product categories that the interviewees usually consumed (at least three of the product categories analysed by the project) and trying to select different ages and compositions of the family in order to guarantee a sample as heterogeneous as possible.

Table 6: Demographic characteristics of the households

	n. components x household	**Age_1**	**Sex_1**	**Age_2**	**Sex_2**	**Age_3**	**Sex_3**	**Age_4**	**Sex_4**	**Age_5**	**Sex_5**	**Age_6**	**Sex_6**
1	3	55	M	55	F	17	F						
2	4	27	F	61	M	57	F	23	M				
3	4	27	F	59	M	59	M	19	M				
4	1	25	F	5	6	7	8	9					
5	2	30	F	29	F								
6	1	65	F										
7	2	27	F	30	M								
8	4	48	M	44	F	12	F	8	M				
9	3	51	F	20	M	16	F						
10	3	61	M	56	F	28	M						
11	5	55	F	56	M	26	M	23	M	15	M		
12	5	39	F	38	M	7	F	4	F	1	F		
13	4	44	F	42	M	13	M	11	F				
14	2	31	F	TBD	M								
15	3	42	F	50	M	12	M						
16	4	58	F	60	M	22	M	18	M				

17	3	54	F	59	M	25	M						
18	2	25	F	60	M	60	F						
19	1	23	F										
20	2	27	M	27	F								
21	4	54	F	55	M	13	F	18	M				
22	3	39	F	63	M	63	F						
23	1	28	F										
24	3	56	F	TBD	M	14	F						
25	6	50	F	52	M	23	M	21	M	16	F	12	M
26	5	27	F	25	M	65	M	55	F	22	F		
27	2	28	M	23	F								
28	1	27	F										

5. Results

5.1 The main results emerged from in-depth interviews

The most used product is long-life cow milk, with eight out of nine people affirming its consumption. Pesto, together with tomato sauce, is at the second place, with seven out of nine consumers: both products are employed in a similar way. Six out of nine of the interviewees, confirmed that they use long life vegetable milk, used and consumed in a similar way to cow and vegetable milks.

In the following paragraphs, the results for each type of products are going to be analyzed, following the answers that were given in the interview.

5.1.1 Tomato sauce

As predictable, all the interviewees stated to use tomato sauce as a condiment for pasta (see Table 1) in packaging storing 200gr (8), to 1 liter (5, 6, 7). The mostly used typology of packaging is the glass bottle with an aluminum cap (1, 5, 6, 7, 9). Only one person refers to use Tetrapak (2), and one uses aluminum cans (8).

Regarding the expiry date, most of the interviewed pay attention to it, but some affirmed to only look at it when buying the product. The only one not paying attention to the expiry date and SSL is the interviewee number 8, affirming that the product is used in the week in which it is bought so there is no need to pay attention to SSL.

Most of the people pay attention to the SSL in the same way they do with the expiry date, even if interviewee n. 1 do not consider it reliable so her household tend to ignore it.

As for the routine of use 5, 6, 7 and 8 use the methodology C, while 2 and 9 use A. The only one having a different routine from the rest of the sample is number 1, using letter B. On average, the product is kept outside of the fridge for 10 minutes.

Number 5 stated that in her household it never happens that a product stays in the fridge until it is expired, so they only have to throw the pack of the tomato sauce.

Most of the interviewees affirmed that if the product exceeds the expiry date, they will still consume the product between a few days after, if it passes a personal inspection regarding the visual and olfactory aspect. Only number 1 said that she also inspects the texture of the product in addition to the smell and the look of it. The person who would consume the product even after 15 days after the SSL is interviewee number 6.

What is important to be clarified is also how consumers dispose the product before throw it away. Interviewees n. 1, 6, 7 and 8 dilute the product with water before throwing it in the sink. Number 9 affirmed that they do not really throw the product in the sink: if there is not the presence of mold, they dilute the product and proceeds to consume it by putting it in the pot where they are cooking the rest of the sauce. If there is the presence of any mold, they throw it in the sink, without diluting it. The way the pack is thrown, depends also on the rules of the town in which the interviewees leave. For example, interviewees n. 1, 6 and 9 throw the glass of the pack in the “Glass bin”, while the cap,

being aluminum has to be thrown in the plastic bin. Others, such as interviewees n. 5 and 7, throw both the glass and the aluminum cap in the "Glass bin". Others, such as number 2 and 8 use the plastic bin as their packs are made of Tetrapak (2) and aluminum (8).

Table 1: Tomato sauce

	Frequency of use	Packaging size	Package type	Attention paid to "expiry date"	SSL	Use of the product	Routine of use	Time spent outside of fridge	Consumption if expiry is exceeded	Disposal of the produc	Disposal of the packaging
1	Weekly	700 g	Glass bottle with aluminum cap	Yes - when buying only	Used to, not anymore	Pasta	B	30 minutes to 1 hour	Visual and olfactory inspection / Texture check	Sink after dilution	Glass and plastic (previously washed)
2	2x Week	250 g	Tetrapak	Yes, always	Yes, always	Pasta	A	1 Minute	Few days- Visual and olfactory inspection	Organic	Plastic
3	/										
4	/										
5	5x Month	1 L	Glass bottle with aluminum cap	Not always	Yes - when buying only	Pasta	C	15 Minutes	Does not happen	Does not happen	Glass (previously washed)
6	2/12 Months	1 L	Glass bottle with aluminum cap	Yes, always	Yes, always	Pasta	C	10 Minutes	15 Days - Visual and olfactory inspection	Sink after dilution	Glass and plastic (previously washed)
7	1x Week	1 L	Glass bottle with aluminum cap	Yes - when buying only	Yes - when buying only	Pasta	C	10 Minutes	Yes after Visual and olfactory inspection	Sink after dilution	Glass (previously washed)
8	3x Week	200 g	Aluminum cans	No	No	Pasta	C	5 Minutes	/	Sink after dilution	Plastic
9	2x Week	750 g	Glass bottle with aluminum cap	Yes, always	Yes, always	Pasta	A	Cooking time	Few days- Visual and olfactory inspection	Sink	Glass and plastic (previously washed)

5.1.2 Long-life cow milk

All the interviewees who affirmed to consume milk, do it on a regular basis (see Table 2). The average packaging is 1-liter size; only number 8 consumes half a liter of milk. Most of the interviewees use a Tetrapak bottle with a plastic cap; however most of them stated that in case of price promotions at the store on milk with another kind of packaging, they would change their purchase. Interviewees n. 2 and 3, however, stated that they normally prefer the plastic bottle to the Tetrapak one.

As for the other products, our interviewees tend to pay attention to the "expiry date", mostly when buying the milk, while the SSL is not as important. In fact, interviewee n. 2 stated that they do not pay attention to it at all, while 5 and 6 do not consider it as reliable as the "expiry date".

While for tomato sauce there was a uniform way of consuming the product, long-life cow milk varies in the use. Interviewees use it for breakfast with coffee or cereals, but also to make yogurt (4). Milk is used also for cooking, as it can be a part of many recipes such as white sauce, smashed potatoes and so on.

Interviewees n. 4, 8 and 9 stated that they put the milk in the fridge right after using it for cooking, while 1, 6 and 7 keep the milk on the table during the whole meal. People who have a similar way of using milk as letter A, tend to keep the milk outside of the fridge for five to ten minutes, while those who can be assimilated to letter B, from ten to twenty minutes. Lastly, we have those that are described by letter C. It is interesting to see in this case, how the time spent outside of the fridge goes from thirty minutes to also larger periods of time such as one hour and a half (5).

Regarding the consumption of the good after its expiry date, interviewee n. 4 does not consume the milk if it is expired and therefore throws it directly in the organic bin. It was also stated that in case the mold is really heavy, it can also be thrown in the WC, as considered dangerous. All the other interviewees stated that after a personal visual, olfactory or tasting inspection they will consume the milk after a few days from the expiry date, while interviewee n. 1, 6 and 7 stated that they would consider consuming the milk after the upon said inspection also after 7 days from expiry.

Lastly, it is interesting to observe the way the sample deals with the disposal of the packaging. While for number 3 it never happens that some of the milk has to be thrown, the others (with exception of interviewee n. 4) throw the milk directly in the sink, without diluting it, because as it is a liquid it is considered similar to water. Interviewees n. 5 and 6 do not recycle the Tetrapak box, so they throw it in the non-recyclable bin, while the interviewees n. 1 and 4 recycle it by putting the box in the papers bin and the cap in the plastic. Interviewees numbers 3, 7, 8 and 9 throw the whole box, together with the cap, in the plastic bin, according to the rules of their towns.

Table 2: Long-life cowmilk

	Frequency of use	Packaging type and size	Attention paid to "expiry date"	SSL	Use of the product	Routine of use	Time spent outside of fridge	Consumption if expiry is exceeded	Disposal of the produc	Disposal of the packaging
1	daily basis	1 liter/depends on offers: tetrapak	Yes, when buying	Yes, when buying	Breakfast	B	10 to 30 minutes	Visual inspection / Tasting after 7 days	Sink	Plastic and Paper
2	/									
3	3xWeek	1 liter / plastic	Yes	Yes, mostly when opened	Breakfast	C	30 minutes	Few days, if still closed	Does not happen	Plastic
4	Weekly	1 liter tetrapak, with plastic cap	Yes, always	Yes, always	YOGURT	A	5 / 10 Minutes	No, thrown away after expiry	Organic	Plastic and Paper
5	Weekly	1 liter tetrapak, with plastic cap	Yes, when buying	No, not reliable	Breakfast	C	1 hour / 1 hour and a half	Few days, visual inspection	Sink	Non-recyclable
6		1 liter tetrapak, with plastic cap	Yes, when buying	No, not reliable	Breakfast	B	5 / 10 Minutes	1 Week - visual inspection, tasting	Sink	Non-recyclable
7	Weekly	1 liter tetrapak, with plastic cap	Yes	Yes	Breakfast	B	20 Minutes	1 Week - taste	Sink	Plastic
8	Everyday	500 ml / Plastic bottle	No	No	Food base - tetrapak	A	10 Minutes	Yes - olfactory inspection	Sink	Plastic
9	Everyday	1 liter tetrapak, with plastic cap	Yes, always	Yes, always	Breakfast	A	5 Minutes	Few days- Visual and olfactory inspection	Sink	Plastic

5.1.3 Long-life vegetable milk

Vegetable milk is used by 7 out of 9 people of the sample (see Table 3). It is an alternative to cow milk, but it is sometimes used simultaneously with it. Interviewees n. 1 and 5 use it rarely, while the others with a much intense frequency. While interviewee n. 2, prefers a 200 ml pack and number 8 a 500 ml one, the other consumers use one-liter packaging.

Ask for cow milk, the most popular package type are plastic bottles and Tetrapak boxes with plastic cap.

It is interesting to state how vegetable milk is used for the same purposes as cow milk, so not only for breakfast (similarly as for cow milk with coffee and/or cereals) but also for food preparations and according to what number 4 stated, for making yogurt.

The interviewed consumers state to pay attention to the expiry date, while the SSL is marginal for them. In fact, as number 7 said, it is not considered as reliable as the actual expiry date. This was a topic in the interview also with interviewee n. 9: the SSL is checked but not counted as a reliable information.

Numbers 2, 7, 8 and 9 use the routine A and they usually leave the good outside of the fridge from one to 20 minutes., while number 9 uses the routine B. The pattern C is only used by interviewee n. 5, which is easily understandable from the time spent outside of the fridge by the milk, which is from one hour to one hour and a half.

Regarding the consumption of this food, if the date of expiry is exceeded, the consumers have different points of view. They all tend to consume it anyway, after a visual and olfactory inspection, but the timing is different for each of them. Interviewees n. 2, 8, and 9 find a few days after expiry

acceptable for consumption, while interviewees n. 4, 5, and 7 are more elastic and can drink the milk also after one week from the expiry date; with interviewee n. 5 who state to throw away the milk rigorously after one week. Due to the infrequent use of the product, interviewee n. 1 can wait up on until two weeks and still consume it. All of the consumers stated that when in need to throw the product they pour it in the sink, as it is a liquid and is considered to be the appropriate way of disposal.

If going into detail of the packaging disposal, we see that interviewees n. 1, 2, 8 and 9 throw the whole pack in the plastic bin, while 5, 6 and 7 use both paper and plastic bin.

Table 3: Long-life vegetable milk

	Frequency of use	Packaging size	Package type	Attention paid to "expiry date"	SSL	Use of the product	Routine of use	Time spent outside of fridge	Consumption if expiry is exceeded	Disposal of the produc	Disposal of the packaging	Milk type
1	3x Year	1 L	Plastic Bottle	Yes - when buying only	Yes - when buying only	Food	B	Cooking time	2 weeks	Sink	Plastic	Coconut
2	Weekly	200 ml	Tetrapak with plastic cap	Yes, always	Yes, always	Breakfast	A	1 minute	Few days- Visual and olfactory inspection	Sink	Plastic	/
3	/											
4	Weekly	1 L	Tetrapak with plastic cap	Yes, not always	Yes, not always	Yogurt	Uses the whole pack	5/10 minutes	1 Week - taste	/	Paper and Plastic	Soy
5	Rarely	1 L	Tetrapak with plastic cap	Yes, not always	Yes, not always	Breakfast	C	1 hour / 1 hour and a half	1 Week - Afterwards thrown	Sink	Paper and Plastic	Soy
6	/											
7	EVERYDAY	1 L	Tetrapak with plastic cap	Yes, always	Yes, but not reliable	Food base - breakfast	A	10 minutes	1 Week - taste	Sink	Paper and Plastic	Oat
8	EVERYDAY	500 ml	Plastic Bottle	No	No	Food base - breakfast	A	20 minutes	Yes - olfactory inspection	Sink	Plastic	/
9	EVERYDAY	1 L	Tetrapak with plastic cap	Yes, always	Yes, always	Breakfast	A	5 Minutes	Few days- Visual and olfactory inspection	Sink	Plastic	Soy

5.1.4 Fresh pesto

Pesto is used similarly to tomato sauce but less frequently (see Table 4). Most of the people consume it rarely, while those who consume it the most tend to have one jar every week. Interviewees n. 5 and 9 stated that they make their own Pesto, while number 8 consumes only fresh pesto.

There is more of a homogeneity in the choice of the packaging type. All of the interviewees consume pesto in a glass jar with aluminum cap, weighting around 250 to 300 grams.

Regarding the expiry date, all the interviewed confirmed to pay attention to it. Mostly when buying the product. Interviewees n. 1 and 6 stated that they use the expiry date as a selection criterion when grocery shopping. All except number 1 and 6 pay attention also to the SSL, even if some of the interviewed stated that they mostly do this while buying the product. Those who do not check the SSL, behave in that way because they do not believe in its reliability. Even those who check for the date usually consume the product also after it has passed.

The routine of the sample varies as for all the other products we analyzed. Interviewees n. 3, 6 and 7 follow the C pattern while n. 2 and 4 were closer to routine A, while 1 to B.

If 1 stated that it never happens that they have to consume pesto after the expiry date, all of the other users confirmed that they sometimes do it. Most of the others would accept consuming it after few days after a personal inspection regarding its smell and look, while interviewees n. 3 and 4 would consume it also after two to three weeks. Number four also provided the way they are able to maintain the product edible up to three weeks: they usually fill the jar with a layer of olive oil, if the pesto does not have much itself, in order to keep the air away from the content of the jar. In general, the largest

time the product spends outside of the fridge is between 5 to 10 minutes. Only interviewee n. 1 stated a larger amount of time, going from 30 minutes to one hour.

Regarding the use of disposing of the product, interviewees 1, 6 and 7 stated that they dilute the pesto and then throw it in the sink, while number 2 uses the organic bin. The exception is interviewee n. 4, who has never the need to throw the product thank to their practice in conserving the pesto. Regarding the pack, interviewees 1 and 6 use both the glass and the plastic bin, while the others, except for n. 3, use the glass bin only. Number 3 is an exception, because she throws the can in the non-recyclable bin, as she considers it the fastest way due to her declared "laziness".

Table 4: Fresh pesto

	Frequency of use	Package type	Attention paid to "expiry date"	SSL	Use of the product	Routine of use	Time spent outside of fridge	Consumption if expiry is exceeded	Disposal of the produc	Disposal of the packaging
1	Rarely	Glass Jar	Whes, when buying only	Used to, not anymore	Pasta	B	30 minutes to 1 hour	Does not happen	Sink after dilution	Glass and plastic (previously washed)
2	2xYear	Glass Jar	Yes, always	Yes, Always	Pasta	A	/	Few days - Visual and olfactory inspection	Organic	Glass (previously washed)
3	Rarely	Glass Jar	Yes	Yes, mostly if opened	Pasta	C	/	Up to 3 weeks	Non-recyclable	
4	1xMonth	Glass Jar	Yes	Yes	Pasta	A	15 / 20 Minutes	Up to 2 weeks	/	Glass (previously washed)
5	/									
6	Weekly	Glass Jar	Yes, always	No	Pasta	C	5 / 10 Minutes	5 Days - Visual inspection	Sink after dilution	Glass and plastic (previously washed)
7	Rarely	Glass Jar	Whes, when buying only	Whes, when buying only	Pasta	C	10 Minutes	Yes, visual inspection	Sink after dilution	Glass (previously washed)
8	/									
9	/									

5.1.5 Preserved Egg-white

This is the less used product. Packaged egg-whites are used only by two interviewees, n. 3 and 9. While the former 3 cooks them one time a week, the latter serves them up to three times weekly. The packaging type is the same for both of the users, but the size changes, as number 3 uses a half-liter pack and number 9 a one liter one.

As for the expiry date, they both pay attention, but things change for the SSL date. Number 3 affirmed that they only look at the SSL if the product is opened. They follow this rule also for the consumption of the product in the case that expiry date is exceeded. In fact, they would consume the product after that date only if the pack is still closed. Interviewee number 9 considers the SSL always but would still consume the product a few days after SSL, even if the product is opened, after a visual inspection of the substance. Egg whites are used for both as meal, but 3 cooks them in the microwave, while 9 cooks them in a pan like regular eggs. The disposal of the product is similar for either of the consumers. In fact, they throw the remaining of the content in the sink, without diluting it and the Tetrapak one in in the paper bin, while the other in the plastic one, but this is understandable as it varies from city to city. When used a second time after opening, they both stated that the product stays outside of the fridge from 5 to 10 minutes maximum, which also helps understanding their routine of use. They both use routine A.

5.2 Diary Analysis and results

The majority of participants who hold the diaries on the SSL and their FW and disposal behaviour report that they used opened food beyond the recommended storage period, provided that the packaging was undamaged and the food appeared to be in acceptable condition.

The diary analysis reveals that food waste is predominantly influenced by purchasing habits, misunderstandings regarding SSL, and packaging inefficiencies.

The analysis indicates that consumers utilize sensory evaluation methods to assess product quality beyond the expiration date. For instance, among the milk consumers, only 21.43% discard milk that has been opened and stored in the fridge for an extended period. Meanwhile, 17.46% utilize the product immediately, favoring methods such as boiling or incorporating it into dishes, while 57.94% depend on their sensory evaluations to ascertain its quality prior to use, thereby avoiding disposal based solely on the expiration date or the duration since the package was opened. Similar trends are observed when analyzing another product category frequently reported by consumers in the study: tomato sauce. Only 15.48% of the participants indicated discarding the product after it had been stored in the refrigerator for a prolonged period, whereas 74.20% relied on their sensory evaluations to determine the product's quality and potential for use independently. As previously confirmed in the literature, numerous participants discard food based on perceived spoilage rather than actual expiration (Aschemann-Witzel *et al.*, 2015).

These results demonstrate that consumers utilize their senses to minimize food waste at home: sensory rating predicts food waste and could enhance the prolonged use of food during its SSL (Ray *et al.*, 2024).

6. Concluding Remarks and implications

Both the qualitative analyses performed highlight a growing attention of consumers towards the issue of sustainability, with consistent behaviors of use and disposal of products. In particular, the in-depth interviews showed that most consumers tend not to consider the information on the Secondary Shelf Life reported on the label, but the prolonged use after the SSL date is already part of their behaviors in light of sustainability: several consumers often rely on sensorial modalities (tasting, visual and olfactory evaluation, etc.) to consume the product even beyond the SSL indication, avoiding FW. But some are respecting the SSL indication and throw away the product even if it can be still suitable for consumption as proved by Nicosia *et al.* (2021). Nevertheless, room for improvement in sustainable behaviours is strongly present. For instance, in the case of disposal, except in rare exceptions, separate waste collection is part of the normal behavior of the interviewees, albeit with a different level of precision, in particular for packages composed of different materials (e.g.: plastic and paper) which are not always separated and disposed of correctly. A correct information on the disposal of these materials is still lacking.

The keeping of the food diaries confirmed the previous results. The diaries show that, although in general there is greater attention and respect for the SSL than stated in the in-depth interviews, for some product categories, in particular long-life milk and tomato sauce, consumption is tolerated even beyond 10 days compared to what it is reported on the label. This does not completely eliminate waste - although it limits it greatly - which occurs mainly for reasons related to the excessive time the package has been open. Furthermore, in the case in which the consumer is aware that s/he will not be able to consume the product for many days after opening the package - due to unexpected departures or commitments - a preventative discard behavior is observed.

The study, even if explorative, has the potential to offer actionable insights as findings can inform managerial decision-making and policy formulation, especially in terms of product development, marketing strategy and consumer engagement in FW prevention. Producers might suspiciously welcome our finding as volume sales can be affected by the proneness of consumers to ignore SSL; however, their sustainable practices should call them to engage in cooperate with policy makers to identify a more appropriate length of the SSL and to implement marketing strategies aimed at better inform their customers on the role of the SSL. Policy makers should be aware that the SSL is partly ignored in the behaviors of households: accordingly, they should try to encourage researches and legislation rules which can support a more appropriate prediction of the SSL indication in order to

reduce FW. Postpone or revise, in accordance with food producers, the length of the SSL indication represents another path to reduce FW on the road to sustainability. This research evidences that consumers are well-beyond rules and adopt a basic but effective sensorial approach to estimate the proper time to consume a food even beyond its SSL. So, policy makers should support positive behaviours and arrange for food waste awareness campaigns aimed at encouraging households to accurately looking at the expiry and SSL dates but engaging them to a sensorial wise approach.

Despite its theoretical, managerial and public policy potential, this paper encounters a number of limitations. First, it describes the initial explorative results of a wider project on the topic. Second, we are aware that the number of in-depth interviews is small and should be increased in next studies. Third, the use of diaries - even if previous works estimate that "the average food waste value is significantly higher when gathered through diaries, while questionnaires are able to catch less than one-third of food waste determinants" (Giordano *et al.*, 2019, p. 1) - was very time-consuming and difficult to coordinate and manage, leading to some withdraw.

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Il ruolo dell'eterogeneità del board nell'adozione di pratiche di economia circolare: un focus sulle imprese quotate europee[1]

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Abstract

Contesto della ricerca. *La transizione verso l'economia circolare è una priorità strategica per le imprese che mirano alla sostenibilità. La governance aziendale, in particolare la composizione del consiglio di amministrazione (CDA), svolge un ruolo cruciale nella definizione delle strategie di sostenibilità.*

Obiettivo della ricerca..*Questa ricerca indaga l'impatto dell'eterogeneità del CDA sulle performance di economia Circolare. Utilizzando le lenti teoriche della teoria degli Stakeholder e della teoria degli Upper Echelons, lo studio analizza come le caratteristiche e l'eterogeneità del CDA influenzano la performance di economia circolare.*

Metodologia. *Lo studio analizza 1.166 imprese europee quotate (2013–2022) utilizzando dati da BoardEx, Thomson Reuters e Orbis. Le ipotesi vengono testate con un modello di regressione lineare multipla.*

Risultati. *I risultati rivelano che CDA diversificati in termini di genere, nazionalità e qualifiche migliorano le performance di circolarità e mostrano altresì il ruolo che la dimensione del Cda ha nell'influenzare la performance di circolarità.*

Limiti della ricerca. *Lo studio considera solo il ruolo delle caratteristiche del CDA, ricerche future potrebbero esplorare fattori come la cultura aziendale e lo stile di leadership.*

Implicazioni Manageriali. *Le imprese dovrebbero garantire CDA eterogenei per migliorare le performance di circolarità.*

Originalità della ricerca. *Questo studio offre nuove intuizioni sul ruolo della governance per la transizione verso l'economia circolare. Inoltre, fornisce prove empiriche sulla validità della teoria degli Stakeholder e della teoria degli Upper Echelons nel contesto dell'economia circolare.*

Keywords: *Economia circolare; Corporate governance; Eterogeneità; Consiglio di amministrazione; Upper Echelons, Theory; Stakeholder theory*

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1. Introduzione

La crescente consapevolezza dell'esaurimento delle risorse naturali e le pressanti richieste della società verso una maggiore tutela degli ecosistemi hanno spinto le imprese ad abbracciare i principi dell'economia circolare (EC). Questo paradigma, alternativo al modello lineare tradizionale "prendi, produci, smaltisci" (Cramer, 2022), si fonda su tre pilastri fondamentali: la valorizzazione del capitale naturale, la massimizzazione del rendimento delle risorse e il miglioramento dell'efficienza dei sistemi produttivi (Ellen MacArthur Foundation, 2015). La finalità ultima dell'economia circolare è creare valore riducendo l'impatto ambientale e ridefinendo i modelli di business, in modo che sostenibilità e progresso economico possano coesistere armoniosamente (Stahel, 2016).

L'economia circolare non si limita alla gestione dei rifiuti, ma si configura come una nuova visione strategica, mirata a ottimizzare il ciclo di vita dei prodotti e a ridurre al minimo lo spreco di risorse e di energia. A differenza della sostenibilità, che si concentra sul mantenimento di un equilibrio ecologico, l'economia circolare propone un approccio più innovativo e sistemico, promuovendo processi produttivi circolari e minimizzando emissioni e rifiuti (Geissdoerfer *et al.*, 2017). In questo contesto, le imprese sono chiamate a trasformare le sfide ambientali in opportunità di crescita e innovazione.

Numerosi studi si sono soffermati sui fattori che spingono le imprese a migliorare le loro performance di circolarità, analizzando aspetti organizzativi, la disponibilità di risorse e i benefici finanziari derivanti dall'adozione di pratiche circolari (Jabbour *et al.*, 2019; Jansen *et al.*, 2020). Tuttavia, ancora scarsa è l'attenzione riservata all'influenza della governance aziendale, e in particolare all'eterogeneità del consiglio di amministrazione, sulle performance di economia circolare. L'eterogeneità all'interno dei consigli, intesa come la presenza di amministratori con esperienze, competenze, background culturali e nazionalità differenti, può rappresentare un potente motore di cambiamento (Mohy-ud-Din, 2023).

La letteratura ha dimostrato che consigli diversificati migliorano la qualità delle decisioni e consentono una gestione più efficace dei rischi e delle sfide organizzative, favorendo una maggiore attenzione verso le pratiche ambientali (Naciti, 2019).

L'approccio teorico adottato in questo studio si fonda sull'Upper Echelons Theory (Hambrick, 2007) e sulla stakeholder theory. L'integrazione delle due teorie fornisce una solida base per comprendere le dinamiche tra la composizione del CDA e le performance di economia circolare, combinando un'analisi dei fattori interni all'azienda (Upper Echelons Theory) con una prospettiva più ampia e relazionale (Stakeholder Theory), fondamentale per un tema complesso e multidimensionale come la sostenibilità.

I risultati offrono nuove prospettive teoriche ed empiriche, evidenziando come una maggiore eterogeneità nella composizione dei consigli di amministrazione contribuisca significativamente al miglioramento delle performance di circolarità. Tale eterogeneità non solo arricchisce il processo decisionale, ma stimola anche l'emergere di soluzioni innovative, indispensabili per affrontare le sfide complesse legate alla transizione verso modelli di economia circolare.

Il contributo si distingue per due aspetti fondamentali. In primo luogo, concentra l'attenzione esclusivamente sulla corporate governance come fattore determinante per le performance di economia circolare, andando oltre le tradizionali analisi sui benefici finanziari o sulle pratiche di rendicontazione sociale. In secondo luogo, adotta un approccio integrato, utilizzando simultaneamente l'Upper Echelons Theory e la Stakeholder Theory per esaminare sia il ruolo delle caratteristiche personali dei consiglieri sia le istanze degli stakeholder.

La nostra ricerca dimostra che consigli diversificati, con membri di differenti nazionalità, background culturali e qualifiche professionali, sono maggiormente in grado di cogliere le opportunità offerte dall'economia circolare e di rispondere alle crescenti aspettative degli stakeholder.

Le implicazioni pratiche dei nostri risultati sono molteplici. Per i manager e i policy maker, questo studio fornisce indicazioni preziose su come strutturare i consigli di amministrazione per ottenere migliori risultati in ambito di economia circolare. Promuovere la diversità non è solo una scelta etica,

ma rappresenta anche una strategia efficace per potenziare le performance aziendali e per rispondere alle pressanti esigenze di sostenibilità espresse dalla società.

L'articolo è strutturato come segue. Il paragrafo 2 presenta il framework teorico della ricerca. Il paragrafo 3 descrive lo sviluppo delle ipotesi. Il paragrafo 4 si sofferma sulla metodologia di ricerca. Il paragrafo 5 mostra i risultati econometrici. Il paragrafo 6 si incentra sulla discussione e le implicazioni della ricerca. Il paragrafo 7 presenta le implicazioni della ricerca. Infine, il paragrafo 8 evidenzia i limiti della ricerca e i possibili futuri approfondimenti.

2. Framework teorico

Il presente studio, adotta le prospettive teoriche della Upper Echelons Theory (Hambrick, 2007) e della Stakeholder theory (Freeman, 1994).

La Upper Echelons Theory (Hambrick & Mason, 1984) suggerisce che le decisioni siano fortemente condizionate dalla composizione del consiglio di amministrazione (Bantel & Jackson, 1989; Carpenter & Fredrickson, 2001). I membri del consiglio interpretano e implementano le strategie in base alle proprie esperienze, ai valori e alla personalità. Da ciò emergono due concetti: il primo ribadisce che le decisioni organizzative dipendono in larga misura dalla composizione del consiglio (Bantel & Jackson, 1989; Carpenter & Fredrickson, 2001); il secondo sostiene che le caratteristiche demografiche del consiglio possano fungere da proxy, seppur parziali e approssimative, dei relativi schemi cognitivi (Hambrick, 2007).

La stakeholder theory, invece, afferma che l'essenza dell'impresa sia determinata dall'interconnessione delle relazioni con i propri stakeholder (Freeman, 1994), aspetto che consente di individuare le responsabilità dell'azienda. È compito del consiglio di amministrazione garantire che l'impresa risponda alle esigenze e agli interessi di tutti gli stakeholder, con implicazioni tanto finanziarie quanto non finanziarie (Gupta *et al.*, 2019). L'interdipendenza tra consiglio di amministrazione e ambiente è affrontata attraverso una combinazione di tecniche strumentali e normative, offrendo un duplice beneficio: da un lato soddisfa il valore intrinseco e le aspettative degli stakeholder, dall'altro migliora la redditività e la reputazione aziendale (Gupta *et al.*, 2019). La stakeholder theory e l'approccio orientato alla sostenibilità ampliano la prospettiva d'impresa, includendo il contesto sociale più ampio e le interazioni con l'ambiente (Gupta *et al.*, 2019). Secondo questa visione, l'obiettivo dell'impresa è la creazione di valore per tutti gli stakeholder (Gupta *et al.*, 2019). Il consiglio di amministrazione deve assicurarsi che le decisioni dei manager siano allineate agli interessi degli azionisti, fungendo inoltre da rilevante strumento strutturale per contenere l'opportunismo manageriale (Naciti, 2019). In base alla stakeholder theory, il consiglio dovrebbe considerare le aspettative e le necessità degli stakeholder, così da minimizzare i potenziali conflitti di interesse (Haniffa & Cooke, 2002).

Diversi studi hanno adottato la Upper Echelons Theory e la stakeholder theory per spiegare il rapporto tra corporate gov*ernance* e prestazioni di sostenibilità (Oyewo, 2023; Rodrigue *et al.*, 2013). Alcuni studiosi si sono focalizzati su variabili quali il genere o il livello di istruzione (Huang *et al.*, 2013; Reimer *et al.*, 2018), altri hanno analizzato l'impatto della CEO Duality (García-Sánchez *et al.*, 2013; Oh *et al.*, 2016), altri ancora hanno indagato le caratteristiche del CEO nei mercati emergenti (Shah *et al.*, 2019) o gli effetti potenziali della governance sulla gestione delle acque reflue (Gómez-Sanabria *et al.*, 2020).

Tuttavia, nessuno studio ha ancora integrato la stakeholder theory e la Upper Echelons Theory per analizzare come l'eterogeneità del consiglio di amministrazione influisca sulle performance di circolarità. Sebbene l'economia circolare sia correlata alla sostenibilità, essa incorpora principi e pratiche peculiari basati sul riutilizzo ciclico delle risorse. A differenza della sostenibilità intesa in senso ampio, che mira a coniugare obiettivi economici, sociali e ambientali, le performance di economia circolare si concentrano in particolare sull'eliminazione degli sprechi e il riuso continuo

delle risorse. Proprio questa distinzione rende imprescindibile indagare come l'eterogeneità all'interno del consiglio di amministrazione possa incidere sulle performance di circolarità.

3. Sviluppo delle ipotesi

La ricerca in ambito di corporate governance ha evidenziato che la presenza di un consiglio di amministrazione diversificato migliora l'efficacia dei processi decisionali (Song *et al.*, 2020), oltre ad accrescere il patrimonio di conoscenze, capacità e competenze collettive di tutti i membri (Mohy-ud-Din, 2023).

Genere e Performance di economia circolare

I consigli di amministrazione con una maggiore diversità di genere sono fortemente associati a migliori risultati in termini di sostenibilità (Cabeza-García *et al.*, 2018), poiché le donne tendono a dare priorità alla sostenibilità ambientale e svolgono un ruolo chiave nel migliorare la performance ambientale delle imprese (Ali *et al.*, 2022). Le loro prospettive diversificate favoriscono l'elaborazione di strategie innovative e la risoluzione creativa dei problemi, consentendo alle aziende di affrontare con maggiore efficacia le sfide ambientali complesse. La presenza femminile nei consigli influisce positivamente sulle convinzioni ambientali dei manager e incoraggia l'adozione di strategie di sostenibilità più complete, contribuendo così a una migliore performance di economia circolare (Ahmad *et al.*, 2021).

Tuttavia, l'impatto della diversità di genere sulla performance di economia circolare dipende dal raggiungimento di una massa critica di donne nel consiglio. La presenza di una sola donna viene spesso percepita come simbolica, con un'influenza limitata, fenomeno noto come *tokenism* (Kanter, 1977). Ciò limita la sua capacità di contribuire alle iniziative strategiche, incluse quelle relative all'economia circolare (Gull *et al.*, 2023). Al contrario, la presenza di almeno tre donne nel consiglio consente di raggiungere una massa critica che permette di valorizzare appieno le loro competenze, favorendo pratiche socialmente responsabili e migliorando la performance ambientale (Joecks *et al.*, 2013; Bear *et al.*, 2010; Macchioni *et al.*, 2024). I consigli con almeno tre donne si concentrano maggiormente sulle questioni ambientali e rispondono meglio alle richieste di sostenibilità degli stakeholder (Ben-Amar *et al.*, 2017; Post & Byron, 2015). Pertanto, il raggiungimento di una massa critica di donne nei consigli di amministrazione è fondamentale per evitare il *tokenism* e sbloccare il pieno potenziale delle prospettive diversificate, migliorando la performance di economia circolare attraverso una gestione delle risorse più innovativa ed efficace. Di conseguenza, si ipotizza:

Hp 1: *La diversità di genere nel consiglio di amministrazione ha un effetto positivo sulla performance di economia circolare.*

Hp 1a: *La presenza di una sola donna nel consiglio ha un effetto non significativo o negativo sulla performance di economia circolare.*

Hp 1b: *La presenza di almeno tre donne nel consiglio ha un effetto positivo sulla performance di economia circolare.*

Età e Performance di economia circolare

L'età costituisce un fattore di rilievo nel determinare le modalità operative del consiglio di amministrazione (Ferrero-Ferrero *et al.*, 2015). Se da un lato i membri più anziani tendono a focalizzarsi su tematiche etiche e sociali, dall'altro i componenti più giovani mostrano una maggiore sensibilità nei confronti della tutela ambientale (Ferrero-Ferrero *et al.*, 2015). Tale sensibilità può influenzare il comportamento aziendale orientato alla responsabilità sociale e alla sostenibilità ambientale (Bekiroğlu *et al.*, 2011). La diversità generazionale permette, infatti, di definire una visione e delle strategie più efficaci nel considerare sia aspetti finanziari che extra-finanziari, promuovendo così un approccio sostenibile da parte dell'impresa (Ferrero-Ferrero *et al.*, 2015).

A differenza delle iniziative di sostenibilità generali, l'economia circolare si concentra specificamente sul riuso ciclico delle risorse, sull'eliminazione degli sprechi e sull'utilizzo continuo

dei materiali. Questa prospettiva richiede un pensiero innovativo e strategie globali che possono essere sviluppate con maggiore efficacia qualora il consiglio di amministrazione presenti un'ampia varietà di età. Sosteniamo, dunque, che la diversità generazionale faciliti la risoluzione dei problemi, migliori la qualità della gestione e contribuisca positivamente alle performance di circolarità.

Alla luce di quanto esposto, è stata formulata la seguente ipotesi:

Hp 2. *La differenza di età nel consiglio di amministrazione incide positivamente sulle performance di EC.*

Nazionalità e Performance di economia circolare

La presenza di membri provenienti da diversi Paesi offre punti di vista eterogenei in merito agli obiettivi primari dell'impresa. In particolare, le diverse nazionalità nel consiglio di amministrazione possono apportare una pluralità di prospettive, conoscenze ed esperienze nel processo decisionale (Niebuhr, 2010). È stato rilevato che le diverse nazionalità esercitano un'influenza positiva sulle performance sociali dell'impresa (Harjoto *et al.*, 2019). Riteniamo che tale eterogeneità di visioni possa tradursi in strategie più creative ed efficaci per sostenere le performance di circolarità, ambito in cui spesso sono necessari approcci innovativi e globali.

Di conseguenza, viene formulata la seguente ipotesi:

Hp 3. *Le differenti nazionalità nel consiglio di amministrazione hanno un effetto positivo sulle performance di EC.*

Livello di istruzione e Performance di economia circolare

La diversità nelle qualifiche include sia la varietà dei livelli di istruzione sia la differenziazione degli ambiti disciplinari. Wang & Hsu (2013) hanno dimostrato che la presenza di livelli di istruzione diversificati potenzia la capacità dei consiglieri di elaborare informazioni e di individuare nuove opportunità di business. Il percorso formativo contribuisce, infatti, a definire la base cognitiva degli individui, favorendo un'analisi più approfondita delle informazioni e l'assimilazione di idee innovative (Wang & Hsu, 2013). La diversificazione dell'istruzione all'interno del *board* amplia la prospettiva cognitiva, incentivando la creatività e l'innovazione nella risoluzione dei problemi (Milliken & Martins, 1996). Al contempo, i membri con livelli di istruzione relativamente più bassi accumulano spesso un'esperienza pratica rilevante, complementare alle conoscenze maggiormente teoriche di chi ha seguito percorsi di studio formali più avanzati (Katmon *et al.*, 2019).

Le performance di circolarità possono variare in modo significativo laddove si confrontino consigli di amministrazione dotati di eterogeneità educativa con consigli più omogenei sul piano del titolo di studio. In fase di decision-making strategico, l'esperienza pratica può talvolta prevalere sulla conoscenza teorica, e viceversa. Di conseguenza, l'eterogeneità formativa all'interno del consiglio di amministrazione risulta particolarmente vantaggiosa per le performance di economia circolare, in virtù delle diverse opinioni, prospettive ed esperienze che essa apporta. Tale eterogeneità assicura, infatti, un ampio spettro di competenze e conoscenze, elemento imprescindibile per affrontare le sfide complesse connesse all'implementazione dell'economia circolare.

Alla luce di queste considerazioni, si formula la seguente ipotesi:

Hp 4. *La diversità di qualifiche nel consiglio di amministrazione ha un effetto positivo sulle performance di EC.*

Dimensione CDA e Performance di economia circolare

Molti studi hanno evidenziato una correlazione tra la dimensione del consiglio di amministrazione e le performance di sostenibilità (Chams & García-Blandón, 2019; Shahab *et al.*, 2022). I consigli di amministrazione di maggiori dimensioni tendono a possedere una gamma più ampia di competenze

e prospettive, aspetto che può favorire discussioni più approfondite e processi decisionali strategici per il miglioramento delle performance di economia circolare (Dalton *et al.*, 1999). Inoltre, un consiglio di amministrazione con un numero più elevato di componenti può offrire maggiori opportunità di coinvolgimento con vari stakeholder, tra cui azionisti, clienti, fornitori e comunità locali.

Questa più ampia partecipazione può incoraggiare una comprensione più profonda dell'importanza dell'economia circolare, facilitando il sostegno alle iniziative connesse (Certo *et al.*, 2003; Coles *et al.*, 2006; Raimo *et al.*, 2021). Inoltre, consiglio di amministrazione di maggiori dimensioni potrebbero adottare una prospettiva di lungo termine sulla performance aziendale, promuovendo investimenti che, sebbene non garantiscono ritorni immediati, contribuiscono nel tempo alla crescita sostenibile e alla resilienza dell'impresa, in linea con gli obiettivi dell'economia circolare (Esposito *et al.*, 2023).

Di conseguenza, si ipotizza:

***Hp 5**. La dimensione del consiglio di amministrazione ha un effetto positivo sulle performance di EC.*

4. Metodologia

4.1 Dati e variabili

Il campione di ricerca include 1.166 imprese provenienti dall'Unione Europea, analizzate nel periodo compreso tra il 2013 e il 2022. Per la raccolta e l'elaborazione dei dati, sono state utilizzate diverse banche dati. BoardEx fornisce informazioni dettagliate sulle caratteristiche demografiche dei membri del consiglio di amministrazione, mentre i dati relativi alle performance di EC sono stati estratti da Thomson Reuters. Infine, il database Orbis, offerto da Bureau Van Dijk, è stato impiegato per la raccolta delle variabili di natura economica e finanziaria.

Tab 1: Definizione delle variabili

Variable	***Definition***	***Source***
Variabile dipendente		
performance EC	*Il punteggio relativo all'uso delle risorse (resource use category score) misura la capacità e la performance di un'azienda nel ridurre il consumo di materiali, energia o acqua, nonché la sua abilità nel trovare soluzioni più eco-efficienti migliorando la gestione della catena di fornitura.*	*Thomson Reuters*
Variabili indipendenti		
Gender diversity	*L'indice di Shannon varia da 0, quando nel consiglio di amministrazione è presente un solo genere, fino a 0,693, in corrispondenza di una distribuzione paritaria tra uomini e donne.*	*BoardEx*
Gender Token	*Variabile dummy che assume valore 1 se l'impresa presenta una sola donna nel consiglio di amministrazione, e 0 in caso contrario.*	*BoardEx*
Gender Critical Mass	*Variabile dummy che assume valore 1 se l'impresa presenta almeno tre donne nel consiglio di amministrazione, e 0 in caso contrario.*	*BoardEx*
Età	*Deviazione standard dell'età di tutti i membri del consiglio di amministrazione.*	*BoardEx*
Nazionalità	*Proporzione di amministratori provenienti da Paesi differenti.*	*BoardEx*
Qualifica	*Numero medio di qualifiche*	*BoardEx*
Dimensione del consiglio	*Numero di amministratori*	*BoardEx*
Variabili di controllo		
Global Compact Signatory	*Variabile dummy che assume valore 1 se l'impresa ha sottoscritto il Global Compact delle Nazioni Unite, e 0 in caso contrario.*	*Thomson Reuters*
Dimensione dell'impresa.	*Numero di impiegati*	*ORBIS*
Età dell'impresa.	*Numero di anni dalla fondazione*	*ORBIS*
Redditività	*Reddito su totale dell'attivo*	*ORBIS*
Industria	*Variabile dummy che assume valore 1 se l'impresa opera in un settore manifatturiero ad alto contenuto di conoscenze, e 0 in caso contrario.*	*ORBIS*

Fonte: nostra elaborazione

Variabile Dipendente. Le *performance di EC* riflettono la capacità di un'azienda nel ridurre l'impiego di risorse come materiali, energia e acqua, nonché nel ricercare soluzioni più eco-efficienti, in particolare grazie al miglioramento della gestione della catena di fornitura. In sostanza, tale variabile indica quanto un'impresa sia efficiente nell'utilizzo delle risorse e quanto si impegni nell'individuare soluzioni sostenibili per ridurre il proprio impatto ambientale (Orazalin & Mahmood, 2021).

Variabili indipendenti. Vengono considerati tre diversi criteri per misurare la rappresentanza femminile all'interno del consiglio di amministrazione. In primo luogo, l'indice di Shannon è una misura spesso impiegata in ecologia per quantificare la diversità all'interno di una comunità (Reguera-Alvarado *et al.*, 2017). Nel caso della *Gender Diversity*, è calcolata come:

$$\text{Shannon index} = -\sum_{i=1}^{n} P_i ln P_i$$

Dove p_i rappresenta la percentuale di ciascun genere all'interno del consiglio di amministrazione e I = (1, 2) indica il numero di generi. Questo indicatore può assumere valori compresi tra 0 e (n-1)/n, a cui corrispondono rispettivamente la presenza di un solo genere e la rappresentanza uguale dei generi. La variabile in esame assume valori da 0 (assenza di diversità di genere) a 0,693 (distribuzione egualitaria di entrambi i generi considerati).

In secondo luogo, viene utilizzato il *Gender Token*, una variabile binaria che assume valore 1 se nel consiglio di amministrazione è presente una sola donna e 0 in caso contrario (Lafuente & Vaillant, 2019; Rixom *et al.*, 2023; Vafaei *et al.*, 2021). In terzo luogo, viene valutato se l'impresa presenta almeno tre donne nel consiglio attraverso la variabile *Gender Critical Mass*, anch'essa binaria, che assume valore 1 se sono presenti almeno tre donne e 0 in caso contrario (Saggese *et al.*, 2021; Wiley & Monllor-Tormos, 2018).

La variabile *età* misura la dispersione dell'età dei membri del consiglio, espressa come deviazione standard (Ferrero-Ferrero *et al.*, 2015).

La nazionalità indica la proporzione di amministratori provenienti da Paesi diversi, offrendo una misura della composizione internazionale del consiglio (Dodd & Zheng, 2022).

La variabile *qualifica* rappresenta la deviazione standard del numero complessivo di qualifiche possedute dai membri del consiglio (Hosny & Elgharbawy, 2022).

Infine, la variabile *dimensione del consiglio* fa riferimento al numero totale di amministratori che compongono il consiglio (Vafaei *et al.*, 2021).

Variabili di controllo. L*' UN Global Compact* rappresenta la principale iniziativa internazionale che affronta le responsabilità sociali e ambientali delle imprese multinazionali, basandosi su meccanismi di governance volontaria (Du Plessis *et al.*, 2013). Per questa ragione, consideriamo la variabile *Global Compact Signatory* quale indicatore degli sforzi di sostenibilità da parte dell'impresa.

La *dimensione dell'impresa* è rappresentata dal numero di dipendenti, utilizzato come proxy della complessità organizzativa (Agnese *et al.*, 2024).

L'*età dell'impresa* è impiegata come misura sostitutiva per valutare il livello di complessità organizzativa e il grado di esperienza acquisita (Srivastava & Gnyawali, 2011). Le imprese più mature, infatti, possono disporre di processi consolidati e di una comprensione più approfondita delle proprie operazioni, aspetto che potrebbe incidere sulla loro capacità di adottare e implementare l'EC.

La *redditività* è misurata attraverso il Return on Assets (ROA) (He & Jiang, 2019; Pan *et al.*, 2021). Un livello di redditività più elevato può garantire la stabilità finanziaria e le risorse necessarie per investire nell'EC.

La variabile *Industria* è un indicatore binario che identifica se l'impresa opera in un settore manifatturiero caratterizzato da un elevato livello di conoscenze. La natura del settore di appartenenza

può influenzare in modo significativo il grado di coinvolgimento dell'impresa nelle pratiche di economia circolare.

4.2 Metodo e modello

E' stato adottato un modello di regressione lineare multipla per dati *panel* al fine di analizzare le performance di EC. Secondo Weisbach & Hermalin (2000), il consiglio di amministrazione si configura come un costrutto di natura endogena. Quando non sussistono i criteri di esogeneità, le stime in prime differenze e a effetti fissi risultano incoerenti. In particolare, i metodi a effetti fissi generano bias nell'analisi della struttura del consiglio, poiché non considerano l'impatto della performance aziendale sulla struttura attuale del consiglio (Wintoki *et al.*, 2012). Inoltre, un'impresa necessita di un intervallo temporale adeguato per poter osservare eventuali miglioramenti delle performance conseguenti all'introduzione di un nuovo assetto di *corporate governance* (Haniffa & Cooke, 2005).

Per fronteggiare il rischio di endogeneità, sono state inserite tutte le variabili indipendenti con un ritardo di un anno (Ashwin *et al.*, 2015; Liang *et al.*, 2013). L'uso di modelli a effetti casuali (random effects) è stato motivato dal fatto che, in presenza di un ampio numero di osservazioni e di numerosi *panel*, tali stimatori risultano più efficienti rispetto agli effetti fissi (Hilbe, 2011). Il test di Hausman ha confermato la correttezza di questa scelta.

Sono state poi testate le ipotesi.

EC performance = f(Gender diversity + Gender Token + Gender Critical Mass + Età + Nazionalità + Qualifica + Dimensione del consiglio + Global Compact Signatory + Dimensione dell'impresa + Età dell'impresa + Redditività + Industria)

Come verifica di robustezza, è stato considerato un ritardo temporale di due anni e ulteriori indici di performance di EC, nello specifico il *Target di riduzione delle risorse*, variabile *dummy* (in questo caso il modello adottato è un *panel binomiale*). Il *Target di riduzione delle risorse* indica la presenza di obiettivi specifici fissati dall'impresa per migliorare l'efficienza nell'uso delle risorse, che possono riguardare vari ambiti, tra cui la riduzione del consumo energetico, l'ottimizzazione dei materiali o la conservazione dell'acqua. L'importanza di tale variabile risiede nella chiarezza degli obiettivi prefissati dall'azienda e nel suo impegno a perseguirli: la definizione di traguardi ben delineati nella riduzione dell'utilizzo di risorse suggerisce, infatti, un impegno concreto nei confronti dell'EC (Ahmadova *et al.*, 2023).

Per un'ulteriore prova di robustezza, sono state inoltre adottate misure alternative per le variabili *qualifica* e *età*. In particolare, è stato considerato il numero medio di qualifiche ottenute dai membri del consiglio e l'età media dei membri del consiglio (Majhi, 2022).

4.3 Statistiche descrittive

La valutazione dei variance inflation factors **(**VIF**)** rappresenta un metodo efficace per individuare eventuali problemi di collinearità tra le variabili. Tuttavia, il VIF medio registrato è pari a 1,28, circostanza che non desta preoccupazioni in merito a questo aspetto (Shrestha, 2022).

La Tabella 2 riporta i dati descrittivi relativi all'intero campione. Le performance di EC presentano un valore medio di 50.705 e una deviazione standard di 31.095. Tale variabilità significativa indica che alcune imprese risultano particolarmente efficienti nell'ambito dell'EC, mentre altre evidenziano inefficienze considerevoli.

Tab 2 Statistiche descrittive

Variabile	Oss.	Media	Dev. Std..	Min	Max
Performance EC	15158	50.705	31.095	0	100
Gender diversity	15158	0.496	0.204	0	0.693
Gender Token	15158	0.189	0.391	0	1
Gender Critical Mass	15158	0.470	0.499	0	1
Età	15158	7.956	2.648	0	22.600
Nazionalità	15158	0.251	0.262	0	0.900
Qualifica	15158	1.067	0.446	0	6.305
Dimensione del consiglio	15158	9.558	4.050	2	34
Global Compact Signatory	15158	0.192	0.394	0	1
Dimensione dell'impresa	15158	19.734.482	55.049.212	0	721000
Età dell'impresa	15158	54.126	51.395	0	550
Redditività	15158	4.329	12.103	-97.555	98.714
Industria	15158	0.745	0.436	0	1

Fonte: nostra elaborazione

5. Risultati econometrici

La Tabella 3 riporta i risultati delle analisi di regressione multipla per dati panel.

Table 3 Risultati della regressione

	Performance EC	
Gender diversity	9.090***	-1.090
Gender Token	-1.055***	(0.372)
Gender Critical Mass	1.154***	(0.401)
Età	0.050	(0.073)
Nazionalità	1.707*	(0.951)
Qualifica	0.928**	(0.465)
Dimensione del consiglio	0.872***	(0.094)
Global Compact Signatory	4.762***	(0.360)
Dimensione dell'impresa	5.10e-05***	(7.68e-06)
Età dell'impresa	0.142***	(0.012)
Redditività	-0.012	(0.013)
Industria	-6.797***	-1.490
Costante	31.220***	-1.857
Osservazioni	15,158	
Numbero di imprese	1,166	
R^2	0.277	

*** p<0.01, ** p<0.05, * p<0.1

Fonte: nostra elaborazione

Variabili indipendenti. Il coefficiente relativo alla *Gender diversity* è pari a 9.090 (p<0.001), a indicare che un'elevata diversità di genere nel consiglio di amministrazione esercita un impatto positivo significativo sulle performance di EC. Ciò suggerisce che una distribuzione equilibrata tra uomini e donne all'interno del consiglio sia associata a risultati migliori in termini di EC. Il coefficiente di *Gender Token* è -1.055 (p<0.001), segnalando che la presenza di una sola donna nel consiglio ha un effetto negativo significativo sulle *performance di EC*. Al contrario, la Gender Critical Mass, ossia la presenza di almeno tre donne, mostra un coefficiente pari a 1.154 (p<0.001), evidenziando che una maggiore diversità di genere nel consiglio di amministrazione risulta correlata a performance migliori in ambito EC.

La variabile *età* presenta un coefficiente positivo di 0.050 (non significativo, indicando che la differenza di età nel consiglio di amministrazione non si configura come un fattore determinante per le performance di EC.

La variabile *nazionalità* del consiglio mostra un coefficiente di 1.707 (p<0.05), rivelando un impatto positivo significativo delle diverse origini nazionali dei membri del consiglio sulle *performance di EC.* Ciò potrebbe indicare che la pluralità di prospettive e di esperienze culturali favorisca processi decisionali più completi e allineati ai principi di EC.

*L*a variabile *qualifica* dei membri del consiglio, con un coefficiente di 0.928 (p<0.01), esercita un effetto positivo significativo sulle *performance di EC*. Un'elevata eterogeneità nelle qualifiche, riflessa in una maggiore deviazione standard, risulta dunque associata a prestazioni migliori in termini di EC, presumibilmente grazie a decisioni più informate e strategiche.

La variabile dimensione del consiglio mostra un impatto positivo di rilievo sulle *performance di EC*, con un coefficiente di 0.872 (p<0.001). Questo risultato suggerisce che i consigli più numerosi, caratterizzati da un'ampia varietà di prospettive e competenze, tendano a favorire risultati superiori in campo di EC.

Variabili di controllo. La sottoscrizione del Global Compact esercita un impatto significativo e positivo sulle *performance di EC*, con un coefficiente di 4.762 (p<0.001), indicando che le imprese aderenti al Global Compact evidenziano una migliore performance in termini di EC

La dimensione dell'impresa mostra un impatto positivo significativo, con un coefficiente di 5.10e-05 (p<0.001), segnalando che le imprese di maggiori dimensioni conseguono risultati superiori sul fronte dell'EC. Anche *l'età dell'impresa* presenta un impatto positivo e significativo, con un coefficiente di 0.142 (p<0.001), suggerendo che le imprese più mature ottengono performance più elevate in termini di EC. La *redditività* (Return on Assets) mostra un coefficiente negativo pari a -0.013 (non significativo), evidenziando che questo indicatore potrebbe non costituire un predittore affidabile delle *performance di EC*. *L'industria* evidenzia un impatto significativo e negativo sulla *performance di EC*, con un coefficiente di -6.797 (p<0.001), suggerendo che il settore in cui l'impresa opera può *influenzarne* le performance di EC, con alcune industrie potenzialmente più penalizzate di altre.

Per verificare la robustezza dei risultati, è stato considerato un ritardo temporale di due anni, analizzando ulteriori indicatori di CE, tra cui la variabile *Target di riduzione delle risorse* (Tabella 4). Trattandosi di una variabile dummy, è stato adottato un modello panel binomiale. Inoltre, in luogo della deviazione standard dell'età e delle qualifiche, sono state impiegate l'età media e il numero medio di qualifiche, al fine di indagare con maggiore dettaglio questi aspetti.

I test di robustezza confermano i risultati precedentemente ottenuti.

Tab. 4 Test di Robustezza

	Performance EC t+2	**Target di riduzione delle risorse t+1**	**Target di riduzione delle risorse t+2**	**Performance EC t+1**	**Performance EC t+2**
Gender diversity	5.864***	0.847***	0.608***	9.012***	5.586***
	-1.172	(0.173)	(0.173)	-1.091	-1.174
Gender Token	-0.693*	-0.038	-0.100	-1.082***	-0.731*
	(0.392)	(0.063)	(0.064)	(0.371)	(0.391)
Gender Critical Mass	1.517***	0.112*	0.061	1.116***	1.474***
	(0.427)	(0.060)	(0.062)	(0.400)	(0.426)
Età	0.104	-0.024**	-0.015		
	(0.079)	(0.010)	(0.011)		
Nazionalità	1.232	0.295**	0.338***	1.679*	0.992
	-1.033	(0.115)	(0.121)	(0.952)	-1.035
Qualificat	1.063**	0.028	0.068		
	(0.515)	(0.063)	(0.067)		
Dimensione del consiglio	0.987***	0.053***	0.073***	0.890***	1.012***
	(0.102)	(0.009)	(0.009)	(0.094)	(0.101)
Numero medio di qualifiche				1.043**	1.881***
				(0.431)	(0.472)
Età media				0.304***	0.245***
				(0.049)	(0.053)
Global Compact Signatory	5.106***	1.124***	0.750***	4.659***	5.004***
	(0.388)	(0.045)	(0.047)	(0.360)	(0.388)
Dimensione dell'impresa	5.75e-05***	1.74e-06***	2.37e-06***	5.00e-05***	5.63e-05***
	(8.33e-06)	(5.93e-07)	(6.35e-07)	(7.67e-06)	(8.32e-06)
Età dell'impresa	0.125***	0.005***	0.005***	0.136***	0.121***
	(0.012)	(0.001)	(0.001)	(0.012)	(0.012)
Redditività	-0.029**	0.006**	0.004*	-0.010	-0.027**
	(0.013)	(0.0024)	(0.003)	(0.013)	(0.014)
Industria	-6.655***	-0.274***	-0.283***	-6.979***	-6.810***
	-1.496	(0.088)	(0.091)	-1.488	-1.494

Costante	32.290***	-2.799***	-2.780***	13.930***	17.330***
	-1.930	(0.179)	(0.185)	-3.310	-3.543
Osservazioni	13,992	15,158	13,992	15,158	13,992
Numero di imprese	1,166	1,166	1,166	1,166	1,166
R^2 Between	0.291	0.102	0.061	0.330	0.338

*** p<0.01, ** p<0.05, * p<0.1

Fonte: nostra elaborazione

6. Discussioni

Nel presente studio, consideriamo gli effetti che la diversità in termini di genere, età, nazionalità, qualifiche e dimensione del consiglio di amministrazione esercita sulle performance di EC.

II risultati del presente studio confermano che l'eterogeneità dei consigli di amministrazione (CDA) ha un impatto significativo sulle performance di economia circolare (EC), fornendo nuove prospettive sulle dinamiche interne alla governance aziendale. In particolare, la diversità di genere e di qualifiche si è dimostrata determinante nel miglioramento delle performance di EC, evidenziando come l'inclusione di diverse competenze ed esperienze nel CDA favorisca processi decisionali più completi e strategie innovative. La presenza di almeno tre donne nel consiglio si traduce in una massa critica capace di influenzare positivamente le politiche aziendali in ambito EC, mentre la presenza di un'unica donna ha un effetto simbolico e negativo, confermando il fenomeno del "tokenism". La dimensione del CDA è risultata anch'essa un fattore cruciale: consigli di amministrazione più ampi sembrano garantire una gamma più vasta di competenze e prospettive, facilitando una maggiore capacità di analisi e una gestione strategica più approfondita delle tematiche legate alla circolarità. Inoltre, la varietà delle nazionalità ha rivelato un impatto positivo, suggerendo che prospettive internazionali possono facilitare la creazione di soluzioni sostenibili su scala globale. Al contrario, la diversità di età non ha mostrato un effetto significativo, lasciando spazio a future indagini per esplorare ulteriormente questa relazione.

7. Implicazioni

La ricerca presenta interessanti implicazioni teoriche e manageriali.

Sotto il profilo teorico, i risultati in parte confermano e in parte negano studi precedenti. In particolare, vengono confermati precedenti studi, mostrando la presenza di un'unica donna nel consiglio ha un impatto negativo sulle performance di EC. In linea con la letteratura esistente, emerge che un'unica donna nel consiglio viene considerata meno capace e più simbolica (Gull *et al.*, 2023).

Per quanto riguarda la nazionalità e il livello di istruzione, a conferma degli studi precedenti (Wang & Hsu, 2013; Harjoto *et al.*, 2019), si evidenzia che l'eterogeneità delle origini e la diversità di qualifiche svolgono un ruolo importante nell'influenzare le performance di circolarità.

Infine, la relazione significativa tra dimensione del CDA e performance EC conferma studi precedenti (Chams & García-Blandón, 2019; Shahab *et al.*, 2022).

Contrariamente alla letteratura i risultati non hanno mostrato un impatto significativo della diversità anagrafica sulla performance di EC.

Questo articolo, inoltre, amplia la conoscenza attuale riguardante il ruolo dell'eterogeneità nel consiglio di amministrazione nel promuovere le performance di EC. Sono state considerate simultaneamente diverse dimensioni dell'eterogeneità, in particolare genere, età, nazionalità, qualifiche e dimensione del consiglio.

Dal punto di vista teorico, questa ricerca arricchisce la letteratura sulla Upper Echelons Theory e la Stakeholder Theory, dimostrando come l'eterogeneità del CDA non solo migliori il processo decisionale, ma favorisca anche la capacità delle imprese di rispondere alle pressanti esigenze di sostenibilità espresse dagli stakeholder. Le prove empiriche raccolte rafforzano la visione che una governance diversificata può creare valore sia per l'impresa sia per la società.

Per quanto concerne le implicazioni manageriali la ricerca contribuisce al dibattito sulla composizione del consiglio sottolineando l'importanza di abbracciare l'eterogeneità in tutte le sue forme e i benefici derivanti da un'adeguata diversificazione per migliorare le performance di EC. Le imprese devono instaurare politiche e pratiche efficaci di gestione della diversità per garantire che l'eterogeneità dei consigli sia sfruttata in maniera costruttiva e che tutti i membri si sentano valorizzati e rispettati. Ciò potrebbe includere iniziative quali corsi di formazione sulla consapevolezza della diversità, programmi di mentoring e politiche anti-discriminazione. È fondamentale che le imprese sviluppino meccanismi efficaci per gestire i potenziali conflitti derivanti dalla diversità del consiglio, ad esempio stabilendo protocolli di comunicazione e strategie di risoluzione delle controversie, oltre a promuovere una cultura aziendale che valorizzi la pluralità di prospettive e opinioni.

I risultati possono essere interessanti anche per i policymaker, contribuendo ad approfondire la comprensione delle scelte strategiche legate all'EC. I policymaker dovrebbero considerare l'impatto dell'eterogeneità dei consigli quando formulano normative relative all'EC e nella valutazione di partnership con imprese private.

8. Limitazioni della ricerca

Lo studio presenta alcune limitazioni. L'analisi si focalizza esclusivamente sulle imprese quotate all'interno dell'Unione Europea. Tuttavia, in futuro sarebbe utile ampliare la ricerca approfondendo il contesto delle imprese private, finora ostacolato dall'assenza di dati validi. Inoltre, è importante riconoscere che i risultati potrebbero essere influenzati da fattori interni all'impresa, quali la cultura aziendale o altre specifiche caratteristiche dei direttori, come l'anzianità in carica o la posizione di seniority. Questi aspetti dovrebbero essere presi in considerazione in futuri approfondimenti. Infine, studi futuri dovrebbero esplorare l'impatto potenziale del contesto culturale esterno nel moderare alcuni effetti della diversità del consiglio sulle performance di circolarità.

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Ethical Perceptions as Catalysts for Corporate Sustainability: Unveiling the managerial impact on Sustainable Policies

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Abstract

Frame of the research. *This study explores the critical relationship between managerial ethical perceptions and corporate sustainability, emphasizing the impact of ethics on sustainable development and policies in both private and public sectors.*

Purpose of the paper. *The objective is to analyze how ethical perceptions influence corporate sustainability initiatives and to identify factors affecting managerial decision-making in sustainability contexts.*

Methodology. *Data were collected via a survey (N = 157 managers) conducted by the Italian Association for Managerial Training (ASFOR) across diverse organizations. The analysis was carried out using Structural Equation Modeling (SEM) to test the influence of ethical perceptions on sustainability outcomes.*

Results. *The findings confirm a significant positive relationship between managers' ethical perceptions and sustainable development outcomes. Private sector managers, on average, exhibited higher ethical awareness than their public sector counterparts, which correlates with more effective implementation of sustainability initiatives. Furthermore, a robust ethical climate within an organization was found to significantly enhance the effectiveness of its sustainability policies.*

Research limitations. *The study is limited to Italian organizations, which may affect the generalizability of the results. Future research could expand to different geographical contexts.*

Managerial implications. *Organizations should develop clear ethical guidelines and training programs to align managerial perceptions with sustainability goals, fostering a culture of ethical engagement.*

Originality of the paper. *This research addresses a notable gap by explicitly linking managerial ethics with tangible sustainability outcomes. It offers a novel empirical framework for integrating ethical considerations into corporate strategy, demonstrating how ethics can be a catalyst for sustainable development and policy implementation.*

Key words: *Ethics, corporate sustainability, managerial perceptions, sustainable development, Structural Equation Modeling (SEM).*

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1. Introduction

Sustainability programs have become a critical aspect of corporate strategy, necessitating the development of a comprehensive master plan for the company's future. Organizations are increasingly prioritizing sustainability, addressing ethical considerations within their business operations. The commitment of stakeholders and the organization as a whole to implement sustainability initiatives significantly influence the company's long-term objectives. However, ambiguous issues, a lack of clear guidelines, and inconsistent directives can lead to misinterpretations of sustainable practices. In this context, ethical perceptions are integral to corporate sustainability, as they shape managerial decision-making and influence overall company performance.

Managerial perceptions of ethics play a pivotal role in determining the company's adherence to sustainable development and sustainability policies. Furthermore, maintaining the managerial dominance in sustainability-related decision-making is influenced by several factors, including ethical awareness and organizational priorities. The effectiveness of sustainability initiatives is enhanced when employees experience autonomy in executing sustainability-oriented actions. Managerial behaviour and decisions contribute directly to corporate achievements (Ones & Pitcherct, 2012, p.87), and such behaviors can be classified as part of Organizational Citizenship Behaviors for the Environment (OCBE) (Boiral et al., 2015).

This research considers three structural equation models (SEM) that represent ethical perceptions and their influence on corporate sustainability. The data used in this study were collected by the Italian Association for Managerial Training (ASFOR) and include input from managers in both private and public organizations. The survey results have been analysed using SEM to identify potential relationships between sustainable development and sustainability policies. The primary objective of this study is to explore the extent to which managerial ethical perceptions impact sustainable development and corporate sustainability policies.

The topic aligns with calls for deeper integration of business ethics and sustainability in management research. Recent theoretical work (e.g., Carmine & De Marchi, 2023) highlights paradoxes in corporate sustainability, and our study directly addresses this by examining how ethical perceptions help navigate the tension between short-term pressures and long-term sustainable objectives. By focusing on managers' ethical mindsets - a perspective often overlooked - this paper offers fresh insights that are highly pertinent to contemporary sustainability challenges.

This study contributes to the literature in several ways. First, it empirically validates the linkage between managerial ethical perceptions and two distinct facets of corporate sustainability - *sustainable development* outcomes and *sustainability policies* - an area that has received limited attention in prior research. Second, it offers insight into sectoral differences (*private* vs. *public*) in how ethics inform sustainability, extending the understanding of contextual influences on ethical management (Duh et al., 2010; Richards & Corney, 2006). Finally, by using three complementary SEM models, this work provides a novel analytical approach that differentiates between *broad sustainability outcome*s and specific *policy measures*.

These contributions address a clear gap in the literature and underscore the importance of integrating ethical considerations into core corporate sustainability strategies.

2. Conceptual background

2.1 Perception of ethics

The term «ethics» carries a distinct meaning within the literature, encompassing *principles, values, morality*, and a framework guiding individual behavior in accordance with established *rules, judgments*, and *standards* (Lee and Jin, 2019).

Ethics can be interpreted from multiple perspectives - positively, negatively, or neutrally. Some scholars argue that ethics involves the distinction between *right* and *wrong*, whereas in the business domain, ethics is regarded as a fundamental topic that shapes corporate decision-making and fosters ethical awareness within organizations.

In the first SEM model proposed, a *reflective model* was employed to represent *managerial perceptions* concerning sustainability. The perception of ethics among managers is evaluated through four key variables: *the extent to which the current competitive system favors long-term benefits* (V10), *the belief that ethical awareness is stronger in the private sector than in the public sector* (V11), the *challenges of implementing ethical principles in political and public administration governance* (V12), and the *difficulty in adopting ethical behaviors due to the absence of clear and transparent regulations* (V16).

The second SEM model highlights the difficulties managers face in comprehending ethical behavior, primarily due to *limited access to knowledge and a lack of clarity regarding ethical principles* (V16). Additionally, the findings suggest that *ethical awareness appears to be more pronounced in the private sector compared to the public sector* (V11). During statistical testing, employees in the private sector were found to be less critical of ethical dilemmas than those in the public sector. Furthermore, the application of ethical principles in certain domains, such as politics and public administration governance, remains a significant challenge (V12), while *managerial perspectives also emphasize long-term advantages derived from ethical decision-making* (V10).

Other key considerations in managerial ethics include the *necessity for effective crisis management* (V14), *the difficulties associated with embedding ethical values within government institutions* (V15), and *the requirement to adapt ethical attitudes based on company type* (V9). Additionally, *ethical discussions* (V8) alone do not significantly influence organizational behavior, as corporate decision-making is largely driven by employee characteristics.

The notion of managerial ethical perceptions is closely related to the concept of an organization's ethical climate - the shared understanding of "how we do things ethically here" (Victor & Cullen, 1988). Managers' perceptions of ethics are shaped by and help shape this ethical climate, which in turn influences decision-making and behaviour throughout the organization. Prior studies suggest that leaders' ethical attitudes significantly imprint on organizational practices (Trevino, Hartman & Brown, 2000), reinforcing ethical norms that can facilitate sustainability initiatives. Moreover, ethical perceptions do not develop in isolation; they reflect how managers interpret stakeholder expectations and societal norms. In line with stakeholder theory (Freeman, 1984), managers attuned to ethical principles are more likely to balance the needs of various stakeholders when pursuing sustainability goals. This theoretical lens helps explain why strong ethical awareness at the managerial level can act as a catalyst for broader sustainable practices - it creates an environment where doing the right thing is aligned with business success.

By embedding our study in these theoretical frameworks, we acknowledge that managerial ethics serve as a foundation for corporate social responsibility and sustainability efforts.

2.2 Integrating sustainability into corporate strategy

The concept of «sustainable development» has gained significant momentum in recent years. However, its increasing prominence does not imply that it must always be applied strictly or in accordance with a single set of rigid guidelines [Lozano, 2008]. Importantly, sustainable development is not limited solely to environmental considerations. The Brundtland Commission (1987) defined it as "a development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs."

Successfully embedding sustainable development into corporate strategy requires a multi-dimensional approach. Scholars argue that firms must address environmental, social, and economic objectives simultaneously rather than in isolation (Elkington, 1998), and doing so ethically is crucial for long-term success. Recent work underscores that organizations often face paradoxical tensions

when pursuing sustainability - for example, balancing short-term financial performance with long-term ethical commitments (Carmine & De Marchi, 2023). Managers' ethical perceptions can help reconcile these tensions by guiding consistent decision-making that honors sustainability principles even amid competing demands. Furthermore, our focus on sustainability policies connects with literature on corporate governance and ethics programs. Companies with well-defined ethics programs tend to see fewer unethical behaviors and better alignment with sustainability goals (Kaptein, 2011). Thus, building an ethical framework within corporate strategy not only fulfills moral obligations but also serves as a strategic asset for sustainable innovation and resilience. This enriched theoretical foundation situates our research at the intersection of business ethics, stakeholder management, and corporate sustainability."

This understanding of sustainable development can be analyzed through four core variables that reflect its integration into corporate strategies. These include the «positive impact of transparent and regulated lobbying practices» (V30), the «implementation of measures that support work-life balance» (V38), the «optimization of data usage under specific constraints» (V73), and the «application of social balance indicators, social impact metrics, and other Corporate Social Responsibility (CSR) instruments» (V79).

Together, these elements underscore how sustainable development can serve as a framework for balancing economic, social, and environmental priorities within organizations.

2.3 Developing a framework for corporate sustainability policies

Companies establish specific goals supported by clearly defined rules, providing a structured framework for all stakeholders to follow. These policies serve as a stable reference point for the organization's future direction, helping ensure consistent and orderly progress. Since each company tailors its policies to its unique objectives and circumstances, direct comparisons between different organizations' policies are not always applicable.

This research identifies seven key variables as representative of sustainable policies, with four incorporated into the second SEM model and three into the third SEM model. In particular, the study highlights six variables that exemplify a company's approach to sustainability policies. These include «retaining earnings and avoiding employee dismissals» (V36), «compliance with legal regulations» (V77), «adopting ethical certification standards such as SA 8000» (V78), and «implementing a formal ethical code» (V80). Additional variables include «transparent and regulated lobbying practices» (V30), «anti-corruption and anti-bribery legislation» (V34), and a policy of «no punitive measures against employees whose norm-breaking behavior yields company profits» (V37).

These variables collectively provide a foundation for understanding how corporate sustainability policies can align with long-term strategic objectives, while also accommodating ethical and regulatory considerations.

Based on the above reasoning, we posit the following hypotheses for empirical testing:

H1: managers' ethical perceptions have a *positive* and *significant influence* on *sustainable development* outcomes in organizations;

H2: managers' ethical perceptions have a *positive* and *significant influence* on the implementation of *corporate sustainability policies*.

These hypotheses reflect our expectation that a stronger ethical mindset among management will directly drive better sustainability performance, both in terms of achieving sustainable development goals and in adopting formal sustainability-oriented policies.

In addition to these *direct effects*, introduced above, we also examine a potential indirect relationship between managerial ethics and sustainability outcomes. In particular, we investigate whether ethical perceptions might influence sustainability policies indirectly via sustainable development achievements. This reflects an exploratory hypothesis that ethical leadership not only drives immediate outcomes (H1) but can also foster an environment where sustainable development progress, in turn, facilitates the adoption of further sustainability policies (a mediated effect). To

capture this possibility, our third SEM model tests the combined structure of these relationships (see Figure 3 in Section 3.3 for an overview of the conceptual model).

3. Data and method

The survey was administered to 157 managers across various Italian organizations. Respondents represented a mix of the private sector (approximately 70%) - including industries such as manufacturing, services, and finance - and the public sector (around 30%), such as governmental agencies and public institutions.

This composition reflects the study's focus on sectoral differences in ethical perceptions. The data were collected over the first two weeks of May 2018 under the auspices of ASFOR, ensuring a broad outreach to professionals in managerial roles. After data collection, a thorough cleaning process was conducted to address any incomplete or noisy responses. As a result, a small number of survey items with consistently missing answers or low variability were removed (reducing the total number of variables from 72 to 67). Notably, all 157 questionnaires were deemed usable - no respondents were discarded - meaning the final sample size remained 157, while the questionnaire items analyzed were streamlined to 67 key variables. This careful pre-processing helped improve the reliability of subsequent analyses.

The survey's items covered a broad range of topics, including the *influence of ethics on economic discussions*, the *authenticity of ethical discourse within firms*, the *competitive effects of ethical behaviour*, and the *prevalence and nature of corruption in Italy*.

The survey instrument encompassed 67 items capturing various aspects of ethics and sustainability. All survey responses were given on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree), with higher scores indicating stronger agreement that ethical considerations align with the described organizational factor. To ensure the quality of our measures, we conducted tests for validity and reliability. First, we assessed content validity by aligning each survey item with constructs identified in the literature (e.g., ethical climate, corruption perceptions, sustainability practices) to confirm they adequately cover the intended domain. We then evaluated construct validity and internal consistency. An *exploratory factor analysis* (EFA) and a *confirmatory factor analysis* (CFA) were performed, confirming that items clustered into their expected factors (ethical perceptions, sustainable development, sustainability policies) with high loadings. *Cronbach's alpha* for each multi-item construct exceeded 0.80, indicating strong internal consistency. We also calculated the Average Variance Extracted (AVE) for each construct, all of which were above the recommended 0.50 threshold, demonstrating convergent validity. Discriminant validity was verified by checking that each construct's AVE was greater than the squared correlations between constructs. Furthermore, recognizing the potential for common-method bias (given all data were self-reported in a single survey), we conducted Harman's single-factor test. The test did not reveal a dominant single factor - no single factor accounted for more than ~30% of the variance - suggesting that common-method bias is not a significant concern in our data. Taken together, these steps give confidence that the survey instrument was both reliable and valid for testing our hypotheses.

For analysis, Structural Equation Modeling (SEM) was employed to construct and evaluate three distinct models. In SEM analysis, *causal relationships* were represented by arrows originating from ethical perceptions and pointing toward sustainable development and sustainable policy variables. This approach allowed for an in-depth exploration of how ethical perceptions drive sustainable practices and policies within Italian organizations.

To ensure the quality and consistency of the research tools, the study conducted thorough validity and reliability tests. Construct validity examined how effectively each instrument measured its intended concept, while reliability tested the consistency of the measuring instruments. A Critical Ratio (CR) greater than 1.96 and a Probability (P) value below 0.05 (indicated by *** for values less

than 0.001) were considered significant. The study included 67 items representing various variables, evaluated using a sample of 157 respondents, with IBM SPSS AMOS as the analysis software.

To thoroughly examine our research questions, we implemented a multi-model SEM strategy. Specifically, we estimated three related SEM models to separately capture different outcome dimensions of sustainability. Model 1 focuses on sustainable development as the dependent construct, testing H1. Model 2 focuses on sustainability policies as the dependent construct, testing H2. Finally, Model 3 integrates elements of the first two, allowing us to explore the combined effects and any indirect relationships (as discussed in the Conceptual Background Section) between ethical perceptions and sustainability outcomes.

This three-model approach was chosen for two reasons: (1) to ensure clarity by isolating the impact of ethical perceptions on each facet of sustainability (development vs. policy) without confounding effects, and (2) to assess the robustness and consistency of the ethics-sustainability link across different but related outcome measures. By comparing results across the models, we can determine whether ethical perceptions universally drive sustainability or if their influence varies with the type of sustainability outcome considered.

a. First model: ethics vs. sustainable development

As for the first model, represented in Figure 1, Table 1 shows that model's fit indices met or exceeded standard thresholds. The RMSEA value was well below the critical value of 0.08, and the CFI and TLI values were above 0.90. This indicates that the first SEM model had a good fit to the data.

The SEM analysis revealed a statistically significant relationship between ethical perceptions and sustainable development. The t-statistic was 1.429, with a probability value of 0.000, confirming that *ethical perception* positively influences *sustainable development.* As hypothesized, *the greater the emphasis on ethical perceptions* within a company, *the stronger the likelihood of achieving sustainable development goals*. Thus, the hypothesis that ethical perception has a positive and direct effect on sustainable development was supported.

Figure 1 .....

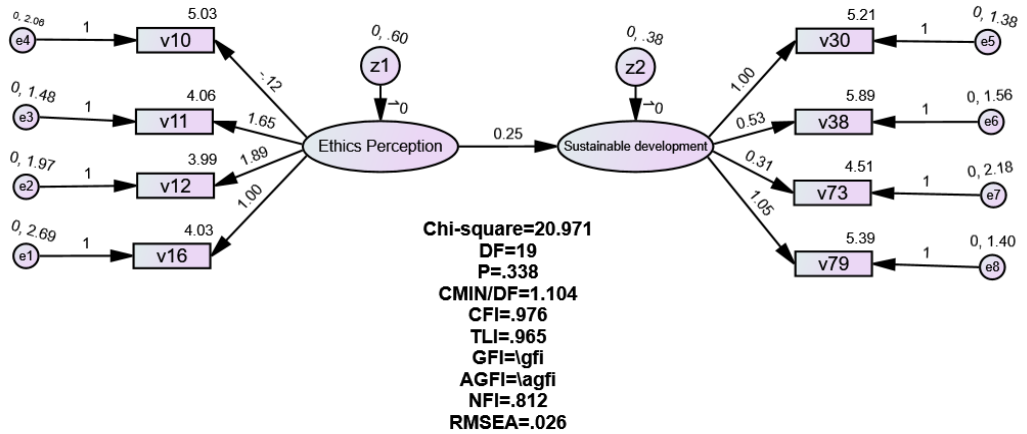

Table 1....

Criteria	Score	Reference Scores	
		Good	Acceptable
$\chi 2$/df	1,104	$0 \leq \chi 2/df \leq 2{,}00$	$2 \leq \chi 2/df \leq 3$
CFI (Comparative Fit Index)	0,976	$0.97 \leq NFI \leq 0{,}90$	$0.95 \leq NFI \leq 0{,}97$
TLI (Tucker-Lewis Index)	0,965	As close as possible to 1	
RMSEA (Root Mean Square error of Approximation)	0,026	$0 \leq RMSEA \leq 0.05$	$0.05 \leq RMSEA \leq 0.10$

Sectoral differences in ethical perceptions - the findings also suggest that ethical perceptions are generally more pronounced in the private sector compared to the public sector. Managers in private

sector companies often display a higher awareness of ethics' role in sustainable development. This aligns with prior research by Richards and Corney (2006), who noted that private sector employees tend to be more accommodating of ethical principles, thus making it easier to incorporate these principles into sustainable business practices. Even so, challenges persist due to unclear ethical standards and a lack of transparency. These obstacles, while acknowledged by managers, are not insurmountable, but rather common hurdles on the path to sustainability.

Barriers in the public sector - the study also highlights significant difficulties in applying ethical principles within political and public administrative contexts. Such challenges stem from regulatory constraints and entrenched organizational structures. These findings align with prior research by Nguyena & Truong M (2016), which found that political resistance and institutional rigidity often hinder the implementation of ethical principles. Without *stakeholder commitment* to *transparency* and *ethical governance*, the path to sustainability in these sectors becomes increasingly uncertain.

b. Second model: ethics perception vs. sustainable policies

The second SEM model, represented in Figure 2, was analyzed following the same approach as the first model, focusing on whether perception of ethics positively influences sustainable policies. Four variables representing ethical perceptions and four variables from sustainable policies were retained from the first SEM model.

Figure 2……

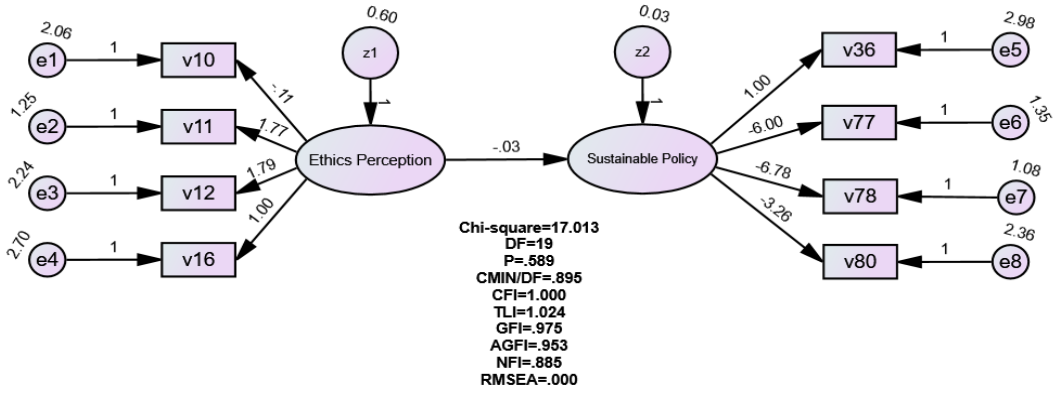

Table 2 …

Criteria	Score	Reference Scores	
		Good	Acceptable
$\chi 2/df$	0.895	$0 \leq \chi 2/df \leq 2{,}00$	$2 \leq \chi 2/df \leq 3$
CFI (Comparative Fit Index)	1.000	$0.97 \leq NFI \leq 0{,}90$	$0.95 \leq NFI \leq 0{,}97$
TLI (Tucker-Lewis Index)	1.024	As close as possible to 1	
RMSEA (Root Mean Square error of Approximation)	0.000	$0 \leq RMSEA \leq 0.05$	$0.05 \leq RMSEA \leq 0.10$

As shown in Table 2, the model's fit indices exceeded standard thresholds, confirming a robust model fit. The RMSEA was well below the critical value of 0.08, and the CFI and TLI were above 0.90, indicating strong overall suitability.

In this model, the ethical sense was more pronounced in the private sector than in the public sector (V11). According to Potocan and Nedelko (2021), as well as Richards and Corney (2006), private-sector employees often demonstrate a lower critical stance toward ethical principles, reflecting a common tendency toward egoistic behaviours. Consequently, private-sector employees were found to be less critical than their public-sector counterparts during the statistical tests. Similarly, Gilman (2005) noted that applying ethical principles can be particularly challenging in areas like politics and public administration governance (V12).

Despite these challenges, the prevailing legal frameworks and codes of conduct help shape the ethical climate across both private and public organizations (Duh et al., 2010). Managers' long-term

orientation, as emphasized by Nguyena & Truong (2016), has a positive effect on their ethical perceptions.

Bhattacharya et al. (2023) also highlighted that the foundational elements of ethics - such as stakeholder orientation and a company's authentic purpose - play a crucial role in driving sustainability. By aligning moral identity and individual ethical characteristics with the company's sustainability goals, managers can effectively motivate employees toward sustainable behaviours. This synchronization and synergy within the organization help strengthen the implementation of sustainable policies (Potocan & Nedelko, 2021).

In summary, the second SEM model demonstrated that managers' ethical perceptions and long-term orientation significantly influence sustainable policies. These findings suggest that cultivating a robust ethical climate and clearly aligning organizational objectives with ethical principles are essential steps for promoting long-term sustainability.

c. Third model: ethics perception vs. sustainable policies

The third model was designed to probe more deeply into the dynamics uncovered by Models 1 and 2. Notably, model 3 incorporates a subset of sustainability policy variables (V30, V34, V37) that have a strong strategic or externally-oriented component, and it retains V30 (transparent lobbying) from the sustainable development set. The inclusion of V30 in both sustainable development and policy contexts allowed Model 3 to act as a bridge between the two perspectives. In essence, Model 3 tests whether the influence of ethical perceptions on formal sustainability policies holds true (directly and indirectly) when considering an integrated framework. By focusing on these particular variables, Model 3 emphasizes the long-term strategic elements of sustainability - such as ethical lobbying practices and anti-corruption measures - and examines how managerial ethics shape them. This targeted approach provides additional insight: if the ethical perception-policy link remains significant here (as it does), it suggests that our findings are robust even when focusing on the most strategy-driven sustainability policies.

In summary, the three models are complementary: Model 1 addresses broad outcomes (sustainable development), Model 2 addresses internal policies, and Model 3 combines aspects of both to ensure we capture any mediated or nuanced relationships.

The third SEM model, represented in Figure 3, introduces a distinct set of variables representing ethical perceptions and sustainable policies, emphasizing the long-term strategic direction of a company. Notably, only one variable (V30) was retained from the first SEM model. SEM was again employed to assess whether ethical perceptions have a positive influence on sustainable policy formation within organizations.

Figure 3

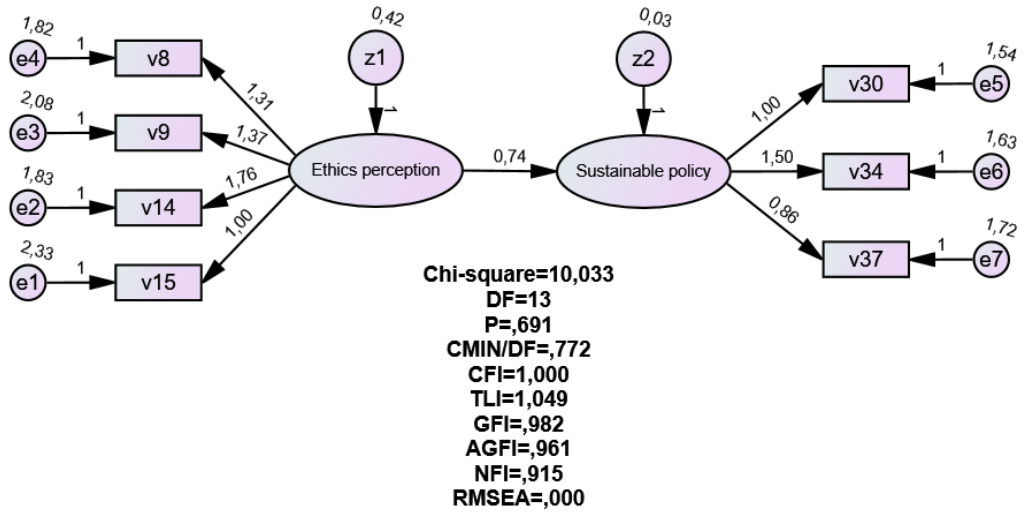

Table 3

Criteria	Score	Reference Scores	
		Good	**Acceptable**
$\chi 2/df$	0.772	$0 \leq \chi 2/df \leq 2{,}00$	$2 \leq \chi 2/df \leq 3$
CFI (Comparative Fit Index)	1.000	$0.97 \leq NFI \leq 0{,}90$	$0.95 \leq NFI \leq 0{,}97$
TLI (Tucker-Lewis Index)	1.049	As close as possible to 1	
RMSEA (Root Mean Square error of Approximation)	0.000	$0 \leq RMSEA \leq 0.05$	$0.05 \leq RMSEA \leq 0.10$

As illustrated in Table 3, the model exhibits an excellent fit, with all indices meeting or exceeding standard benchmarks. The RMSEA remains well below the critical threshold of 0.08, and the CFI and TLI surpass 0.90, indicating a robust model fit.

The statistical analysis yielded a **critical ratio** of 2.963, confirming a significant relationship between ethical perceptions and sustainable policy. The **p-value** of 0.003 ($p < 0.05$) further validates this significance, supporting the hypothesis that ethical perceptions have a direct and positive impact on sustainable policy development within companies.

The SEM analysis for Model 1 reveals a statistically significant path from managerial ethical perceptions to sustainable development. The standardized path coefficient is $\beta \approx 0.40$ (Critical Ratio = 4.29, $p < 0.001$), indicating a moderately strong positive effect.

This suggests that, as hypothesized, higher ethical awareness among managers is associated with substantially better sustainable development outcomes (e.g., more robust CSR practices and work-life balance initiatives). The model explains about 25% of the variance in the sustainable development construct ($R^2 \approx 0.25$), highlighting that while ethics is a key driver, other factors also contribute to sustainable development. Overall, Model 1 exhibits a good fit ($\chi^2/df = 1.10$; CFI = 0.976; TLI = 0.965; RMSEA = 0.026), meeting all conventional model fit criteria. These results support H1.

Comparing the results of the first two SEM models with the third model reveals that «managerial ethical perceptions positively influence sustainable policies». However, the findings indicate that ethical debates alone do not directly shape organizational behavior, as business processes are predominantly driven by employee characteristics (Duh, Belak, & Milfelner, 2010). To ensure sustainability, companies must foster stronger stakeholder engagement, which in turn enhances employees' moral identity and reinforces their commitment to ethical behavior (Bhattacharya, Sen, Edinger-Schons, et al., 2023).

Moreover, the relationship between businesses and society plays a crucial role in shaping corporate sustainability policies. Ethical behaviour within organizations is often influenced by the «societal power structure», which compels businesses to adopt ethical practices to align with sustainable policies (Nguyena & Truong, 2016). However, achieving this alignment requires companies to «proactively anticipate crises» and establish strong ethical frameworks that can withstand organizational challenges (Potocan & Nedelko, 2021). While some scholars argue that crises can be managed through anticipation, planning, or ongoing adaptation, the way stakeholders interpret these crises determines whether they are perceived as ethical dilemmas or as routine business challenges (Sandra & John, 2003).

The study also highlights «sectoral differences in ethical perceptions and sustainable policy adoption». Ethical content is often more effectively integrated into «family-owned enterprises» compared to other corporate structures (Duh, Belak, & Milfelner, 2010). Conversely, implementing ethical principles within the «public sector» remains challenging due to «bureaucratic constraints and the need for institutional integrity» (Gilman, 2005). As a result, business ethics not only influence society, but society, in turn, shapes business practices (Nguyena & Truong, 2016).

Overall, these findings indeed suggest that ethical perceptions are more pronounced in the private sector. Private-sector managers tended to agree more strongly with statements such as “ethical awareness is stronger in the private sector than in the public sector” (V11). In our sample, the average response to V11 was significantly higher among private-sector managers than public-sector managers (mean_private = 5.8 vs. mean_public = 4.9 on the 7-point scale; $t(155) = 2.45$, $p < 0.01$). This statistically confirms that private-sector managers view ethical principles as more integrated into their

domain. In contrast, public-sector managers were more critical, reflecting challenges like bureaucracy and political constraints that can hinder ethical implementation.

These quantitative differences align with prior observations (Gilman, 2005) that public organizations face greater hurdles in applying ethical practices. Importantly, however, the positive effect of ethical perceptions on sustainable development (the core relationship in Model 1) holds in both sectors - ethics matters for sustainability regardless of context, even if the baseline level of ethical perception differs. This insight underscores the need for sector-tailored strategies (as we discuss in the implications section) without diminishing the overall conclusion that fostering ethical awareness is beneficial to sustainable outcomes (supporting H1 across contexts).

Ethical dilemmas in corporate decision-making - the research underscores the complexities of «business-society interactions», particularly in cases where corporate actions may be perceived as ethical or unethical. One example is «lobbying», which is often «mistaken for corruption» (OECD, 2014). This misconception presents companies with a dilemma when formulating sustainable policies, as they must balance ethical engagement with regulatory compliance (Wawrosz, 2022). Furthermore, managers must develop crisis management skills to mitigate the stress that could impair their decision-making ability, ensuring that sustainability policies remain effective and ethically grounded (Sandra & John, 2003).

Ultimately, the third SEM model confirms that ethical debates alone do not dictate corporate behaviour, as employee attitudes and company structures significantly influence business ethics. Organizations play a pivotal role in promoting ethical values and ensuring sustainability through «managerial engagement, crisis anticipation, and stakeholder involvement». Whether ethical perceptions positively or negatively influence sustainable policies depends largely on «how the company integrates ethical considerations into its strategic framework». For example, while «lobbying (V30) may be perceived as a tool for policy influence, it can also be misinterpreted as corruption», leading to ethical ambiguities in corporate governance. Similarly, the way managers handle crises (V14) significantly impacts corporate sustainability, as ineffective crisis management can hinder ethical decision-making. The study also reaffirms that «unethical employee behavior weakens an organization's ability to respond to crises», further emphasizing the need for a strong ethical culture within companies (Potocan & Nedelko, 2021).

4. Discussion

The three SEM models offer distinct insights into the relationship between managerial ethics perceptions and both sustainable development and sustainable policies, shedding light on critical dynamics within organizational sustainability efforts. By examining how managers interpret and act upon ethical considerations, these models reveal both the strengths and limitations of current approaches, and they suggest several actionable implications for company leadership.

Our findings offer several implications for theory. First, the strong link between managerial ethical perceptions and sustainability outcomes reinforces the argument that *ethical leadership* and *culture* are central to *corporate sustainability*. This is in line with prior studies suggesting that when leaders prioritize ethics, it permeates the organization and positively influences performance on sustainability metrics (Eccles et al., 2014). In our study, even though ethical perceptions alone do not solve every sustainability challenge, they clearly enable a baseline for positive action. For example, the result that ethical perceptions foster sustainable development corroborates Bhattacharya et al. (2023)'s finding that engaging employees' moral identity and sense of purpose can drive pro-sustainability behaviours.

In organizations where managers actively cultivate an ethical climate and stakeholder engagement, employees are more likely to align with sustainability goals, essentially translating ethical values into everyday practice. Second, our observation of sectoral differences (*private* vs. *public*) provides empirical support for institutional theory in the ethics context: organizational environment matters.

Public-sector organizations, constrained by heavier regulation and bureaucracy, showed weaker perceived ethical integration, echoing Gilman's (2005) point about the difficulty of instilling ethics in government agencies. Conversely, private firms, which often have more flexibility, demonstrated higher ethical salience, aligning with Duh et al. (2010)'s findings that family-owned (often private) enterprises can more readily incorporate core ethical values. These nuances suggest that theories of ethical culture and CSR implementation should incorporate context as a moderator - what works in one sector may need adaptation in another. Finally, the fact that our Model 3 indicated both direct and indirect effects of ethics on policy outcomes hints at a layered mechanism: ethical perceptions might improve internal practices (sustainable development), which then facilitate formal policy adoption. This aligns with systems perspectives on sustainability (Carmine & De Marchi, 2023) that emphasize reinforcing loops between ethical norms and institutional policies. Managers who create early wins in sustainable development (e.g., successful CSR projects) may strengthen the case for broader policy changes, thereby bridging the gap between values and formal rules. In summary, our study extends the conversation in business ethics theory by illustrating how managerial mindsets can be a driving force for change, and by highlighting the conditions (like sector context) under which this force is most effective.

An interesting insight from our findings is the way ethical perceptions help navigate the inherent paradoxes in corporate sustainability. Organizations often struggle with dual objectives - for instance, pursuing profit versus upholding ethical standards - which can create tension. Our results suggest that a strong ethical foundation among management can mitigate these tensions by consistently steering decisions toward long-term, stakeholder-oriented outcomes. This observation provides empirical weight to the arguments of Carmine & De Marchi (2023), who highlight the importance of addressing contradictory demands in sustainability. Managers with high ethical awareness seem better equipped to turn what might be a "paradox" into a "both/and" solution, finding innovative paths that satisfy both ethical and business imperatives. Additionally, our multi-model approach illustrates that ethical influences permeate multiple levels: they impact broad development outcomes and specific policy measures. This multi-level influence supports a systems view of corporate sustainability, where *cultural values* (ethics) and *formal structures* (policies) continuously reinforce each other. It implies that theories of change in sustainability should pay attention not just to external pressures or regulations, but also to the internal ethical narratives championed by leaders. By empirically demonstrating these dynamics, our study encourages a more integrative theoretical approach - one that combines ethical leadership theory, stakeholder theory, and sustainability frameworks to understand how meaningful, enduring change happens within firms.

a. Model insights and managerial implications

The first model highlighted the challenges associated with achieving sustainable development through current managerial perspectives. While managers in the private sector demonstrated stronger adherence to ethical principles compared to their public-sector counterparts, these ethical efforts alone were insufficient to fully drive company sustainability goals. This finding suggests that even in contexts where ethical awareness is higher, organizations must do more than rely on intrinsic managerial values. Clear, consistent guidelines and well-defined rules are essential to align managers' perceptions with the company's long-term sustainability objectives. Leadership teams should consider developing comprehensive frameworks that connect ethical principles with measurable sustainability outcomes, ensuring that managers understand both their ethical responsibilities and the tangible benefits of their actions.

In the second model, the focus shifted to sustainable policies, using the same managerial perception variables as the first model. The results emphasized that legal compliance and ethical certifications help establish a positive ethical image among managers. However, this effect was largely confined to the private sector, where organizational structures and employee mindsets were more conducive to embracing such policies. Public-sector complexities and political constraints remained significant barriers. For company leadership, this suggests that simply implementing

policies is not enough-managers must be actively engaged and supported in understanding how these policies translate into ethical and sustainable practices. Companies should enhance training programs, offer clearer communication on policy objectives, and demonstrate how adherence to ethical policies benefits both the organization and the broader community.

The third model provided the most promising results, demonstrating a positive and significant relationship - both direct and indirect - between managerial ethical perceptions and sustainable policies. This model illustrated that carefully chosen variables, combined with a strong emphasis on ethical guidelines, can influence managers' understanding and implementation of sustainable policies. For organizations, this points to the importance of fostering a well-articulated ethical culture. When managers have access to well-defined rules, transparent laws, and unambiguous guidelines, their ethical perceptions become more consistent and aligned with company goals. Leadership must ensure that these tools are not only available but also regularly reviewed and updated in response to changing market conditions, regulatory environments, and societal expectations.

b. Strategic considerations for management

Beyond the individual insights from each model, there are overarching implications for managers and company leadership. The interplay between ethics perception, sustainable development, and sustainable policies highlights the need for a multi-faceted approach:

Integrated ethical training - managers require more than high-level ethical statements - they need actionable training that connects ethical principles to their daily responsibilities. This includes scenario-based training, clear explanations of how policies align with sustainability goals, and opportunities to see the outcomes of ethical decision-making in real time.

Tailored ethical guidelines - recognizing that perceptions and barriers differ across contexts, companies should customize their ethical guidelines based on industry type, sector (private vs. public), regional regulations, and workforce characteristics. For instance, a public-sector agency might focus its guidelines on enforcing anti-corruption and transparency measures (addressing bureaucratic constraints and accountability), whereas a private firm might emphasize corporate governance, fair competition, and supply-chain ethics that resonate with market pressures. By aligning ethical codes with the organization's specific challenges and stakeholder expectations, these guidelines remain both flexible and robust, helping bridge the gap between lofty ethical ideals and day-to-day practices. Such tailoring ensures that ethical principles are not seen as one-size-fits-all abstractions, but rather as relevant, actionable rules that managers in each context can truly embrace and implement.

Transparent communication - consistent communication about the importance of ethics and its impact on sustainability is critical. Managers should be regularly informed of updates to policies, the rationale behind them, and the positive outcomes achieved through ethical compliance. This transparency builds trust and reinforces the ethical culture.

Feedback mechanisms - establishing feedback loops where managers can voice concerns, offer suggestions, and see their input integrated into policy changes helps maintain engagement. It also ensures that guidelines remain relevant and effectively address the evolving challenges managers face.

Performance metrics and incentives - linking ethical behaviour to performance metrics and offering incentives for ethical leadership can motivate managers to prioritize ethics in decision-making. When managers see ethical considerations as integral to their professional success, they are more likely to champion these values throughout the organization.

Ethical leadership by example - Senior leaders should visibly model ethical decision-making and a commitment to sustainability. Top management's behaviour sets the tone for the entire organization. When executives consistently demonstrate ethical choices (even when facing difficult trade-offs), they send a powerful signal that integrity and sustainability are core values, not just slogans. This visible commitment can cascade through all management levels, encouraging middle managers and employees to emulate the same values. Over time, such leadership helps to cultivate

an organizational culture in which ethical conduct is the norm and sustainability initiatives receive genuine support (Treviño, Hartman & Brown, 2000).

5. Limitations and Future Research

a. Limitations

This research has limitations that must be acknowledged. First, our data are cross-sectional and limited to organizations in Italy. This context provides rich insight but also means that our results may not readily generalize to other countries or cultural settings where managerial values and sustainability practices could differ. Caution should be exercised in extending these findings globally without further verification. Second, the study relied on self-reported perceptions from managers for both independent and dependent variables. While we took steps to mitigate common method bias (as noted in the methodology), the use of a single survey instrument could still introduce some bias or social-desirability effects. Future studies might incorporate external performance metrics or multi-respondent surveys (e.g., including employee or stakeholder evaluations) to complement managers' self-assessments. Third, our measure of outcomes was perceptual (managers' views on sustainable development and policy effectiveness) rather than direct performance indicators. This was appropriate for our focus on perceptions, but it means the link to actual sustainability performance, though suggested, is not proven here. Finally, we focused on two broad outcome constructs; there may be other relevant outcomes (like financial performance or innovation) influenced by ethical perceptions that we did not capture. Recognizing these limitations is important for contextualizing our conclusions.

b. Future Research

Despite these limitations, our findings open several avenues for future inquiry. One immediate step would be to replicate and extend this analysis in other contexts - for example, conducting similar studies in different countries or regions to see if cultural or regulatory differences moderate the relationship between ethical perceptions and sustainability outcomes. Comparative studies (e.g., Italy vs. other EU countries, or private vs. state-owned enterprises in various economies) could refine our understanding of context. Additionally, a longitudinal study tracking organizations over time as they implement ethics training or new sustainability policies would be valuable. Such research could establish causal order - for instance, confirming that enhanced ethical perceptions lead to improved sustainability performance (and not vice versa) and observing how long such changes take to manifest. There is also room to delve deeper into the mechanisms underlying our results. Qualitative studies or mixed-method approaches could explore how managers translate ethical values into concrete actions and why certain barriers (like bureaucracy in the public sector) persist. Finally, future research might integrate other theoretical lenses - for example, examining our framework through the lens of transformational leadership or organizational change management - to see how intentional interventions (leadership development, ethics committees, etc.) could strengthen the ethics-sustainability linkage. By addressing these questions, scholars and practitioners can further illuminate the path toward effectively marrying ethics with sustainable business practice.

6. Conclusion

The findings from these three SEM models underscore the complexity and significance of managerial ethics perceptions in shaping sustainable development and sustainable policies. While each model revealed distinct challenges and opportunities, the overarching theme is clear: strong ethical guidelines, transparent communication, and active managerial engagement are critical to achieving sustainability goals. By integrating these elements into their strategic planning, company

leaders can create an organizational culture where ethical perceptions consistently align with and drive meaningful sustainability outcomes.

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Carbon Transition in the Automotive Industry: what are stakeholders' expectations?

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Abstract

Frame of the research. *The automotive sector is undergoing an unprecedented transformation. The success of their transition depends on identifying viable alternatives and understanding stakeholder expectations toward the industry's future.*

Purpose of the paper. *The aim of this study is to shed light on the stakeholders' public discourse on the low-carbon transition of the European automotive sector.*

Methodology. *We carried out a qualitative analysis using data from European and international newspapers from 2020 to 2024, in particular: Financial Times (London), the Guardian (London), the Time (London), New York Times (International Edition).*

Results. *We found that electric vehicles dominate discussions, with strong support from the automotive industry despite concerns over charging infrastructure and affordability. Academic institutions focus more on hydrogen solutions, though skepticism remains about scalability. While automakers prioritize production and sales, cities and mobility providers emphasize shared mobility and public transport.*

Research limitations. *This study relies on media sentiment analysis, which captures prevailing discourse but may not fully represent all stakeholder perspectives, and it is limited to European context.*

Managerial implications. *The findings suggest that policymakers and industry leaders must address critical barriers such as infrastructure expansion, policy coherence, and affordability. Strengthening incentives for consumers, improving public charging networks, and fostering cross-sector collaboration will be essential to accelerate the transition.*

Originality of the paper. *By integrating Stakeholder Theory and the Multi-Level Perspective on socio-technical transitions, this paper offers a comprehensive framework for identifying viable alternatives and analyzing stakeholder expectations for a sustainable and equitable automotive future.*

Key words: *Low-carbon transition; Multi-Level Perspective; automotive regime; stakeholders' narratives.*

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1. Introduction

The pursuit of sustainable transport options has been a subject of policy debate for decades, gaining heightened attention with the global push for sustainable development and climate action. Transportation, as a critical link in the global supply chain, plays a central role in the broader sustainability agenda by addressing urbanization, climate change, and resource efficiency. The automotive industry, a key driver of this agenda, has seen significant transformations fueled by environmental concerns, technological advancements, and changing societal expectations. These shifts aim to establish transportation systems that are economically viable, environmentally friendly, and socially inclusive (Ivory and Genus, 2010).

The European automotive sector faces the dual challenge of adhering to the European Union's ambitious climate targets while navigating a complex ecosystem of technological innovation and diverse stakeholder expectations. Achieving decarbonization requires balancing the interests of multiple stakeholders, including governments, manufacturers, energy providers, consumers, and non-governmental organizations (NGOs), all of whom bring different priorities to the table. Governments focus on stringent emissions regulations, manufacturers emphasize cost-effective technological transitions like electric vehicles (EVs) and hydrogen alternatives, while NGOs advocate for social and environmental equity (Freeman, 1984; Geels, 2012; Geels *et al.*, 2017). The interplay among these perspectives highlights the complexity of aligning diverse interests to advance sustainable mobility solutions.

Prior studies have explored the shift from internal combustion engine (ICE) vehicles to sustainable alternatives through various approaches, such as adapting business models, promoting alternative fuel vehicles (AFVs), and encouraging shifts in consumer behavior, including mobility sharing. Figliozzi *et al.* (2011), Wu *et al.* (2015), and Nie *et al.* (2016) analyzed the diffusion of EVs by balancing environmental benefits and economic feasibility, focusing primarily on the roles of primary stakeholders in the automotive supply chain. However, Graham *et al.* (2014) emphasized the importance of incorporating secondary stakeholders, such as NGOs, media, and communities, whose exclusion could hinder EV adoption. This broader perspective underscores the need to integrate social sustainability into the economic and environmental dimensions of sustainable mobility (Köhler *et al.*, 2019; Sovacool *et al.*, 2018).

Building on these foundations, Turan *et al.* (2024) examined stakeholder dynamics and ethical challenges in the automotive sector using a transdisciplinary approach. They developed a theoretical stakeholder model grounded in Freeman's Stakeholder Theory (1984) and analyzed EV diffusion studies through the lens of various stakeholders. Their retrospective analysis of EV adoption in Germany from 2010 to 2030, using a simulation-optimization model, revealed the complex interplay of stakeholder influences and highlighted the need for ethical practices to support sustainable transitions. While Turan *et al.* (2024) offered quantitative insights, they left room for a qualitative exploration of stakeholder narratives and expectations.

Our study aims to fill this gap by focusing on stakeholder perspectives to identify viable alternatives for decarbonizing the European automotive sector. Unlike Turan *et al.*, 2024 who employed quantitative modeling, this study takes a qualitative approach, leveraging media narratives to capture the social and communicative dimensions of the decarbonization process. By exploring stakeholder expectations and preferences, we aim to align their diverse interests with sustainable practices. This approach not only addresses technical and regulatory aspects but also delves into the socio-political narratives that shape the automotive sector's future.

By integrating Stakeholder Theory and the Multi-Level Perspective (MLP) on socio-technical transitions, this paper offers a comprehensive framework for identifying viable alternatives and analyzing stakeholder expectations for a sustainable and equitable automotive future. This approach not only advances academic discourse but also provides actionable insights for policymakers and industry leaders seeking to navigate the complexities of the mobility transition.

The paper is structured as follows: It begins with a review of stakeholder perspectives and of the MLP framework on sustainable mobility and their roles in decarbonizing the automotive sector. It then outlines the qualitative methodology used to analyze media narratives. The findings are discussed in the context of sustainable mobility, concluding with actionable recommendations to align stakeholder expectations with decarbonization goals.

2. Theoretical Framework

Stakeholder Theory, which focuses on the interests and roles of various actors, and the MLP framework, which examines the interplay between technological innovations, existing regimes, and external pressures, provide valuable lenses for understanding the dynamics of this transition. By engaging secondary stakeholders in the process, policymakers and industry leaders can ensure that decarbonization strategies are not only technically feasible but also socially acceptable and economically viable. This holistic approach will be essential for achieving a sustainable, inclusive, and equitable automotive sector.

2.1. Stakeholder Theory as a Lens for Understanding Perspectives

Stakeholder Theory, developed by Freeman (1984), emphasizes the importance of identifying and addressing the interests of all parties affected by or influencing an organization. In the context of the automotive sector's decarbonization, stakeholders include governments, original equipment manufacturers (OEMs), energy providers, consumers, non-governmental organizations (NGOs), and technology innovators. By centering stakeholder perspectives, this theory facilitates the evaluation of diverse and sometimes conflicting interests, enabling the identification of common goals and viable alternatives. For example, OEMs prioritize cost-efficient transitions to EVs or hydrogen-fueled alternatives, while governments focus on regulatory compliance and climate targets (Geels *et al.*, 2017a, 2017b). Consumers demand affordable and convenient mobility solutions, whereas NGOs advocate for environmental sustainability.

Governments directly and indirectly, through various related public authorities and ministries play a regulatory role, implementing policies such as subsidies for EVs, carbon pricing, and fuel efficiency standards. Geels (2012) emphasize the importance of aligning policy interventions with stakeholder expectations to ensure social acceptability and economic feasibility. For example, the European Green Deal's ambitious targets for phasing out ICEVs have catalyzed innovation while sparking debates about affordability and infrastructure readiness (Fetting, 2020). Consumers, as end-users, influence market dynamics through their purchasing decisions and preferences. Studies reveal that affordability, charging infrastructure, and range remain critical factors in consumer adoption of EVs (Hackbarth and Madlener, 2016). Behavioral research further highlights the socio-cultural dimensions of sustainable mobility, such as the role of peer influence and public perception in shaping adoption patterns (Axsen and Kurani, 2012). Energy suppliers are key stakeholders in determining the environmental impact of EVs. The carbon intensity of electricity generation directly affects the lifecycle emissions of EVs, making the transition to renewable energy essential (Manoharan *et al.*, 2019). Collaborations between energy suppliers and automobile manufacturers are increasingly focusing on developing smart grid technologies and vehicle-to-grid (V2G) systems to enhance grid stability and reduce emissions (Turton and Moura, 2008). Non-governmental organizations and academic institutions contribute to the transition by advocating for sustainability and conducting research to inform policy and industry practices. The Dieselgate scandal, for instance, underscored the need for stringent regulatory oversight and transparency in emission reporting, prompting widespread reforms in the industry (Rhodes, 2016).

The literature on mobility transition in the automotive sector recognizes the significant role that secondary stakeholders play in shaping the future of sustainable mobility. While primary stakeholders

such as governments, original equipment manufacturers (OEMs), and energy suppliers often dominate discussions on decarbonization, secondary stakeholders contribute in essential ways by influencing public perception, advocating for sustainability, and fostering innovation. These stakeholders include associations, unions, non-governmental organizations (NGOs), the media, emerging technology firms, and urban planners. Below is a detailed analysis of their influence based on literature. For instance, labor unions, industry associations, NGOs, and the media, significantly influence the mobility transition in the automotive sector. Labor unions advocate for a just transition for workers affected by technological shifts, focusing on retraining programs and job security (Rhodes, 2016). NGOs push for greater accountability in corporate sustainability, demanding transparency and stronger regulations to combat greenwashing and promote decarbonization (Hackbarth and Madlener, 2016). Industry associations shape policy through lobbying efforts, while the media plays a critical role in shaping consumer behavior by raising awareness of sustainable mobility options and exposing corporate malpractices, which drives regulatory change (Geels and Schot, 2007). Entrepreneurs and emerging tech companies are pivotal in fostering innovation by developing disruptive technologies such as electric vehicles (EVs), autonomous driving, and mobility-as-a-service platforms, helping shift the sector toward sustainability (Bohnsack *et al.*, 2014). Urban planners and local governments also contribute by integrating sustainable mobility into urban infrastructure through bike lanes, pedestrian-friendly streets, and EV charging stations, supporting multimodal transport (Gössling, 2013). Additionally, financiers and investors provide the capital necessary for scaling sustainable technologies, such as EVs and hydrogen fuel cells, using financial instruments like green bonds and venture capital to drive innovation (Manoharan *et al.*, 2019). Collectively, these stakeholders create a supportive environment for the automotive sector's transition to a low-carbon future.

2.2. Multi-Level Perspective on Socio-Technical Transitions

Sustainable mobility represents a pivotal goal in addressing the environmental challenges posed by transportation systems. As the largest contributor to greenhouse gas (GHG) emissions within the transport sector, the automotive regime plays a central role in this transition (International Energy Agency Transport, 2024). Recent literature underscores the importance of designing systemic pathways that incorporate technological advancements, policy frameworks, and societal shifts to achieve sustainable mobility (Geels, 2012; Loorbach, 2010; Upham and Gathen, 2021).

The MLP framework, introduced by Geels (2002), examines transitions as interactions across three levels: niche innovations, the socio-technical regime, and the external landscape. Applied to the European automotive sector, this perspective provides insights into how emerging decarbonization alternatives interact with existing structures and external pressures. MLP has been extensively used to conceptualize transitions in sustainable mobility. MLP highlights the interplay among three levels: niche innovations, socio-technical regimes, and landscape pressures (Geels, 2002). Landscape pressures, such as international climate agreements and consumer demand for low-emission vehicles, create a window of opportunity for niche innovations like electric vehicles (EVs), hydrogen fuel cells, and shared mobility systems to disrupt the existing automotive regime (Loorbach, 2010). These innovations, however, require alignment with the socio-technical regime, which includes entrenched systems of production, market structures, infrastructure, and cultural norms.

Despite significant progress, the path to sustainable mobility is fraught with challenges. Loorbach (2010) argue that the automotive regime's resistance to change stems from entrenched business models, vested interests, and technological lock-in. However, through collaborative approaches and stakeholder engagement, these barriers can be mitigated, fostering a more inclusive and effective transition. At the niche level, innovations such as EVs, hydrogen vehicles, and advanced autonomous driving systems are gaining traction. Actors in these niches include technology developers, research institutions, and pilot project participants. At the regime level, established automotive manufacturers, fuel suppliers, and regulatory bodies represent the status quo, which faces disruption from emerging

technologies. Meanwhile, landscape-level pressures, such as EU climate policies, global market trends, and societal demands for sustainability, drive the urgency for systemic change (Geels *et al.*, 2017a). The MLP framework contextualizes agents' perspectives within these dynamics. For instance, it explains resistance from incumbents within the socio-technical regime and highlights opportunities for niche innovations to gain momentum through policy support and market incentives. This approach aligns with research suggesting that understanding interactions across these levels is essential for designing effective decarbonization strategies (Smith *et al.*, 2005).

2.3. Integrating Stakeholder Theory and MLP

Combining Stakeholder Theory with the MLP creates a robust framework for evaluating decarbonization options. Stakeholder Theory offers a detailed, micro-level perspective on individual and group expectations, while MLP provides a broader, macro-level understanding of systemic interactions and structural transformations. This integration enables the development of actionable strategies that balance stakeholder priorities with overarching system requirements. For instance, engaging stakeholders through participatory processes allows policymakers and industry leaders to align niche innovations with regime objectives and adapt to landscape pressures. This holistic approach ensures decarbonization efforts are not only technically achievable but also socially acceptable, increasing their chances of successful implementation (Geels, 2012). The MLP framework effectively analyzes socio-technical transitions (Geels, 2002; Geels *et al.*, 2017a) but overlooks the role of secondary stakeholders, such as public institutions, universities, and media, in shaping landscape pressures. This study addresses this gap by examining public discourse and stakeholder narratives to understand their influence on decarbonization strategies in the European automotive sector. Different studies have conducted similar analysis, employing plethora of integrations with the MLP. For instance, Upham and Gathen (2021) analysed the narratives of expert stakeholders the development of the sociotechnical processes of EV adoption in the German state of Lower Saxony using Stones's (2017) strong structuration frame. By integrating stakeholder expectations into MLP, we highlight how societal narratives contribute to systemic change, ensuring that sustainability transitions are both technologically feasible and socially inclusive (Mitchell *et al.*, 1997; Köhler *et al.*, 2019).

3. Data and Method

3.1. Methodological choices

This study aims to identify viable alternatives to decarbonize the European automotive sector based on stakeholder perspectives and analyze their expectations towards the industry's future. To achieve this, we delve into both the overarching and detailed aspects of the transition discourse within the automotive sector, as reflected in the news media. Our primary focus was on understanding diverse preferences for sustainable mobility and evaluating stakeholders' expectations within the broader context of the mobility transition.

From a methodological perspective, we adopted a qualitative research approach to explore viable alternatives for decarbonizing the European automotive sector from the perspective of stakeholders. The methodology is centered on analyzing textual data to understand stakeholder expectations and preferences regarding the sector's transition towards sustainability. This approach allows for an in-depth examination of recurring themes, patterns, and sentiments expressed in publicly available documents.

Content analysis was chosen due to its suitability for processing and interpreting textual data. This method allows for both manifest and latent content examination, identifying explicit themes and underlying sentiments. It provides a rigorous framework to analyze stakeholder perspectives across

time, offering insights into evolving trends and expectations within the European automotive sector. By categorizing and coding the data systematically, content analysis facilitates the identification of patterns, recurring themes, and nuanced insights that directly address the research objectives (Krippendorff, 2019).

3.2. Data

This study relies on news articles as a key data source, reflecting public discourse on the transition to sustainable mobility in the automotive sector. Newspapers serve as a valuable platform for capturing stakeholder perspectives, including policymakers, industry leaders, and consumers, as they discuss decarbonization efforts. Data was collected from the Nexis Uni database, which provides access to reputable newspaper articles. This approach ensures a broad and timely representation of discussions surrounding sustainable mobility. Newspapers offer a balanced mix of opinions and play a crucial role in shaping public perceptions, making them ideal for analyzing stakeholder expectations regarding the automotive sector's transition. Using news articles allows for an up-to-date assessment of trends and concerns in the industry. As widely read media sources, newspapers provide real-time insights into shifts in public and stakeholder sentiment. This methodology enables a comprehensive analysis of the societal and industry-wide implications of transitioning to sustainable mobility.

Our study explores mobility news articles on the automotive industry in Europe published in popular newspapers from January 1, 2020, through October 14, 2024. The usage of online platforms gained traction in the post-covid era, hence the use of 2020 as the starting year for our study data (De' *et al.*, 2020; Shaver, 2022; Zancajo *et al.*, 2022), while October 14, 2024, is the date the collection of data begun, making sense for the collection of all available relevant data for the study. The data was gathered through a systematic search on the Nexis Uni platform. The search was designed to ensure coverage of relevant articles from top-tier newspapers in Europe, focusing on the automotive industry and mobility innovations. Yearly data files were downloaded to manage the dataset size efficiently.

The terms included a combination of keywords related to mobility, sustainability, and innovative vehicle technology, ensuring focused and relevant data. The primary search term included the following keywords: ("automotive", "tram", "car", "scooter", "fleet", "vehicle," "mobility" "auto mobility*") AND ("Robot taxi", "electric", "hydrogen", "bio-fuel", "solar powered automobile") AND ("station", "mobility community", "car-sharing", "sharing", "car-pooling", "pooling", "car leasing", "hailing", "ride-hailing", "bike-sharing", "shared mobility", "MaaS") AND ("digital mobility", "sustainable vehicle*", "sustainability", "green mobility", "robot car", "zero-emission car*", "emission free vehicle", "service", "vehicle transition", "mobility service", "ride sharing", car or mobility leasing", "micro mobility"). Based on the study focus, we narrowed in on automotive and Europe as the industry and geographic region respectively (see appendix for how keywords were combined in Nexis Uni in the search for data). Following the source type: newspapers, four key source names were employed for our data collection, namely, Financial Times (London), the Guardian (London), the Time (London), New York Times (International Edition). The data files were sorted yearly, and we found a total of 8496 articles published across the time frame. The data was further cleaned, automatically and manually for duplicates and irrelevant materials - resulting in a data size of 4912 file across the four newspaper sources as presented in Table 1.

Tab. 1: Initial and final data size for all Source Names

Data Source	Year					
	2020	2021	2022	2023	2024	TOTAL
Financial Times (London, England)	690	937	759	989	1020	4395
The Times (London)	447	495	374	479	364	2159
The Guardian (London)	166	320	256	323	270	1335
The New York Times - Int. Edition	68	142	123	134	140	607
Initial data size	1371	1894	1512	1925	1794	8496
Data size after cleaning:						
1. Automatic[3]	1204	1660	1315	1562	1478	7219
2. Manual[4] (final data size)	746	1263	1090	918	895	**4912**

Source: our elaboration

3.3. Content Analysis

Content analysis was the primary method for systematically examining news articles on sustainable mobility and decarbonization in the European automotive sector (Krippendorff, 2019). Open coding identified initial themes, which were then grouped into broader categories to analyze stakeholder perspectives. Word frequency analysis highlighted key themes in the discourse. Both manifest and latent content were analyzed to capture explicit themes and underlying sentiments, enriching the insights gained. The study employed rigorous coding protocols, intercoder reliability testing, and a combination of automated and manual techniques to ensure accuracy and reliability (Elo and Kyngäs, 2008). The iterative nature of the method allowed continuous refinement of themes, ensuring adaptability to emerging patterns and contributing to a robust analysis of decarbonization pathways in the European automotive sector. Articles were coded based on relevant keywords, concepts, and themes, allowing for the identification of recurring patterns. Emerging patterns were identified by grouping related codes, enabling the development of thematic categories as shown in Figures 1 to 4. Validity was ensured through a structured search strategy, data cleaning, and the use of reputable sources. Reliability was maintained through clear methodological guidelines and inter-coder reliability checks, minimizing bias, and ensuring reproducibility.

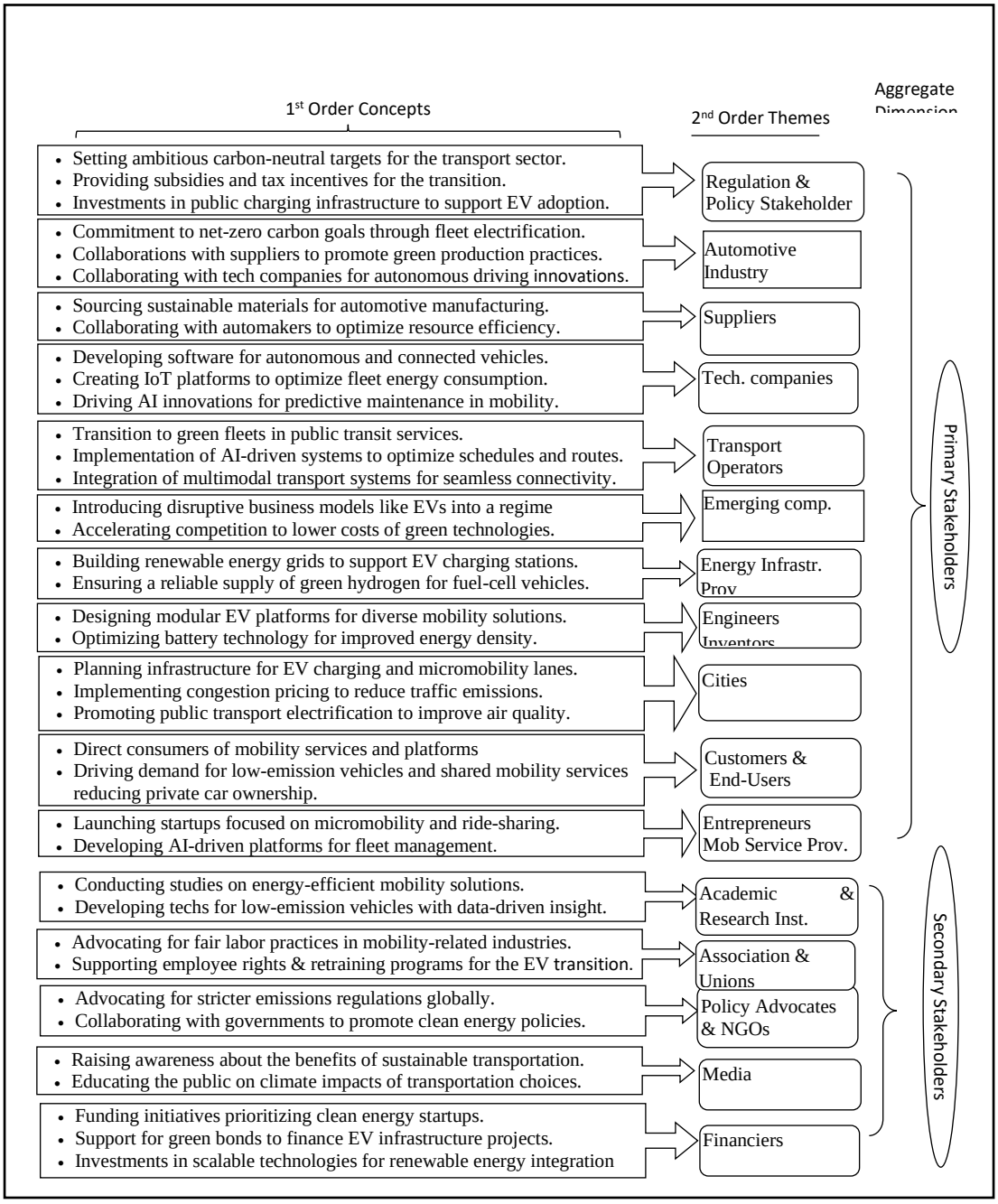
3.4. Sentiment Analysis

Sentiment analysis identifies and classifies perceptions as positive or negative (Da Silva *et al.*, 2014; Phan *et al.*, 2020). In this study, it serves as a key tool for analyzing stakeholder emotions and attitudes toward technology, business models, and vehicles in the automotive sector's decarbonization. The analysis was applied to the stakeholder perspectives to assess the emotional tone of discussions on the decarbonization of the automotive sector. This analysis revealed both positive and negative sentiments across different stakeholders, illustrating the tension between the established automotive regime and the pressures to transition to greener technologies. Prior studies (Domingo *et al.*, 2020; Liu, 2019) emphasize sentiment analysis as a valuable tool for understanding consumer behavior, brand reputation, and public perception. The findings offer meaningful insights for shaping strategic decisions and policy actions that align with stakeholder interests.

[3] Automation cleaning of data entailed the automatic detection of file duplicate when copying the yearly data into a single folder to ensure that data duplication in different years is prevented.

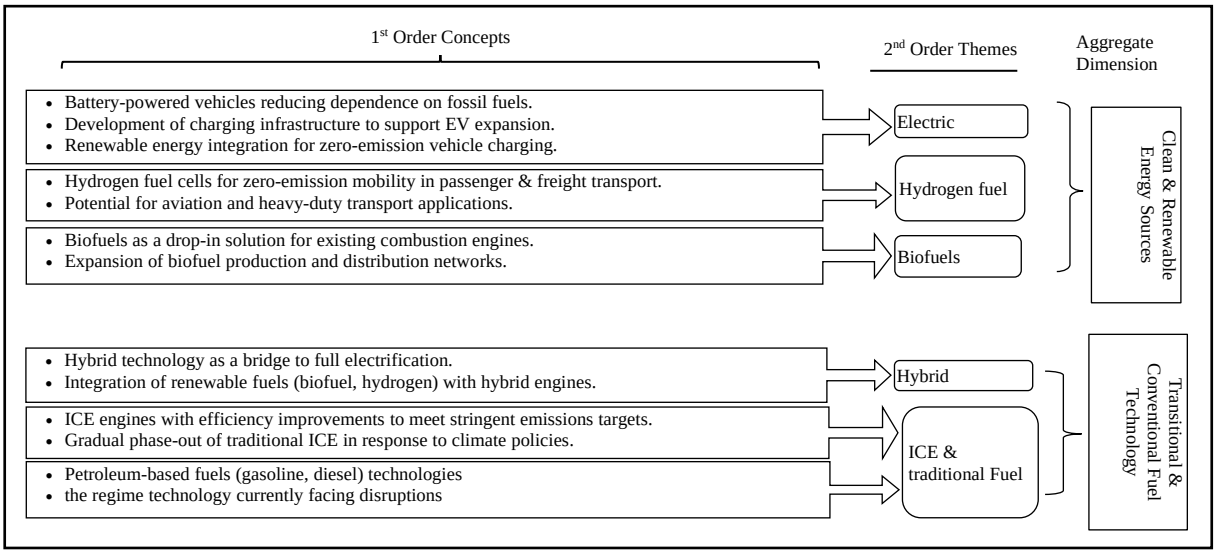
[4] This involved manual deletion of file duplicates. Duplicates are identified by the documents that ended with the word 'copy' or with numbers in parenthesis (i.e., filename (1); filename (2); filename (3) indicating a second, third, and fourth copies respectively of the file named 'filename')

Fig. 1: Stakeholder coding



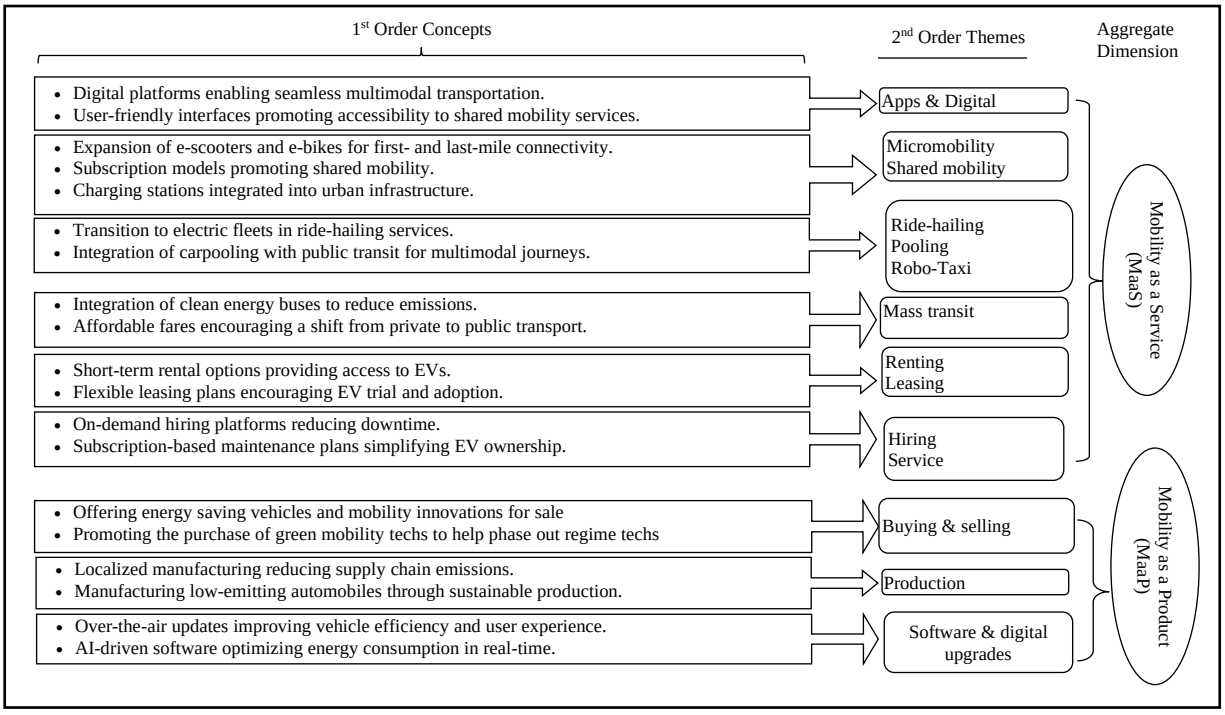
Source: our elaboration

Fig. 2: Technology coding



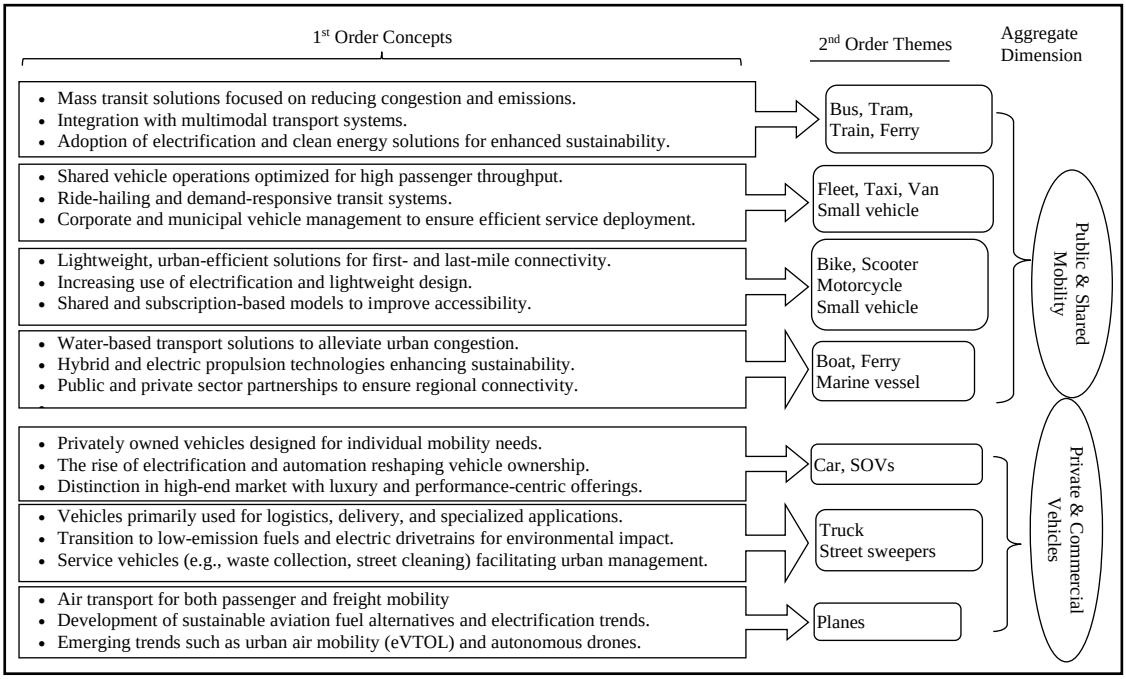
Source: our elaboration

Fig. 1: Business model coding



Source: our elaboration

Fig. 2: Vehicle coding



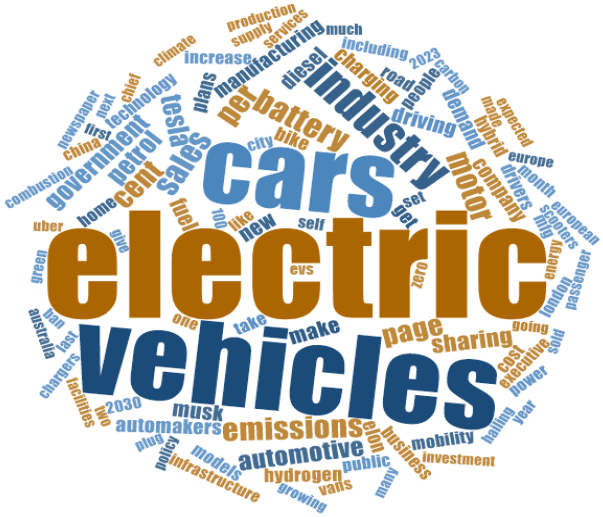
Source: our elaboration

4. Findings

4.1. Content Analysis

This section explores four key themes: stakeholders, technology, business models, and vehicle types. The findings are presented based on stakeholder perspectives, with supporting extracts illustrating their views. A word frequency analysis highlights the most discussed topics in the automotive transition. In Fig. 5, the terms “vehicle” and “electric” appear most frequently, showing that electric vehicles (EVs) dominate the discussion.

Fig. 5: Word Frequency generated from the codes



Source: our elaboration

4.1.1. Technological Trends and Stakeholder Discussions

The analysis of technological trends within the European automotive sector reveals a strong consensus among stakeholders regarding the shift towards electric vehicles (EVs), though the discussion surrounding hydrogen and other alternative technologies remains an area of interest, albeit to a lesser extent. The query matrices presented in Table 2 - Table 4 illuminate these trends, showing clear patterns in how various stakeholders engage with electric technology, business models, and vehicle types. In total, 1125 coding references for electric vehicles were recorded, far surpassing other technologies like ICE, and hydrogen. This disparity underscores the importance of electric vehicles in the ongoing transition toward decarbonization within the European automotive sector. The dominance of EVs as a technological solution corresponds with the niche innovation level of the MLP, where new technologies are gaining attention but are still facing challenges to scaling up due to resistance from the automotive regime (Geels, 2002).

The perspectives of customers and end-users highlight key concerns that impact the widespread adoption of electric vehicles. Central to these concerns are issues surrounding charging infrastructure, range anxiety, and the economic viability of EVs. One notable concern expressed by end-users is the growing charger anxiety, where drivers worry about the availability of charging stations as the number of EVs on the road continues to increase:

> *"Will my car get me there? Developments in battery technology have eased range anxiety - the worry that the car will not make it to the next charger, let alone your destination. But it has been replaced by charger anxiety as drivers struggle to find an available charger as the number of electric cars on the road increases." (The Times, July 27, 2024).*

This reflects a fundamental challenge for the European automotive sector, where the expansion of the charging network has not kept pace with the rising demand for EVs. As a result, stakeholders, particularly consumers, have expressed growing frustration with the accessibility and reliability of charging infrastructure. In addition to concerns over charging infrastructure, economic factors also play a critical role in influencing customer decisions. A significant issue is the affordability of EVs, especially in the mid-priced segment. As one extract points out:

> *"Discounts alone have not been enough to bring back EV buyers - particularly at the mid-priced part of the market. Even Tesla, which has cut prices in China and is popular among locals, lost market share in January as overall demand for EVs slowed." (Financial Times, August 3, 2024, p.1).*

This underscores the need for government interventions, such as tax incentives and financial subsidies, to make electric vehicles more accessible to a broader range of consumers, particularly as demand fluctuates.

The automotive industry is seeing increasing investment in the development of electric vehicles and related technologies. For instance, BYD, a major player in the electric vehicle market, continues to expand its presence globally with innovative electric vehicles and electric buses:

> *"Founded in 1995 to make lithium batteries for consumer electronics, BYD has developed into one of the biggest producers of batteries for electric vehicles. … BYD is now the world's second-largest producer of electric buses and the fourth largest maker of electric vehicles." (Financial Times, 2021).*

Such developments are critical in shaping the automotive sector's transition and illustrate the technological innovations that are driving the shift towards electrification. However, there is a clear recognition that government policies and economic incentives will be crucial in accelerating the transition to electric mobility. Industry representatives have repeatedly called for measures such as tax cuts, subsidies, and the expansion of the charging infrastructure to boost consumer confidence and stimulate demand for EVs.

The role of academic and research institutions in shaping the discourse on electric vehicles is pivotal, as these stakeholders bring a long-term perspective to the technological and environmental

benefits of electrification. Academic institutions have emphasized the importance of addressing consumer barriers and increasing awareness of the environmental benefits of EVs. One expert, Jamie Hamilton from Deloitte, argues that more focus is needed on removing barriers that prevent average consumers from adopting electric vehicles:

> *"There needs to be more focus on removing barriers preventing the average consumer from contemplating a switch to electric. Electric cars are cleaner, have faster acceleration, and lower maintenance costs. The disparity will only widen as car companies focus on the electric future." (The Times, June 6, 2024).*

This highlights the need for stakeholders to collaborate in promoting public awareness and policy advocacy to overcome barriers to adoption. The issue of inadequate charging infrastructure is also reported as an important barrier to EV adoption:

> *"… one of the biggest threats to the uptake of electric cars is the lack of infrastructure. While the number of charging station is growing - with more than 8600 added last year - the number is still lagging far behind what is required" (The Times, 2023).*

While electric vehicles dominate the discussions, hydrogen remains an important alternative, particularly among academic and research institutions. An interesting discussion on hydrogen vehicles emerged in the context of the Paris Olympics, where over 120 academics and experts called for the replacement of a hydrogen-powered car with an electric vehicle as the official vehicle for the games:

> *"The future and validity of hydrogen vehicles became a global issue in the lead-up to the Paris Olympics. In July, more than 120 academics, scientists, and engineers called on the Paris Olympics organisers to dump its selection of a Toyota hydrogen car as the official games vehicle and replace it with an EV." (The Guardian, 2024).*

This incident highlights the growing preference for electric vehicles among researchers, who view hydrogen technology as a less viable alternative in the short term due to its infrastructure challenges and scalability issues. While hydrogen technology may still play a role in specific sectors, such as heavy-duty transportation, the EU automotive industry is clearly prioritizing electric mobility as the main pathway to decarbonization. The discussion around hydrogen reinforces the concept of niche innovations competing within the broader automotive system (Geels, 2005). Despite its promise, hydrogen is still facing significant challenges in terms of infrastructure and market adoption.

4.1.2. Business Models and Stakeholder Perspectives

The analysis of stakeholder perspectives on business models within the European automotive sector, as presented in Table 3, reveals clear distinctions in how different stakeholders perceive the future of mobility and the transition to more sustainable transport. The automotive industry, cities, customers, and mobility service providers each focus on different aspects of the evolving mobility business models, highlighting varying priorities based on their unique interests and objectives.

The automotive industry primarily emphasizes traditional business models focused on selling and production. With 86 references to selling and 33 references to production, the industry's discourse is largely rooted in its long-established practices of manufacturing and selling vehicles. This aligns with the broader push towards electric vehicle (EV) adoption, with companies like Tesla leading the charge. Supporting this view, the following extract highlights the sales success of EVs:

> *"In December alone, when total sales increased 18 per cent year-on-year to 128,000, nearly 33 per cent of all registrations were battery electric vehicles as the market was swamped by Tesla Model 3 and Model Y deliveries." (The Times, 2023).*

This illustrates that the focus remains on sales growth, particularly through EVs, which have gained substantial traction in markets, even becoming top-sellers. Moreover, a wider view on the sales trend of battery-powered cars is evidenced by:

"The figures show that battery electric cars made up 15 per cent of new sales, compared with 20 per cent a year ago." (The Times, 2023).

This serves to highlight the growing shift toward EVs and the automotive industry's increasing reliance on electric vehicle sales to drive future growth. The data also underscores that the automotive sector remains invested in the production and sale of vehicles as its central business model, while transitioning to embrace electric vehicle manufacturing. This finding corroborates with Germany's experience where the share of BEVs saw a 17.1% increase in shares which represented 60% increases in registered EVs from September 2021 to September 2022 (KBA, 2025). This suggests a continued commitment to the traditional business model but with incremental changes to adapt to environmental sustainability. Hence, a state of coexistence of the regime and niche in the socio-technical regime of the MLP. This is evident as incumbents, despite their traditional production and sales model, now actively support mobility services (MaaS) like car sharing and public transport, collaborating with emerging companies to advance sustainable mobility. These business model innovations reflect the transition of the regime towards more sustainable solutions and align with MLP's view that innovations at the niche level must be integrated into regime dynamics for broader system change to occur (Sovacool *et al.*, 2017).

Cities, by contrast, are increasingly moving towards shared mobility and on-demand ride-hailing services as key business models. The shared mobility model, with 38 references, reflects cities' efforts to provide alternative transport options to reduce reliance on private car ownership. Meanwhile, on-demand ride-hailing services, such as Uber, take center stage, with 86 references. Cities are promoting shared mobility options to meet sustainability goals, alleviate congestion, and offer more affordable transportation choices to their residents. The growing trend towards shared mobility is further emphasized by:

"The government hopes e-scooters will allow more people to go back to the office without having to crowd trains and buses, risking Covid-19 infection, and without adding to road congestion or emissions generated by cars." (Financial Times, September 4, 2020).

This policy shift suggests that cities are actively supporting business models that enable shared mobility rather than traditional car ownership. These models are aimed at reducing congestion, increasing access to sustainable transport, and addressing environmental concerns. The perspective of mobility service providers further supports the emphasis on shared mobility and on-demand ride-hailing. The 112 references to shared mobility and 190 references to ride-hailing services indicate that these business models are central to the mobility service providers' strategies. These providers are leveraging technology to reshape how people travel, providing flexible, on-demand options that challenge traditional transportation structures. However, despite setbacks, companies like Uber are adjusting their business models to remain relevant. Similarly, mobility service providers such as Uber and Lyft provide micromobility options to boost sharing and promote decarbonization.

"Similarities with ride-sharing companies such as Uber are no accident. Before founding Bird, Travis VanderZanden created a car-wash app that was acquired by Lyft and later worked at Uber. Both Uber and Lyft have e-bike and scooter sidelines." (Financial Times, May 6, 2020).

This highlights the diversification of mobility services to include e-scooters and e-bikes, expanding their business models beyond just car-based services. The emphasis on on-demand services such as ride-hailing and shared mobility is critical as mobility service providers seek to meet changing consumer needs for more flexible, sustainable, and convenient transportation solutions. These business model innovations reflect the transition of the regime towards more sustainable solutions and align with MLP's view that innovations at the niche level must be integrated into regime dynamics for broader system change to occur (Sovacool *et al.*, 2017).

4.1.3. Mobility Modes and Stakeholder Discussions

The discussion on mobility types reveals three key areas: cars and vans, public transport, and Micromobility as presented in Table 4. Each trend reflects the perspectives of different stakeholders, shaping the future of European transportation.
The automotive industry remains heavily focused on cars (294 references) and vans (133 references), reinforcing their role as primary mobility sources. Industry stakeholders continue to invest in electric vehicle (EV) technologies to transition from internal combustion engines (ICEs), maintaining private car ownership as central to mobility. However, city stakeholders take a more diversified approach, acknowledging the need for alternative transport solutions while still recognizing the role of cars:

"Fewer cars mean safer streets, cleaner air and more room to maneuver for pedestrians and bicyclists." (The Guardian, June 6, 2024).

This statement underscores the ongoing efforts to reduce car dependency in urban spaces while promoting sustainability. Public transport emerges as a key trend, particularly in urban areas, where trains (133 references), trams (28 references), and buses play a crucial role in reducing congestion and emissions. Cities increasingly promote rail travel for intercity mobility, while government policies also emphasize expanding public transport to enhance accessibility and environmental benefits:

"Expanded train service or an extra subway stop can actually change the trajectory of someone's life. That's powerful. That's what cities are meant to do." (The Guardian, June 6, 2024).

This highlights the push for multi-modal transportation, integrating public transit with other mobility options. Micromobility solutions like bicycles (31 references) and e-scooters are gaining traction, especially as governments seek alternatives to crowded public transport and traffic congestion. The promotion of e-scooters reflects this shift:

"The government hopes e-scooters will allow more people to go back to the office without having to crowd trains and buses, risking Covid-19 infection, and without adding to road congestion or emissions generated by cars." (Financial Times, September 4, 2020).

This trend aligns with sustainability and urban mobility goals, fostering cleaner, more efficient city transportation networks. The European automotive sector is witnessing a shift towards multi-modal mobility, balancing private car use, public transport expansion, and micromobility adoption. While cars remain dominant, cities and governments are prioritizing sustainable alternatives to improve accessibility, reduce congestion, and lower emissions.

Tab. 2: Results from Matrix Query of Stakeholder theme and Technology

Theme: Technology	Stakeholders																			**Total**
	A : Academic and Research Institutions	B : Associations and Unions	C : Automotive Industry	D : Cities	E : Customers and End-Users	F : Emerging competitors	G : Energy Infrastructure Providers	H : Engineers	I : Entrepreneurs	J : Financiers	K : Market competitors	L : Media	M : Mobility Service Providers	N : NGOs	O : Transport operators	P : Regulation and Policy Stakeholders	Q : Suppliers	R : Tech companies	S : Transport authorities	
Electric	18	25	661	100	91	17	0	14	0	11	22	4	23	0	5	79	8	20	57	**1125**
Hydrogen	38	11	16	5	5	2	0	1	0	0	0	1	5	0	0	5	3	0	1	**93**
Biofuel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Wind	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	**5**
Hybrid	2	0	13	1	3	0	0	1	0	0	0	0	1	0	0	0	1	0	0	**22**
ICE	15	2	83	27	17	1	0	1	0	2	4	0	6	0	1	23	0	0	4	**192**
Row Total	**89**	**38**	**764**	**133**	**124**	**20**	**0**	**17**	**0**	**13**	**26**	**5**	**37**	**0**	**6**	**109**	**12**	**25**	**62**	**1480**

Source: our elaboration

Tab. 3: Results from Matrix Query of Stakeholder theme and Business Model

Theme: Business Model	Stakeholders																			Total
	A : Academic and Research Institutions	B : Associations and Unions	C : Automotive Industry	D : Cities	E : Customers and End-Users	F : Emerging competitors	G : Energy Infrastructure Providers	H : Engineers	I : Entrepreneurs	K : Financiers	M : Market competitors	N : media	O : Mobility Service Providers	P : NGOs	Q : Transport operators	R : Regulation and Policy Stakeholders	S : Suppliers	T : Tech companies	U : Transport authorities	
Apps & Digital	1	4	24	6	20	0	0	0	0	0	0	0	13	0	0	0	0	1	1	**70**
Micromibility	0	1	0	1	2	0	0	0	0	0	0	0	2	0	0	0	0	0	0	**6**
Shared mobility	2	6	23	38	45	6	0	1	1	1	0	0	112	0	2	0	0	2	0	**238**
Ride-hailing	0	0	18	86	19	2	0	0	1	5	0	0	190	0	0	1	0	2	1	**325**
Car Pooling	2	0	7	2	5	1	0	3	1	0	0	0	2	0	0	0	0	0	0	**23**
Robo-taxi	0	0	13	8	3	0	0	1	0	0	0	0	11	0	0	0	0	0	0	**36**
Mass transit	0	16	3	10	14	0	0	0	0	0	0	0	8	0	0	6	0	0	0	**57**
Car Renting	3	0	2	2	6	0	0	0	0	0	0	0	6	0	0	0	0	1	0	**20**
Leasing	0	0	6	0	2	0	0	3	0	0	0	0	3	0	0	0	0	0	0	**14**
Hiring	1	0	2	11	2	0	0	0	0	0	0	0	5	0	0	3	0	0	1	**25**
Service	0	2	17	4	11	1	0	0	0	1	0	0	16	0	0	1	1	1	1	**56**
Buying & Selling	0	4	72	16	17	3	0	3	0	2	5	0	4	0	0	7	0	10	4	**167**
Production	1	1	34	2	2	1	0	0	0	0	1	0	3	0	0	1	0	0	0	**46**
Softwares	0	0	14	1	2	0	0	0	0	0	1	0	1	0	0	0	0	1	0	**20**
Row Total	**10**	**34**	**254**	**187**	**150**	**14**	**0**	**11**	**3**	**9**	**7**	**0**	**376**	**0**	**2**	**19**	**1**	**18**	**8**	**1103**

Source: our elaboration

Tab. 4: Results from Matrix Query of Stakeholder theme and Vehicle Types

Theme: Vehicle	Stakeholders *																			Total
	A	B	C	D	E	F	G	H	I	K	M	N	O	P	Q	R	S	T	U	
Bike	4	1	2	31	16	0	0	1	0	0	2	0	18	0	0	2	0	0	1	**78**
Boat	2	0	2	11	1	0	0	0	0	0	0	0	0	0	0	7	0	0	1	**24**
Bus	2	2	11	14	9	1	0	1	0	0	1	0	4	0	0	0	0	0	1	**46**
Car	19	18	344	57	68	6	0	7	0	4	6	4	27	0	2	27	2	30	11	**632**
Ferry	0	0	1	3	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	**7**
Fleet	1	5	3	6	2	1	0	0	0	0	0	0	3	0	0	3	0	0	0	**24**
Marine vessel	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**3**
Metro	0	0	0	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	2	**17**
Motor cycle	3	1	1	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	**9**
Planes	0	1	6	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**9**
Pubic transport	0	0	1	3	4	0	0	0	0	0	0	0	1	0	0	0	0	0	3	**12**
Scooter	0	0	0	4	2	0	0	0	0	0	0	0	3	0	1	2	0	0	2	**14**
Single-occupancy Vehicle (SOV)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**1**
Street sweepers	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Taxi	0	0	3	3	4	0	0	0	0	0	0	0	2	0	0	0	0	1	0	**13**
Train	0	0	49	135	3	0	0	1	0	0	0	0	13	0	0	5	13	0	7	**226**
tram	2	4	1	28	1	0	0	0	0	0	0	0	2	0	1	7	0	0	2	**48**
Truck	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**5**
Van	0	0	133	1	7	0	0	0	0	0	0	0	1	0	0	6	0	0	2	**150**
Row Total	**33**	**34**	**558**	**310**	**126**	**9**	**0**	**10**	**0**	**4**	**9**	**4**	**76**	**0**	**5**	**61**	**17**	**31**	**32**	**1319**

* *The Stakeholders are in order of presentation in Table 3 above*

Source: our elaboration

4.2. The Sentiment Analysis of mobility transition and trends

The overall sentiment analysis shows that 59.23% of stakeholder discussions were negative, while 40.77% were positive from the 4912 newspaper articles on the subject as evident in Table 5. These findings reflect the ongoing challenges and resistance to the widespread adoption of sustainable mobility, despite the significant potential for decarbonization. One of the key findings of the sentiment analysis is the shift in sentiment over time. To provide depth to the above results and also serve as a robustness check on the automatically generated sentiments, we conducted a separate sentiment analysis for the yearly files. The yearly analysis shows less than 2% variation from the general analysis in terms of the grand total of coded references, indicating a more robust sentiment

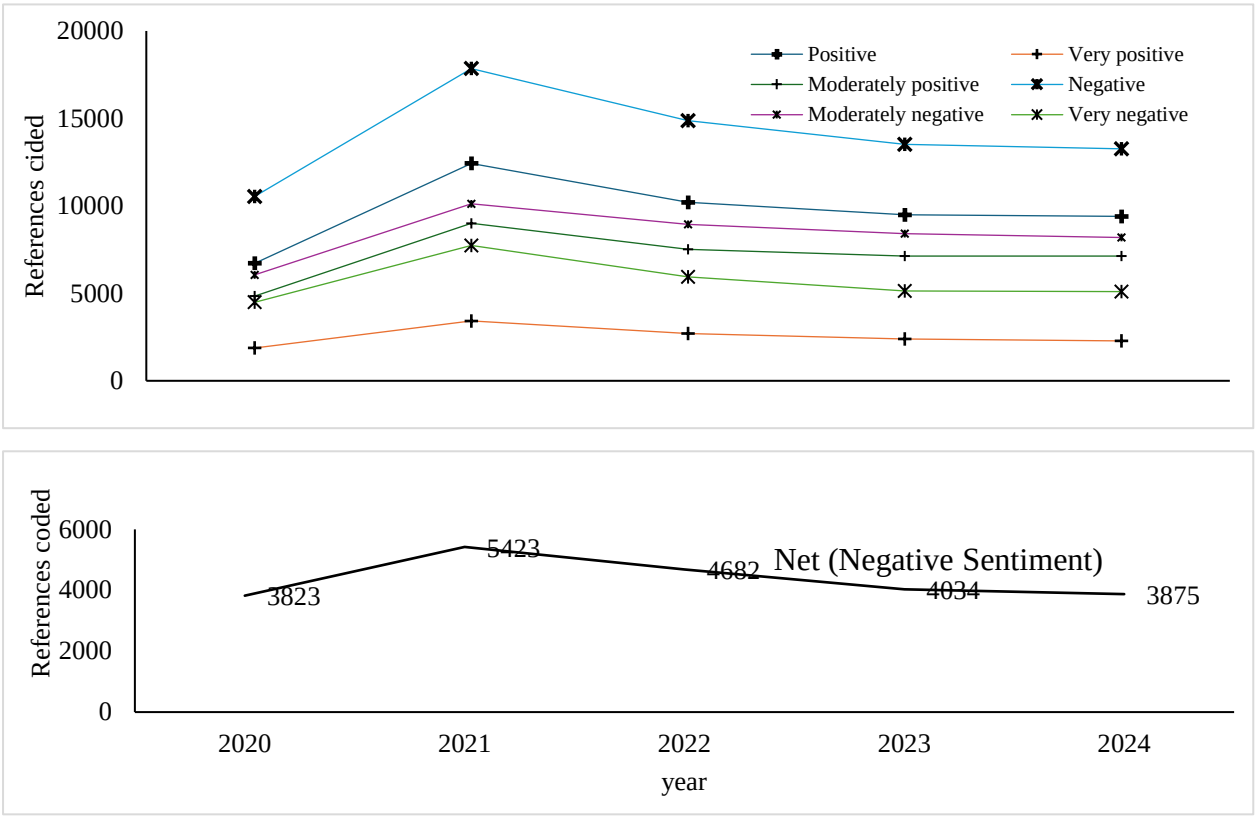
coding. For each yearly folder of files coded for sentiments, there were more negative coded references than positives, hence a net negative sentiment each year, presented in Figure 6. Clearly, the negative sentiments increased from its 2020 level (net of 3823 coded references) to its highest of 5423 in 2021 after which an improvement is experienced through 2022 to 2024. Further analysis like the trend analysis of sentiments, the query matrix of sentiments attributable to stakeholders and technologies provided depth of information on the overall sentiment results.

Tab. 5: Sentiment analysis results of study data (all files)

Sentiments		Count of content		Percentage
Positive [a]		48203		40.77
Negative [b]		70028		59.23
Total		118231		100.00
[a] consist of very positive (12648) and moderate positive (35555) [b] consists of moderate negative (41636) and very negative (28392)				

Source: our elaboration

Fig. 6: Trend Analysis of sentiments and net negative sentiments



Source: our elaboration

Electric vehicles received the highest number of sentiments (n = 3,336), with 1,936 positive and 1,400 negative mentions. The strong positive sentiment underscores the market's confidence in EVs as the most viable alternative for decarbonization. The EV transition is marked by significant investments from major automakers such as General Motors, Volkswagen, and Tesla. Companies are aligning their strategies with global climate commitments, as evidenced by General Motors' pledge to phase out gasoline-powered cars by 2035. Additionally, EV infrastructure is improving, with investments in home and public charging networks, such as those led by Gridserve and InstaVolt, making EV adoption more convenient. Furthermore, major actors in the automobile industry,

especially automakers, have experienced boom in business from the production and sale of electric vehicles. This highlights the increasing healthy coexistence of the niche innovation and the regime in a transformation path with high promise of transition in the medium to long-term. Apparent transition is easier on the one hand, from the automakers perspective as far as it makes business sense beyond the promotion of green mobility. Despite positive momentum, challenges persist, particularly in charging infrastructure. Long charging times and high battery replacement costs also contribute to user frustration. Within the MLP framework, EVs are positioned at the niche level but are rapidly integrating into the socio-technical regime, supported by policy incentives and industry shifts.

Hydrogen-powered vehicles received 215 mentions (127 positive and 88 negative), indicating cautious optimism. Hydrogen technology is lauded for its potential in heavy-duty transport and long-range applications. Several European governments and automotive companies are investing in hydrogen refueling stations, further strengthening its potential. However, concerns about hydrogen's efficiency, infrastructure limitations, and production costs persist. The limited number of hydrogens refueling stations further hinders adoption. Hydrogen vehicles remain a niche innovation with the potential to disrupt the regime, particularly in sectors where EVs face range limitations.

Biofuels (n = 47) and hybrid vehicles (n = 31) received limited attention, reflecting their role as transitional technologies rather than long-term solutions. Biofuels are recognized for their compatibility with existing ICE infrastructure, allowing for a gradual transition. Similarly, hybrid vehicles are seen as an intermediate solution, bridging the gap between ICEs and full electrification. However, concerns about biofuel sustainability and land use persist, as reflected in extracts criticizing the environmental impact of large-scale biofuel production. Hybrid vehicles also face scrutiny for their continued reliance on fossil fuels, limiting their long-term viability. Within the MLP, biofuels and hybrid vehicles reinforce the existing regime while providing incremental sustainability improvements.

ICE vehicles received 665 mentions, with a nearly balanced sentiment distribution (325 positive vs. 340 negative). ICE vehicles remain dominant due to their affordability, reliability, and widespread infrastructure. The rising costs of compliance with emissions regulations further challenge ICE viability. Under the MLP, ICEs represent the dominant regime, but ongoing innovations and regulatory shifts are facilitating its gradual destabilization with EV presence destructing the regime. It has shown potential of becoming the new regime or the dominant technology with the existing regime, with the associated innovative entrants (new entrants) eventually becoming the incumbent.

The sentiment analysis reveals a clear trajectory of transition within the automotive sector, with EVs emerging as the leading niche technology challenging the ICE-dominated regime. Hydrogen and biofuels remain supplementary solutions, with their success dependent on infrastructure advancements and policy support. The MLP framework underscores that while the current regime (ICE vehicles) still holds a presence, niche innovations (EVs, hydrogen) are gaining momentum and restructuring the automotive landscape. Policymakers and industry stakeholders must align regulatory frameworks, infrastructure investments, and consumer incentives to ensure a seamless transition to sustainable mobility.

5. Conclusion

This study examines the decarbonization of the European automotive sector by analyzing stakeholder perspectives and technological pathways through the lens of Stakeholder Theory and the Multi-Level Perspective (MLP) framework. The findings highlight key misalignments between industry optimism, policy incentives, and consumer adoption, with electric vehicles (EVs) emerging as the dominant transition technology, while hydrogen and hybrid alternatives remain secondary options.

This study contributes to stakeholder theory by illustrating how varying stakeholder priorities influence decarbonization pathways, with automakers driving EV adoption while consumers and

cities remain hesitant due to infrastructure and cost concerns. Additionally, applying the MLP framework reinforces the notion that EVs are gradually disrupting the internal combustion engine (ICE) regime, while hydrogen remains a niche innovation with potential long-term relevance. The findings suggest that policymakers and industry leaders must address critical barriers such as infrastructure expansion, policy coherence, and affordability to align stakeholder interests. Strengthening incentives for consumers, improving public charging networks, and fostering cross-sector collaboration will be essential to accelerate the transition.

This study relies on media sentiment analysis, which captures prevailing discourse but may not fully represent all stakeholder perspectives. Future research should integrate interviews or surveys with key stakeholders to validate sentiment trends and explore the evolving role of alternative technologies. Additionally, expanding the analysis beyond Europe could offer comparative insights into global decarbonization strategies. Overall, this study underscores the importance of aligning technological innovation, regulatory frameworks, and stakeholder expectations to achieve a sustainable automotive transition.

This study contributes to the literature on sustainability transitions, particularly in the European automotive sector's decarbonization. By applying the Multi-Level Perspective (MLP) framework, the study highlights technological, policy, and market barriers impeding full EV adoption. The integration of sentiment analysis offers a novel perspective, allowing us to track the evolving views of key stakeholders, including the automotive industry, policymakers, consumers, and academia, across a five-year period. Through sentiment analysis, the study tracks stakeholder views, revealing that while EVs dominate decarbonization discussions, infrastructure challenges, regulatory uncertainty, and cost issues persist. These findings align with existing literature on sustainability transitions, emphasizing the role of stakeholder engagement in overcoming barriers (Geels, 2002b; Smith *et al.*, 2005).

Practically, the study provides actionable insights for policymakers and industry leaders, emphasizing the need for coordinated policies and infrastructure investments. By identifying key drivers and barriers, the study guides strategies for accelerating decarbonization. The findings also reinforce Stakeholder Theory, suggesting that proactive engagement with stakeholders is essential to mitigate resistance (Freeman, 1984). Ultimately, the study lays the groundwork for future research on public perceptions, policy interventions, and alternative technologies, calling for diversified solutions and collaborative approaches to sustainability.

Acknowledgement

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The invisible wage gap: Gender Disparities in Adjunctive Salary Components Across Firm Sizes and Sectors

LETIZIA LO PREIATO[1]

Abstract

Frame of the research. *Despite extensive research on the gender pay gap, the role of adjunctive salary components-such as bonuses, individual salary supplements, and discretionary pay-remains underexplored. These components significantly impact overall earnings and may contribute to hidden forms of gender-based wage inequality.*

Purpose of the paper. *This study investigates gender disparities in adjunctive salary components across different firm sizes, organizational roles, and industries in the province of Brescia (Lombardy, Italy). It examines whether women systematically receive lower discretionary pay and explores how firm, and industry characteristics influence these gaps.*

Methodology. *Using a large-scale administrative dataset, we conduct a series of t-tests to quantify gender disparities in adjunctive salary components. We also assess variations by firm size and industry sector to identify structural patterns in wage inequalities.*

Results. *Findings confirm that women earn significantly lower adjunctive salary components than men, particularly in smaller firms and male-dominated industries. The largest discrepancies are observed in individual salary supplements, where managerial discretion plays a crucial role. However, female managers exhibit narrower gaps, suggesting that bargaining power increases at higher hierarchical levels.*

Research limitations. *This study focuses exclusively on firms in the province of Brescia, which, despite being economically significant within the Italian context, represents a limited sample. Future research should expand the analysis first at the regional level and then nationally to enhance the generalizability of the findings.*

Managerial implications. *The results highlight the need for firms to implement transparent and structured policies for adjunctive salary allocation to mitigate gender disparities, particularly in smaller companies.*

Originality of the paper. *This study is among the first to systematically analyze gender disparities in adjunctive salary components, providing new empirical evidence on the hidden mechanisms reinforcing the gender pay gap.*

Key words: *Gender pay gap; Adjunctive components of the salary; Wage disparities; Firm's size; Firm's industry; Firm's characteristics.*

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1. Introduction

Gender equality represents one of the most pressing contemporary challenges from cultural, social, economic, and legislative perspectives (Morais Maceira 2017; Ritala 2024). Bridging the persistent gap between men and women is not merely an ethical concern but a strategic imperative for ensuring long-term economic sustainability, with tangible effects on a country's GDP per capita (Morais Maceira 2017). Within this complex landscape, the gender pay gap plays a pivotal role (Goldin 2014; Morais Maceira 2017). As underscored by the 2024 Nobel laureate in economics, Claudia Goldin, disparities in labor force participation are closely linked to unfavorable conditions-including wage inequalities-that women face throughout their careers: "if certain women are disadvantaged in the labor market their participation will be stymied" (Goldin 2014).

Despite progress made in recent decades, achieving equal pay for equal work remains a challenge (Santero-Sánchez and Núñez 2025). In 2022, women's gross hourly earnings in the European Union (EU) were, on average, 12.7% lower than those of men, rising to 13.2% in the euro area (Eurostat). At first glance, Italy appears among the most equitable EU countries, reporting a comparatively lower gender pay gap of 4.3% in gross hourly earnings (Eurostat). However, this measure is incomplete, as it fails to account for key determinants such as employment rate disparities, horizontal and vertical segregation, and additional wage components (Oelz 2013). A more comprehensive indicator, the gender overall earnings gap-introduced by Eurostat-reveals that the actual earnings gap between Italian men and women is approximately 43% (INAPP 2022). This metric captures differences in gross hourly wages, hours worked, and labor market participation (Eurostat).

Focusing specifically on gross hourly earnings, previous research has demonstrated the influence of wage structures on the gender pay gap, establishing a clear relationship between salary components and remuneration disparities between men and women (Blau and Kahn 1996; Oelz 2013). According to the International Labour Organization (ILO), true pay equality requires parity across all elements of the earnings package (Oelz 2013).

Building on this premise, this study investigates the impact of additional salary components on the gender pay gap, particularly in the Italian context, where identifying the actual wage disparity remains challenging. Utilizing data from the *Rapporti biennali sulla situazione maschile e femminile* (Biennial Reports on the Situation of Men and Women) for the province of Brescia-located in the heart of Lombardy-we examine whether significant remuneration differences exist between men and women. Furthermore, we assess whether firm-specific characteristics, such as company size and industry sector, influence the distribution of additional wage components. Our findings reveal substantial gender-based differences in these salary components, with firm size and sector playing a differential role in shaping specific elements of compensation.

These results are particularly promising, not only for the insights they provide but also due to the high accuracy and timeliness of the reported data. This underscores the importance of transparent salary reporting and enhanced data accessibility in fostering a more precise analysis of Italy's employment landscape.

2. Literature review

2.1 Gender equality in Europe and Italy

All industrialized countries have enacted legislation mandating equal treatment of men and women in the labor market (Blau and Kahn 2003). By the mid-1980s, both OECD and European countries had adopted laws to promote the principles of equal pay and equal opportunities in employment (Blau and Kahn 2003). In particular, the principle of equal pay for equal work has been a foundational pillar of the European Union, enshrined in Article 119 of the 1957 Treaty of Rome. This principle has been repeatedly reinforced by European governing bodies, including in the most recent European Gender

Equality Strategy 2020-2025 (European Parliament. Directorate General Presidency. 2013; Santero-Sánchez and Núñez 2025). However, despite continued policy recommendations, the gender wage gap in Europe remains substantial, with women earning, on average, 12.7% less than men as of 2022-the latest available data (Eurostat).

The situation in Italy is no exception. Gender equality is embedded in the Italian Constitution, particularly in Article 3, which emphasizes both formal and substantive equality between men and women. This constitutional principle has been reinforced by legislative measures such as Law No. 903/1977 and Law No. 125/1991.

Law No. 903/1977 established the principle of gender equality in employment, prohibiting any form of sex-based discrimination in hiring, training, working conditions, and career progression. It also guaranteed equal pay for equal work, strengthened maternity protections, and granted women access to all professions, laying the groundwork for future gender equality policies in Italy.

Building on this framework, Law No. 125/1991 introduced affirmative action measures aimed at eliminating gender-based discrimination and promoting equal opportunities in the workplace. It required both public and private employers to adopt concrete strategies to reduce gender disparities in career advancement, remuneration, and access to managerial positions, thereby reinforcing the principles set out in previous legislation.

These two laws were later incorporated into Legislative Decree No. 198/2006, which established the Code of Equal Opportunities Between Men and Women. This decree consolidated and expanded the existing legal framework for gender equality, strengthening measures to promote equal treatment in employment and beyond. Additionally, it introduced the *Rapporti biennali sulla situazione maschile e femminile* (Biennial Reports on the Situation of Men and Women), requiring companies to monitor and report gender disparities in the workplace.

Despite these legislative advancements, recent data from the *Istituto Nazionale per la Previdenza Sociale*[2] (INPS, 2024) indicate that gender equality in Italy's labor market remains elusive, particularly concerning employment and wages. The female employment rate for individuals aged 15-64 stands at just 52.5%, significantly lower than the European average of 65.7%-a gap of thirteen percentage points (Eurostat). Moreover, while the reported gender pay gap appears relatively low at 4.3%, this figure can be misleading, as it fails to capture broader structural inequalities (INAPP 2022). A more comprehensive metric-the gender overall earnings gap, which accounts for multiple labor market factors-reveals a stark wage disparity of approximately 43% in Italy (INAPP, 2022), highlighting the limitations of existing legal measures in fully addressing the issue.

According to Carta F. et al. (2023), this persistent gap is partially attributable to compositional effects, including lower female labor force participation and entrenched horizontal and vertical segregation. Traditional human capital theory suggests that wage disparities result primarily from individual choices regarding education, skills, and work experience (Becker G. 1962; Mincer and Polachek 1978). However, this framework fails to account for the broader social and workplace dynamics that shape individual decisions (Santero-Sánchez and Núñez 2025).

Italian cultural norms continue to reinforce deeply ingrained gender roles, often confining women to caregiving responsibilities (Lombardo and Del Giorgio 2013). This dynamic significantly impacts women's work-life balance, leading to reduced working hours and limited career progression, which in turn exacerbates wage disparities and financial insecurity (EIGE 2023; Goldin et al. 2024, p. 213).

2.2 Province of Brescia situation: labor market and segregation

Italy experiences significant territorial disparities between its northern and southern regions. It remains one of the Western countries where regional imbalances continue to play a crucial role, with a north-south GDP gap unmatched by any other advanced economy (Felice 2018). The economic divide between northern and southern Italy is deeply rooted in history, initially characterized by the

[2] *Istituto Nazionale per la Previdenza Sociale* (National Institute for Social Security) it's the Italian social security agency that administers welfare benefits, pensions, and other related services.

formation of three macro-areas-North-West, North-East and Center, and South and Islands-which later consolidated into two: Center-North and South and Islands (Felice 2018; Chilosi and Ciccarelli 2022).

Among the northern regions, Lombardy stands out as Italy's economic powerhouse, consistently exceeding the national average in both productivity and employment (Felice, 2018). The region's economic resilience was particularly evident during the 2008-2013 crisis, when employment growth was primarily driven by job creation among large incumbent firms (Scoccianti and Sette 2024). Furthermore, in 2020 - during the Covid-19 pandemic - Lombardy recorded 826,051 active enterprises, the highest number in Italy, increasing to 848,449 in 2021 (ISTAT 2023). With 20.4% of the workforce employed in industry (excluding construction), compared to 16.9% nationwide, the region maintains a strong industrial base, complemented by thriving finance, technology, and service sectors (ISTAT 2023).

Within this economic landscape, Brescia plays a pivotal role, ranking as the second-largest province in Lombardy in terms of active enterprises, following Milan. In 2020, Brescia reported 102,473 active businesses, a figure that rose to 104,911 in 2021 (ISTAT 2023). The province is known for its strong industrial foundation, particularly in metalworking, machinery, and automotive sectors, and is highly export-oriented, with substantial contributions to both traditional and high-tech industries (Istat, 2023). Notably, 28.2% of the workforce in Brescia is employed in industry, reinforcing its role as a key driver of regional and national production (ISTAT 2023).

While Brescia's economic strength mirrors that of Lombardy, the province faces persistent gender disparities in the labor market, particularly in terms of wage inequality and workforce participation. Despite its undisputed economic power, Brescia exhibits one of the lowest female employment rates in Italy, standing at 41.7% in 2023, significantly below the 61.3% recorded for men (ISTAT 2023). In terms of the gender pay gap, the province reported an average earnings gap of 15.3% in 2021, exceeding the regional average of 14.8% (REGIONE LOMBARDIA 2022).

This contradiction-an economic leader with significant gender disparities-underscores the urgent need for a more detailed investigation into gender equality and the gender pay gap in a province that serves as a cornerstone of Italy's industrial and economic framework. The economic stability of the province of Brescia creates an ideal foundation for analyzing the underlying causes of the gender pay gap, eliminating the constraints to economic growth and employment opportunities typically found in southern regions. It provides a unique starting point, particularly due to its dichotomy between significant labor potential and the still limited female involvement, coupled with a pronounced gender pay gap.

2.3 The pivotal role of adjuntive components of the salary

The analysis of adjunctive salary components is essential in assessing the true extent of the gender pay gap between men and women. As early as 1995, Blau highlighted the impact of wage structures on gender pay disparities. However, while this assertion remains highly relevant, Blau's analysis primarily emphasized the role of women's skills and experience rather than the effect of adjunctive salary components on wage inequality (Blau and Kahn 1996). According to a report by the International Labour Organization (ILO) (2013), evaluating the fairness of wages requires a comprehensive assessment of all elements within the earnings package. These include base salary, overtime, production and performance-based bonuses, seniority increments, opportunities for business travel, career advancement prospects, the absence of penalties following maternity leave, and flexibility in working hours (Oelz 2013). Together, these factors provide a more nuanced understanding of wage equity, and the structural barriers women face in the labor market. This issue is particularly relevant in the Italian context, where the officially reported gender pay gap appears lower than expected.

A notable example of the relevance of adjunctive salary components in shaping the gender pay gap in Italy is represented by the 2012 protest by Fiat/FCA women workers, which was brought to

the attention of then-Labor Minister Elsa Fornero. The protest underscored how family and childcare leave directly penalized women, preventing them from qualifying for annual performance bonuses (European Parliament. Directorate General for Internal Policies of the Union. 2021). The constraints on women's working hours further limit their access to adjunctive salary components, ultimately reinforcing wage disparities (European Parliament, Directorate General for Internal Policies of the Union, 2021). In this regard, data from the *Rapporti biennali sulla situazione maschile e femminile* (Biennial Reports on the Situation of Men and Women) serve as a crucial resource for conducting a comprehensive analysis of earnings disparities.

Previous studies on the gender pay gap have largely focused on either the entire workforce, using aggregated data, or on specific workforce segments, particularly top executive positions (e.g., García et al. 2001; Gardeazabal and Ugidos 2005; Scicchitano 2014; Anastasiade and Tillé 2017; Santero-Sánchez and Núñez 2025). These studies consistently find that the wage gap is more pronounced in top-level positions compared to lower hierarchical levels (Gardeazabal and Ugidos 2005; Santero-Sánchez and Núñez 2025). While such research has significantly advanced our understanding of gender wage dynamics, it remains limited in its ability to compare workers at equivalent levels within organizations, often restricting the analysis to top echelon positions. Given the persistent gender pay gap and the underrepresentation of women in senior leadership roles (Kögel, C. et al. 2023), it is insufficient to explain the phenomenon solely by examining wage differences in high-ranking positions. A more comprehensive approach is required-one that considers gender disparities across all hierarchical levels.

The *Rapporti biennali sulla situazione maschile e femminile* (Biennial Reports on the Situation of Men and Women) address this gap by categorizing employees into managers, middle management, white-collar workers, blue-collar workers, and protected categories. The reports provide disaggregated salary data by gender and role, detailing key adjunctive salary components, such as *overtime pay*, which refers to work performed beyond standard working hours; *individual salary supplements-superminimi individuali*-which represent additional remuneration individually negotiated between employer and employee, exceeding the base salary; *productivity bonuses*, which include variable compensation linked to individual, team, or organizational performance outcomes; and a residual category encompassing all other supplementary pay components, referred to as *other*.

This dataset offers a broader perspective not only on salary structures but also on the relationship between different pay components and various organizational levels. Given the persistence of the gender pay gap and the underrepresentation of women in top echelon positions, it is unlikely that wage disparities can be explained solely by differences in managerial salaries. Instead, we hypothesize that:

H1 *Women earn lower compensation across all adjunctive salary components, for all organizational roles.*

2.3 The effect of the firm's characteristics on the wages

The relationship between wages and firm size has been a central topic in labor market research for decades. Numerous studies have explored the link between firm size and wage differentials (e.g., Evans and Leighton 1989; Schmidt and Zimmermann 1991; Oi and Idson 1999), generally finding that larger firms tend to offer higher wages. More recently, Mueller et al. (2017) demonstrated that within-firm pay inequality-wage differentials between top- and bottom-level positions-tends to increase with firm size.

Beyond firm size, industry affiliation also plays a significant role in shaping wage structures. As early as 1986, Dickens and Katz found that high-wage industries exhibit lower quit rates, higher labor productivity, a smaller share of female workers, a more highly educated workforce, longer working hours, greater non-wage compensation, higher unionization rates, larger establishments, higher market concentration, and greater profitability (Dickens and Katz, 1986). More recently, Card et al.

(2023) found that workers in higher-paying industries tend to possess both higher observed and unobserved skills, thereby amplifying wage disparities across industries. Similarly, Haltiwanger et al. (2024) linked the growing wage gap among workers to increasing industry dispersion, particularly within high-wage industries, where high-income workers are increasingly concentrated, benefiting from rising industry premia.

In the context of the gender pay gap, recent research has emphasized the family-friendliness of firms and occupations as a crucial factor in explaining wage disparities (Goldin 2014; Goldin C. and Lawrence F. Katz 2016). A key distinction is drawn between the public sector, often considered more accommodating to gender equality, and the private sector, which is typically perceived as less favorable for women (Christofides and Michael 2013; Anastasiade and Tillé 2017; Kleven et al. 2019). Carta et al. (2023), in a Bank of Italy report, highlighted that Italian women are more frequently employed in the public sector, which is perceived as more family-friendly than the private sector. Similarly, the 2022 INAPP report found that women in the private sector are predominantly employed in the tertiary sector, particularly in wholesale and retail trade and real estate activities, whereas their presence is lower in the secondary sector, which generally offers higher wages. Moreover, as emphasized in the INAPP 2022 report, wage composition is influenced by multiple factors, including firm size, industry affiliation, and collective or sectoral bargaining agreements.

Given the significant influence of firm characteristics on adjunctive salary components, as well as the well-documented impact of firm size-where larger firms tend to offer higher wages-and industry affiliation, particularly the secondary sector, which is associated with higher earnings, we formulate the following hypotheses:

H2: *The gender pay gap in adjunctive salary components is smaller in larger firms compared to smaller firms.*

H3: *The gender pay gap in adjunctive salary components is smaller in firms operating in the tertiary sector compared to those in the secondary sector*

3. Method

3.1 Data and variables

The data used in this analysis is drawn from the periodic reports on the gender composition of the workforce *Rapporti biennali sulla situazione maschile e femminile* (Biennial Reports on the Situation of Men and Women) referring to the biennial 2020-2021. Specifically, the data concerning the adjunctive components of salary pertains to the second reference year (2021), thereby partially mitigating the impact of the Covid-19 pandemic. The sample comprises 899 companies in the province of Brescia, each employing a minimum of 50 workers.

In these reports, data is presented in an aggregated format, meaning that the total amount for each adjunctive salary component is reported, disaggregated by gender and role. To facilitate comparison across components, we computed the mean value of each adjunctive salary component by dividing its total amount by the number of employees eligible for that specific component.

For reasons of consistency, we excluded the protected categories from the analysis, as this classification is not further disaggregated by job role within firms. A detailed description of the variables used in the study can be found in Tab 1.

Tab. 1: Variable description

Variable	Description
Women managers' overtime pay	Total amount of women managers' overtime pay divided by the total amount of women managers

Variable	Description
Men managers' overtime pay	Total amount of men managers 'overtime pay divided by the total amount of men managers
Women middle managers' overtime pay	Total amount of women managers' overtime pay divided by the total amount of women middle managers
Men middle managers' mean overtime pay	Total amount of men middle managers 'overtime pay divided by the total amount of men middle managers
Women white-collar workers' overtime pay	Total amount of women white-collar workers' overtime pay divided by the total amount of women white-collar workers'
Men white-collar workers' overtime pay	Total amount of men white-collar workers' overtime pay divided by the total amount of men white-collar workers'
Women blue-collar workers' overtime pay	Total amount of women blue-collar workers' overtime pay divided by the total amount of women blue-collar workers'
Men blue-collar workers' overtime pay	Total amount of men blue collars 'overtime pay divided by the total amount of men blue-collar workers'
Women managers' individual salary supplements	Total amount of women individual salary supplements divided by the total amount of women managers
Men managers' individual salary supplements	Total amount of men managers' individual salary supplements divided by the total amount of men managers
Women middle managers' individual salary supplements	Total amount of women individual salary supplements divided by the total amount of women middle managers
Men middle managers' individual salary supplements	Total amount of men middle managers' individual salary supplements divided by the total amount of men middle managers
Women white-collar workers' individual salary supplements	Total amount of women white-collar workers' individual salary supplements divided by the total amount of women white-collar workers'
Men white-collar workers' individual salary supplements	Total amount of men white-collar workers' individual salary supplements divided by the total amount of men white-collar workers'
Women blue-collar workers' individual salary supplements	Total amount of women blue-collar workers' individual salary supplements divided by the total amount of women blue-collar workers'
Men blue-collar workers' individual salary supplements	Total amount of men blue-collars' individual salary supplements divided by the total amount of men blue-collar workers'
Women managers' productivity bonuses	Total amount of women managers' productivity bonuses divided by the total amount of women managers
Men managers' productivity bonuses	Total amount of men managers' productivity bonuses divided by the total amount of men managers
Women middle managers' productivity bonuses	Total amount of women managers' productivity bonuses divided by the total amount of women middle managers
Men middle managers' productivity bonuses	Total amount of men middle managers' productivity bonuses divided by the total amount of men middle managers
Women white-collar workers' productivity bonuses	Total amount of women white-collar workers' productivity bonuses divided by the total amount of women white-collar workers'
Men white-collar workers' productivity bonuses	Total amount of men white-collar workers' productivity bonuses divided by the total amount of men white-collar workers'
Women blue-collar workers' productivity bonuses	Total amount of women blue-collar workers' productivity bonuses divided by the total amount of women blue-collar workers'
Men blue-collar workers' productivity bonuses	Total amount of men blue-collar workers' productivity bonuses divided by the total amount of men blue-collar workers'
Women managers' other	Total amount of women managers' other divided by the total amount of women managers
Men managers' other	Total amount of men managers' other divided by the total amount of men managers
Women middle managers' other	Total amount of women managers' other divided by the total amount of women middle managers
Men middle managers' other	Total amount of men middle managers' other divided by the total amount of men middle managers
Women white-collar workers' other	Total amount of women white-collar workers' other divided by the total amount of women white-collar workers'
Men white-collar workers' other	Total amount of men white-collar workers' other divided by the total amount of men white-collar workers'
Women blue-collar workers' other	Total amount of women blue-collar workers' other divided by the total amount of women blue-collar workers'
Men blue-collar workers' other	Total amount of men blue collars' other divided by the total amount of men blue-collar workers'

The descriptive statistics for each variable are presented in Tab 2.

Tab. 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Women Managers	899	1,98	25,36	0	656
Men Managers	899	2,73	20,55	0	495
Women middle managers	899	4,82	84,68	0	2288
Men middle managers	899	4,25	23,42	0	496
Women white collar workers	899	34,28	104,79	0	1376
Men white collar workers	899	29,78	58,71	0	821

Variable	Obs	Mean	Std. Dev	Min	Max
Women blue collar workers	899	28,56	120,87	0	2559
Men blue collar workers	899	66,82	88,82	0	990
Overtime pay					
Women managers' overtime pay	96	131,20	444,06	0	2439
Men managers' overtime pay	333	204,05	2856,20	0	51863
Women middle managers' overtime pay	254	325,70	1273,14	0	10692
Men middle managers' overtime pay	468	562,05	2638,42	0	32960,75
Women white-collar workers'overtime pay	878	523,31	845,52	0	1385,47
Men white-collar workers'overtime pay	846	1088,64	1863,14	0	33795,04
Women blue-collar workers'overtime pay	607	522,90	927,11	0	10094,32
Men blue-collar workers'overtime pay	831	1159,02	1192,38	0	9397,333
Individual pay - mean					
Women managers' individual salary supplements	96	16647,62	31023,75	0	190190
Men managers' individual salary supplements	333	20727,64	33649,98	0	193012,2
Women middle managers' individual salary supplements	254	13527,11	13909,10	0	57610,1
Men middle managers' individual salary supplements	468	19361,61	18719,39	0	94929,74
Women white-collar workers' individual salary supplements	878	2198,09	2973,98	0	21467,15
Men white-collar workers' individual salary supplements	846	5129,82	6547,67	0	52499,18
Women blue-collar workers'individual salary supplements	607	380,37	915,34	0	8276,813
Men blue-collar workers'individual salary supplements	831	1228,45	1858,11	0	10653,33
Productivity bonuses - mean					
Women managers' productivity bonuses	96	3218,06	6437,66	0	30000
Men managers' productivity bonuses	333	3765,51	14623,50	0	180874
Women middle managers'productivity bonuses	254	1618,80	3332,48	0	22662,55
Men middle managers'productivity bonuses	468	2093,90	5139,52	0	49279,33
Women white-collar workers'productivity bonuses	878	807,52	6866,34	0	200000
Men white-collar workers'productivity bonuses	846	1030,70	2607,63	0	35754,07
Women blue-collar workers'productivity bonuses	607	520,72	3861,33	0	93231,43
Men blue-collar workers'productivity bonuses	831	705,32	2806,60	0	66583,34
Other - mean					
Women managers' other	96	2195,52	6160,91	0	46151
Men managers' other	333	4879,85	12285,00	0	101841,5
Women middle managers' other	254	1928,77	5683,55	0	66369
Men middle managers' other	468	2592,57	6434,26	0	55276,81
Women white-collar workers'other	878	508,16	1568,14	0	25359,71
Men white-collar workers'other	846	973,70	2518,05	0	27918,11
Women blue-collar workers'other	607	266,77	815,99	0	10685,24
Men blue-collar workers'other	831	603,65	1765,11	0	25986,41

The descriptive statistics reveal that, on average, women earn less than their male counterparts, with earnings in some cases amounting to only half or one-third of those received by men. This disparity is particularly evident in certain adjunctive salary components, such as overtime pay for middle managers and individual salary supplements for blue-collar workers.

To further illustrate the composition of the workforce in our sample, Figure 1 presents the total distribution by gender and role, expressed as percentages. This visualization highlights that the sample is representative of the Italian labor market, as it reflects the underrepresentation of women in higher positions-with women accounting for only 12.5% of managers and 20.6% of middle managers. In contrast, gender distribution among white-collar workers is nearly balanced (50%-50%), whereas blue-collar positions are predominantly held by men, further reinforcing the sample's alignment with national labor market trends.

As the objective of this study is to examine not only gender disparities in adjunctive salary components but also their relationship with firm characteristics, such as firm size and industry, Figures 2 and 3 illustrate the distribution of employees in our sample by firm size and industry.

For firm size classification, we adopt as reference the 2003/361 EU Recommendation, which categorizes enterprises based on staff headcount, annual turnover, and balance sheet total. According to this classification, micro-enterprises have fewer than 10 employees and an annual turnover or balance sheet total not exceeding €2 million; small enterprises have fewer than 50 employees and an annual turnover or balance sheet total not exceeding €10 million; and medium-sized enterprises have fewer than 250 employees, with an annual turnover not exceeding €50 million or a balance sheet total not exceeding €43 million.

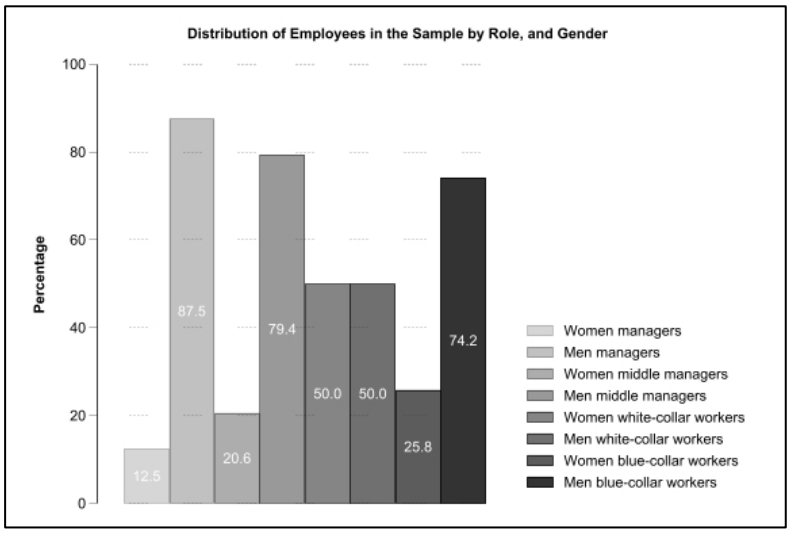
While our dataset does not include financial information, but rather employment figures, and comprises only firms with more than 50 employees, we adjusted the classification based on the

sample composition. Specifically, we distinguish among firms with 50-99 employees, 100-249 employees, and those exceeding 250 employees. Within our sample, 471 firms fall within the 50-99 employee range, 305 firms have 100-249 employees, and 123 firms employ more than 250 workers.

Our sample remains representative of the Italian labor market, as the employment dynamics observed in the full sample are mirrored in the subsample, except for white-collar workers. While gender distribution appears relatively unbalanced overall, only in firms with more than 250 employees does the proportion of men and women approach parity.

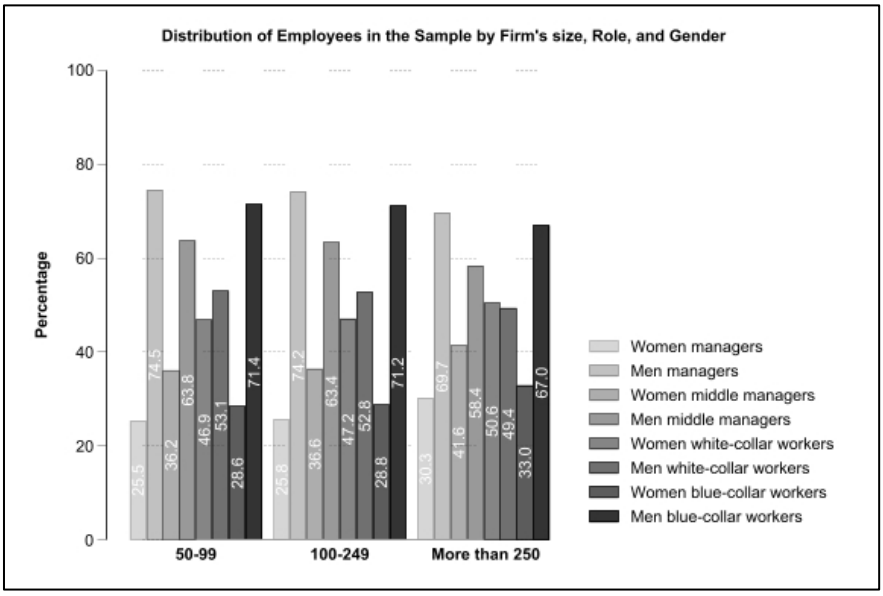
Regarding industry classification, our analysis focuses on the secondary and tertiary sectors, comprising 556 and 343 firms, respectively. Figure 3 illustrates the distribution of employees across these two sectors, further reinforcing the representativeness of our sample. In the tertiary sector, gender parity is more evident across all hierarchical levels, with a notable female-dominated imbalance. In contrast, the secondary sector is overwhelmingly male-dominated, with men accounting for nearly 90% of managerial and blue-collar positions.

Fig. 1: Distribution of Employees in the Sample by Role and, Gender.



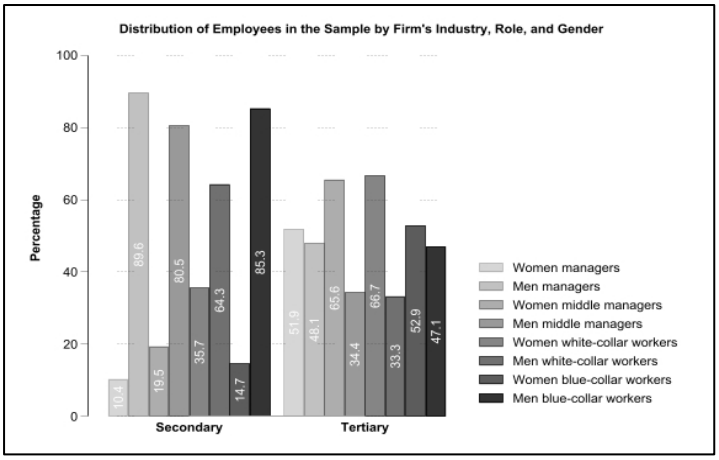
Source: Our elaboration

Fig. 2: Distribution of Employees in the Sample by Firm's size, Role and, Gender.



Source: Our elaboration

Fig. 3: Distribution of Employees in the Sample by Firm's Industry, Role and, Gender.



Source: Our elaboration

3.2 Method

Unlike previous studies on the gender pay gap, which required the use of specific modeling techniques to capture wage disparities across different hierarchical levels and individual characteristics within the sample (e.g., Gardeazabal and Ugidos 2005; Scicchitano 2014; Santero-Sánchez and Núñez 2025), our dataset is already disaggregated by role and gender. This allows us to implement a t-test to assess the statistical significance of mean differences in adjunctive salary components across different roles and gender groups.

Since the objective of this analysis is to evaluate the impact of firm characteristics on adjunctive salary components, the study follows a two-phase approach. In the first phase, a t-test was conducted on the overall sample, across all adjunctive salary components, without accounting for firm size or industry classification.

The second phase refined the analysis by incorporating firm-specific characteristics. First, the t-test was conducted separately for each firm size category-50-99 employees, 100-249 employees, and more than 250 employees-to examine whether firm size influences gender disparities in adjunctive salary components. Finally, an additional t-test was conducted for each industry sector-secondary and tertiary-to assess whether sectoral affiliation affects gender differences in salary distribution.

This methodology resulted in a total of six t-tests, progressively refining the analysis from an aggregate level to firm size and industry-specific subsamples, allowing for a more granular evaluation of gender-based disparities in adjunctive salary components.

4. Results

This section presents the findings of our analysis.

4.1 Overall Sample Analysis

The first t-test, conducted across all adjunctive salary components without accounting for firm size or industry classification, is reported in Tab 3. The results indicate that, on average, women receive significantly lower adjunctive salary components than men, earning less than half of their male counterparts.

A particularly stark disparity emerges in blue-collar workers' individual salary supplements, where women earn, on average, only one-third of what men receive (€380.37 vs. €1,228.45).

Interestingly, and in contrast to findings in the literature (e.g., Gardeazabal and Ugidos 2005; Scicchitano 2014; Santero-Sánchez and Núñez 2025), female managers receive adjunctive salary

components comparable to those of their male counterparts, particularly in individual salary supplements (women: €16,647.62; men: €20,727.64) and productivity bonuses (women: €3,218.06; men: €3,765.51). A similar trend is observed for middle managers, with women earning €13,527.11 in individual salary supplements compared to €19,361.61 for men, and €1,618.80 in productivity bonuses versus €2,093.90 for men.

For white-collar workers, productivity bonuses appear relatively balanced between men (€1,030.70) and women (€807.52), as well as for blue-collar workers (women: €520.72; men: €705.32).

Statistical significance is achieved in overtime pay and individual salary supplements across all categories except managers, in productivity bonuses for middle managers (p-value < .1), and in the "other" salary component for all categories.

4.2 Firm Size Analysis

The second, third, and fourth t-tests examine gender disparities in adjunctive salary components across different firm sizes. The results are reported in Tab 4 (50-99 employees), Tab 5 (100-249 employees), and Tab 6 (more than 250 employees).

For firms with 50 to 99 employees (Tab 4), the overall trend is confirmed, with women earning less than men across all adjunctive salary components. However, some notable exceptions emerge. In overtime pay, female managers earn more than their male counterparts (€36.40 vs. €4.05), though this difference is not statistically significant. A similar trend is observed for managers' productivity bonuses, where women earn €3,457.84 compared to €2,259.55 for men, but again, the difference lacks statistical significance.

Wage parity is observed in white-collar workers' productivity bonuses (women: €902.00; men: €947.34) and middle managers' "other" salary component (women: €2,199.78; men: €2,320.60), though neither is statistically significant.

Conversely, blue-collar workers' individual salary supplements remain a highly critical component, with women earning less than a third of their male counterparts (€395.75 vs. €1,392.00), a statistically significant result (p-value < .01).

Overall, statistical significance is observed in overtime pay across all categories except managers, in individual salary supplements and the "other" component for white-collar and blue-collar workers.

For firms with 100 to 249 employees (Tab 5), results largely confirm previous trends. However, women managers earn more than men in overtime pay (€69.73 vs. €38.94), though the difference is not statistically significant.

The most critical disparities are found in middle managers' overtime pay, where women earn only a quarter of their male counterparts (€133.25 vs. €582.34, p-value < .05), and in blue-collar workers' individual salary supplements, where women earn only a third of what men receive (€388.41 vs. €1,180.39, p-value < .01).

Overall, statistical significance is reached across all adjunctive salary components and categories, except for managers' overtime pay and managers' productivity bonuses.

For firms with more than 250 employees (Tab 6), the results are largely consistent with those observed in the overall sample and across different firm sizes. Women continue to earn less than their male counterparts in most adjunctive salary components, though in some cases, earnings are more comparable. Specifically, middle managers' overtime pay (€250.83 for women vs. €297.88 for men), managers' individual salary supplements (€24,256.62 for women vs. €24,732.83 for men), and middle managers' productivity bonuses (€2,303.06 for women vs. €2,496.33 for men) show relatively small differences.

Statistically significant differences are observed in overtime pay for white-collar and blue-collar workers, in individual salary supplements for middle managers, white-collar, and blue-collar workers, in productivity bonuses for blue-collar workers, and in the "other" salary component across all

categories except middle managers. However, the p-value for middle managers in this component approaches the threshold for statistical significance (p-value = .144).

4.3 Firm's Industry Analysis

Regarding industry classification, the results of the fifth (secondary sector) and sixth (tertiary sector) t-tests are presented in Tab 7 and Tab 8, respectively.

For firms in the secondary sector (Tab 7), the results reaffirm the overall trend. Women consistently earn less than their male counterparts across all adjunctive salary components and job categories. Some disparities are particularly critical, with women earning less than half of men's earnings in certain cases.

For overtime pay, women managers earn, on average, five times less than their male counterparts (€43.55 vs. €231.77), though this difference is not statistically significant. However, two highly significant disparities emerge. First, in white-collar workers' individual salary supplements, women earn less than half of what men receive (€2,917.90 vs. €6,957.17, p-value < .01). Second, in blue-collar workers' individual salary supplements, women earn only a third of what men receive (€541.68 vs. €1,609.89, p-value < .01).

Statistical significance is observed in overtime pay for all categories except managers, in individual salary supplements for all categories except managers, in productivity bonuses for white-collar and blue-collar workers, and in the "other" salary component for all categories except middle managers.

For firms in the tertiary sector (Tab 8), results again confirm that women, on average, earn less than men, with a few exceptions.

Women managers earn slightly more than their male counterparts in overtime pay (€253.91 vs. €121.91), while white-collar and blue-collar workers receive comparable productivity bonuses (white-collar: €973.96 vs. €672.99; blue-collar: €583.95 vs. €487.30). However, none of these differences are statistically significant.

More balanced earnings are observed in managers' individual salary supplements (€17,621.43 for women vs. €21,325.83 for men), middle managers' individual salary supplements (€8,457.27 for women vs. €11,896.47 for men), and managers' productivity bonuses (€3,923.59 for women vs. €4,583.16).

Statistical significance is achieved in overtime pay for white-collar and blue-collar workers, in individual salary supplements for middle managers, white-collar, and blue-collar workers, in middle managers' productivity bonuses, and in the "other" salary component across all categories except middle managers.

Tab. 3: Adjunctive salary components by gender and role

Adjunctive salary components by gender											
	Group 1 (women)				**Group 2 (Men)**						
Variables	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**t**	**p-value**	
Overtime pay - mean											
Managers' overtime pay	96	131,20	45,32	444,06	333	204,05	156,52	2856,20	-0,447	0,328	
Middle managers' overtime pay	254	325,70	79,88	1273,14	468	562,05	121,96	2638,42	-1,621	0,053	*
White-collar workers'overtime pay	878	523,31	28,54	845,52	846	1088,64	64,06	1863,14	-8,062	0,000	***
Blue-collar workers'overtime pay	607	522,90	37,63	927,11	831	1159,02	41,36	1192,38	-11,376	0,000	***
Individual salary supplements - mean											
Managers' individual salary supplements	96	16647,62	3166,35	31023,75	333	20727,64	1844,01	33649,98	-1,114	0,134	
Women middle managers' individual salary supplements	254	13527,11	872,73	13909,10	468	19361,61	865,30	18719,39	-4,774	0,000	***
White-collar workers' individual salary supplements	878	2198,09	100,37	2973,98	846	5129,82	225,11	6547,67	-11,895	0,000	***
Blue-collar workers'individual salary supplements	607	380,37	37,15	915,34	831	1228,45	64,46	1858,11	-11,399	0,000	***
Productivity bonuses - mean											
Managers' productivity bonuses	96	3218,06	657,04	6437,66	333	3765,51	801,36	14623,50	-0,528	0,299	
Middle managers'productivity bonuses	254	1618,80	209,10	3332,48	468	2093,90	237,57	5139,52	-1,501	0,067	*
White-collar workers'productivity bonuses	878	807,52	231,73	6866,34	846	1030,70	89,65	2607,63	-0,898	0,185	
Blue-collar workers'productivity bonuses	607	520,72	156,73	3861,33	831	705,32	97,36	2806,60	-1,001	0,159	
Other - mean											
Managers' other	96	2195,52	628,80	6160,91	333	4879,85	673,21	12285,00	-2,914	0,002	**
Middle managers' other	254	1928,77	356,62	5683,55	468	2592,57	297,42	6434,26	-1,430	0,077	*

White-collar workers'other	878	508,16	52,92	1568,14	846	973,70	86,57	2518,05	-4,588	0,000	***
Blue-collar workers'other	607	266,77	33,12	815,99	831	603,65	61,23	1765,11	-4,839	0,000	***
*p-value < 0.01 ***; p-value < 0.05 **; p-value < 0.1 ****											

Tab. 4: Adjunctive salary components by gender for firms with 50 - 99 employees

Adjunctive salary components by gender (50 - 99 employees)											
	Group 1 (Women)				**Group 2 (Men)**						
Variables	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**t**	**p-value**	
Overtime pay - mean											
Managers' overtime pay	22	36,40	36,40	170,72	108	4,05	4,05	42,10	0,883	0,807	
Middle managers' overtime pay	92	577,67	202,92	1946,31	191	669,63	203,55	2813,07	-0,320	0,374	***
White-collar workers'overtime pay	455	503,63	41,87	893,21	428	1142,32	104,40	2159,84	-5,678	0,000	***
Blue-collar workers'overtime pay	292	511,01	59,41	1015,22	434	1174,79	59,77	1245,08	-7,877	0,000	***
Individual salary supplements - mean											
Managers' individual salary supplements	22	8649,05	2750,99	12903,27	108	17299,35	3112,11	32341,96	-2,083	0,020	**
Women middle managers' individual salary supplements	92	15020,50	1527,51	14651,35	191	18524,64	1250,48	17281,90	-1,775	0,039	**
White-collar workers' individual salary supplements	455	2139,32	134,80	2875,41	428	5599,44	360,21	7452,02	-8,997	0,000	***
Blue-collar workers'individual salary supplements	292	395,75	57,99	990,97	434	1392,00	100,48	2093,17	-8,588	0,000	***
Productivity bonuses - mean											
Managers' productivity bonuses	22	3457,84	1491,55	6996,01	108	2259,55	960,22	9978,92	0,676	0,748	
Middle managers'productivity bonuses	92	1458,58	377,24	3618,32	191	1657,70	337,56	4665,18	-0,393	0,347	
White-collar workers'productivity bonuses	455	902,60	443,63	9462,89	428	947,34	139,07	2877,05	-0,096	0,462	
Blue-collar workers'productivity bonuses	292	551,65	320,55	5477,63	434	634,04	173,97	3624,27	-0,226	0,411	
Other - mean											
Managers' other	22	2424,10	2087,97	9793,43	108	3050,84	1060,47	11020,69	-0,268	0,395	
Middle managers' other	92	2199,78	816,12	7827,99	191	2320,60	475,15	6566,77	-0,128	0,449	
White-collar workers'other	455	481,20	79,44	1694,62	428	940,46	132,24	2735,78	-2,977	0,002	**
Blue-collar workers'other	292	222,13	45,09	770,48	434	585,54	87,55	1823,98	-3,690	0,000	***
*p-value < 0.01 ***; p-value < 0.05 **; p-value < 0.1 ****											

Tab. 4: Adjunctive salary components by gender for firms with 100 - 249 employees

Adjunctive salary components by gender (100 - 249 employees)											
	Group 1 (Women)				**Group 2 (Men)**						
Variables	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**t**	**p-value**	
Overtime pay - mean											
Managers' overtime pay	38	69,73	64,27	396,21	138	38,94	27,67	324,97	0,440	0,669	
Middle managers' overtime pay	94	133,25	57,47	557,22	185	582,34	222,53	3026,76	-1,954	0,026	**
White-collar workers'overtime pay	301	541,20	42,82	742,84	296	1049,57	94,00	1617,22	-4,922	0,000	***
Blue-collar workers'overtime pay	225	505,99	55,59	833,79	286	1163,62	68,35	1155,88	-7,465	0,000	***
Individual salary supplements - mean											
Managers' individual salary supplements	38	14069,84	3486,03	21489,32	138	20885,63	2869,26	33706,19	-1,510	0,067	*
Women middle managers' individual salary supplements	94	12432,66	1407,66	13647,75	185	20268,85	1478,25	20106,40	-3,839	0,000	***
White-collar workers' individual salary supplements	301	2278,40	180,21	3126,47	296	4915,29	330,11	5679,48	-7,011	0,000	***
Blue-collar workers'individual salary supplements	225	388,41	61,62	924,24	286	1180,39	97,18	1643,45	-6,883	0,000	***
Productivity bonuses - mean											
Managers' productivity bonuses	38	2430,07	921,61	5681,19	138	4046,51	1432,15	16823,93	-0,949	0,172	
Middle managers'productivity bonuses	94	1280,62	269,28	2610,79	185	2344,12	433,25	5892,85	-2,085	0,019	**
White-collar workers'productivity bonuses	301	582,60	64,16	1113,18	296	1033,25	136,30	2344,98	-2,991	0,002	**
Blue-collar workers'productivity bonuses	225	385,30	53,13	796,96	286	683,64	79,55	1345,38	-3,119	0,001	**
Other - mean											
Managers' other	38	1654,43	604,07	3723,71	138	5678,74	1132,10	13299,21	-3,136	0,001	**
Middle managers' other	94	1225,08	337,44	3271,65	185	2421,60	451,65	6143,13	-2,122	0,017	**
White-collar workers'other	301	451,17	74,97	1300,65	296	911,55	123,12	2118,20	-3,194	0,001	***
Blue-collar workers'other	225	199,73	35,99	539,81	286	493,27	84,82	1424,43	-3,186	0,001	***
*p-value < 0.01 ***; p-value < 0.05 **; p-value < 0.1 ****											

Tab. 6: Adjunctive salary components by gender for firms with more than 250 employees

Adjunctive salary components by gender (More than 250 employees)											
	Group 1 (Women)				**Group 2 (Men)**						
Variables	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**t**	**p-value**	
Overtime pay - mean											
Managers' overtime pay	36	254,03	95,24	571,43	87	714,23	596,60	5564,67	-0,762	0,224	
Middle managers' overtime pay	68	250,83	76,68	632,29	92	297,88	79,55	762,97	-0,426	0,335	
White-collar workers'overtime pay	122	552,57	81,83	903,84	122	995,08	106,37	1174,93	-3,297	0,001	***
Blue-collar workers'overtime pay	90	603,75	89,75	851,47	111	1085,54	102,12	1075,91	-3,544	0,000	***
Individual salary supplements - mean											
Managers' individual salary supplements	36	24256,62	7297,97	43787,80	87	24732,83	3758,50	35056,96	-0,058	0,477	
Women middle managers' individual salary supplements	68	13019,55	1606,23	13245,31	92	19274,88	1961,95	18818,35	-2,467	0,007	**
White-collar workers' individual salary supplements	122	2219,13	268,85	2969,58	122	4002,79	430,50	4754,98	-3,514	0,000	***
Blue-collar workers'individual salary supplements	90	310,40	61,29	581,49	111	712,86	113,39	1194,60	-3,123	0,001	**
Productivity bonuses - mean											
Managers' productivity bonuses	36	3903,30	1152,41	6914,44	87	5189,23	1680,63	15675,82	-0,631	0,265	
Middle managers'productivity bonuses	68	2303,06	454,09	3744,49	92	2496,33	456,95	4382,94	-0,300	0,382	
White-collar workers'productivity bonuses	122	1007,83	141,98	1568,19	122	1316,95	197,56	2182,12	-1,271	0,103	

Blue-collar workers'productivity bonuses	90	758,87	137,90	1308,24	111	1039,90	161,81	1704,82	-1,322	0,094	*
Other - mean											
Managers' other	36	2626,99	917,10	5502,59	87	5883,13	1284,36	11979,69	-2,063	0,021	**
Middle managers' other	68	2534,84	578,10	4767,15	92	3501,02	699,90	6713,23	-1,064	0,144	
White-collar workers'other	122	749,29	151,08	1668,69	122	1241,07	236,83	2615,90	-1,751	0,041	**
Blue-collar workers'other	90	579,24	139,15	1320,11	111	958,24	210,56	2218,44	-1,504	0,067	*
*p-value < 0.01 ***; p-value < 0.05 **; p-value < 0.1 ****											

Tab. 7: Adjunctive salary components by gender for firms belonging to the secondary sector

Adjunctive salary components by gender (secondary sector)											
	Group 1 (Women)				**Group 2 (Men)**						
Variables	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**t**	**p-value**	
Overtime pay - mean											
Managers' overtime pay	56	43,55	43,55	325,93	249	231,77	208,76	3294,22	-0,883	0,189	
Middle managers' overtime pay	147	329,49	114,16	1384,13	326	577,87	154,50	2789,59	-1,293	0,098	*
White-collar workers'overtime pay	548	607,49	41,04	960,82	542	1386,27	93,66	2180,47	-7,616	0,000	***
Blue-collar workers'overtime pay	367	618,41	45,30	1168,64	554	1392,31	49,65	1168,64	-11,515	0,000	***
Individual salary supplements - mean											
Managers' individual salary supplements	56	15952,04	3844,24	28767,68	249	20525,84	2083,06	32870,18	-1,046	0,149	
Women middle managers' individual salary supplements	147	17217,40	1235,86	14984,03	326	22613,30	1059,72	19133,70	-3,315	0,001	***
White-collar workers' individual salary supplements	548	2917,90	141,08	3302,50	542	6957,17	311,36	7248,79	-11,817	0,000	***
Blue-collar workers'individual salary supplements	367	541,68	53,52	1025,39	554	1609,89	85,83	2020,13	-10,561	0,000	***
Productivity bonuses - mean											
Managers' productivity bonuses	56	2714,12	884,34	6617,78	249	3489,67	920,46	14524,62	-0,608	0,272	
Middle managers'productivity bonuses	147	1799,02	289,53	3510,33	326	2034,82	252,38	4556,84	-0,614	0,270	
White-collar workers'productivity bonuses	548	707,29	65,30	1528,73	542	1231,33	121,86	2837,00	-3,790	0,000	***
Blue-collar workers'productivity bonuses	367	479,36	51,01	977,12	554	814,34	81,35	1914,67	-3,489	0,000	***
Other - mean											
Managers' other	56	3141,84	1053,91	7886,74	249	5515,29	829,04	13082,10	-1,770	0,040	**
Middle managers' other	147	2607,74	561,46	6807,34	326	3065,57	396,68	7162,29	-0,666	0,253	
White-collar workers'other	548	644,34	78,84	1845,68	542	1226,17	125,55	2923,00	-3,925	0,000	***
Blue-collar workers'other	367	339,33	51,84	993,12	554	769,91	87,73	2064,94	-4,225	0,000	***
*p-value < 0.01 ***; p-value < 0.05 **; p-value < 0.1 ****											

Tab.8: Adjunctive salary components by gender for firms belonging to the tertiary sector

Adjunctive salary components by gender (tertiary sector)											
	Group 1 (women)				**Group 2 (Men)**						
Variables	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**Obs**	**Mean**	**Std. err.**	**Std. dev.**	**t**	**p-value**	
Overtime pay - mean											
Managers' overtime pay	40	253,91	87,19	551,42	84	121,91	48,50	444,47	1,323	0,905	
Middle managers' overtime pay	107	320,49	107,21	1109,01	142	525,72	189,84	2262,16	-0,941	0,174	
White-collar workers'overtime pay	330	383,52	32,07	582,59	304	557,99	49,70	866,48	-2,950	0,002	**
Blue-collar workers'overtime pay	240	376,85	64,25	995,42	277	692,46	66,13	1100,69	-3,423	0,000	***
Individual salary supplements - mean											
Managers' individual salary supplements	40	17621,43	5421,53	34288,76	84	21325,83	3934,69	36062,04	-0,553	0,291	
Women middle managers' individual salary supplements	107	8457,27	1003,17	10376,84	142	11896,47	1289,67	15368,22	-2,105	0,018	**
White-collar workers' individual salary supplements	330	1002,77	97,66	1774,02	304	1871,84	173,20	3019,92	-4,371	0,000	***
Blue-collar workers'individual salary supplements	240	133,70	41,49	642,82	277	465,57	69,29	1153,25	-4,109	0,000	***
Productivity bonuses - mean											
Managers' productivity bonuses	40	3923,59	978,71	6189,89	84	4583,16	1633,47	14970,99	-0,346	0,365	
Middle managers'productivity bonuses	107	1371,22	296,82	3070,35	142	2229,53	528,07	6292,70	-1,417	0,079	*
White-collar workers'productivity bonuses	330	973,96	607,40	11033,88	304	672,99	120,20	2095,71	436,467	0,686	
Blue-collar workers'productivity bonuses	240	583,95	389,10	6027,95	277	487,30	242,37	4033,78	0,211	0,583	
Other - mean											
Managers' other	40	870,68	203,36	1286,13	84	2996,22	1020,74	9355,27	-2,042	0,022	**
Middle managers' other	107	995,96	331,46	3428,66	142	1506,67	347,76	4143,99	-1,063	0,144	
White-collar workers'other	330	282,02	49,52	899,49	304	523,57	83,32	1452,65	-2,492	0,007	**
Blue-collar workers'other	240	155,83	25,61	396,82	277	271,14	48,80	812,16	-2,092	0,019	**
*p-value < 0.01 ***; p-value < 0.05 **; p-value < 0.1 ****											

5. Discussion and Conclusion

5.1 Discussion

The findings of this study confirm the persistence of gender disparities in adjunctive salary components, reinforcing the argument that the gender pay gap extends beyond base wages. Across all firm sizes and industries, women consistently receive lower additional salary components than men, with statistically significant gaps in key categories, particularly among blue-collar and white-

collar workers. These results provide strong empirical support for H1, which posits that women earn lower compensation across all adjunctive salary components, regardless of their organizational role.

One of the most striking results concerns individual salary supplements for blue-collar workers, where women earn, on average, only one-third of what men receive. This disparity is particularly pronounced in smaller firms (50-99 employees) and in the secondary sector, where women's earnings in this category fall significantly below those of their male counterparts (€395.75 vs. €1,392.00 and €541.68 vs. €1,609.89, respectively). These findings support H2, indicating that the gender pay gap in adjunctive salary components is more pronounced in smaller firms, where salary structures may be less standardized, allowing for greater managerial discretion in pay allocation. Moreover, the results highlight a structural issue within traditionally male-dominated sectors, where women's access to performance-related pay and discretionary salary components appears more restricted.

Paradoxically, female managers receive adjunctive salary components that are more comparable to those of their male counterparts, particularly in terms of individual salary supplements and productivity bonuses. This finding contradicts some of the existing literature (e.g., Gardeazabal and Ugidos 2005; Scicchitano 2014; Santero-Sánchez and Núñez 2025), which often identifies greater wage disparities in higher-ranking positions. However, the persistence of pay gaps in more discretionary categories, such as individually negotiated salary supplements and the "other" salary component-where men receive significantly higher amounts across most firm sizes and industries-suggests that gender-based differences in bonus allocation and supplementary pay mechanisms remain a key factor contributing to earnings inequality.

Additionally, the analysis by firm size reveals that the gender pay gap tends to be smaller in larger firms, supporting H2, which suggests that larger organizations may have more structured salary policies that reduce gender-based discretionary pay differences (cit. on firm size and wage structures). However, significant gaps persist in specific adjunctive salary components, particularly in middle and lower hierarchical positions.

Regarding industry classification, results indicate that the tertiary sector exhibits greater gender balance in salary components compared to the secondary sector, where earnings disparities are more pronounced across all categories. This aligns with H3, which proposes that the gender pay gap in adjunctive salary components is smaller in firms operating in the tertiary sector than in those in the secondary sector. This finding is consistent with prior research suggesting that the tertiary sector offers more flexible work arrangements and career structures that are less penalizing for women (e.g., Kleven et al., 2019). However, even in the tertiary sector, men continue to receive higher discretionary salary components overall, suggesting that institutional and cultural factors may still influence gendered pay outcomes.

5.2 Conclusion

This study advances the literature on the gender pay gap by analyzing, for the first time to our knowledge, the role of additional salary components, which are fundamental to understanding the true magnitude of gender-based wage disparities (Oelz 2013; INAPP 2022). Our findings provide further empirical evidence that gender wage inequalities extend beyond base salaries, affecting discretionary pay elements across organizational levels, firm sizes, and industries. In particular, the results highlight critical gaps in individually negotiated salary supplements and other variable compensation components, systematically disadvantaging women. These findings challenge the assumptions of traditional human capital theory, which attributes wage disparities primarily to individual choices regarding education, skills, and work experience (Becker G. 1962; Mincer and Polachek 1978). However, this framework fails to account for the broader structural and social dynamics that shape remuneration, particularly in smaller firms and male-dominated industries (Santero-Sánchez and Núñez 2025).

Notably, the most significant and statistically relevant discrepancies are observed in salary components characterized by high employer discretion, where women tend to have lower bargaining

power. This is particularly evident in individually negotiated salary supplements, which represent additional remuneration beyond the base salary. The fact that this component plays a pivotal role in gender-based wage differentials reinforce previous studies on the "don't ask" approach of women in salary negotiations (Kray et al. 2024), especially among employees in lower hierarchical positions. The absence of statistically significant gender differences in salary supplements among women managers further supports the argument that when women reach higher positions, they gain slightly greater contractual power.

Furthermore, the findings suggest that firm size and industry characteristics are crucial in shaping gender-based salary disparities. While larger firms tend to exhibit smaller gender pay gaps, this is insufficient to eliminate inequalities, as women in lower hierarchical positions still face significant disadvantages in bonus allocation and discretionary pay. Similarly, while the tertiary sector offers a more balanced gender distribution, men continue to receive higher performance-related pay in most occupational categories.

From a policy perspective, these results underscore the need for greater transparency in salary structures and adjunctive salary components, particularly in sectors and roles where discretionary pay plays a significant role. Measures such as mandatory pay reporting, increased oversight on performance-based compensation, and targeted policies to enhance gender pay equity in blue-collar occupations could help mitigate some of these disparities.

However, this study is not without limitations. Firstly, the sample of companies is relatively small and located in a geographically and economically homogeneous area. Expanding the sample to include a broader regional and national perspective would be necessary.

Future research should explore the underlying mechanisms driving these differences, including the role of bargaining power, workplace culture, and employer discretion in bonus allocation. Additionally, integrating longitudinal data could provide deeper insights into career progression dynamics and their impact on gender-based wage disparities over time.

By shedding light on hidden dimensions of the gender pay gap, this study contributes to a more comprehensive understanding of earnings inequalities in the Italian labor market and highlights the importance of addressing gender disparities beyond base wages to achieve meaningful pay equity.

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Certificazione di genere UNI PdR 125:2022 e standard di rendicontazione di sostenibilità GRI ed ESRS: Strumenti complementari

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Abstract

Inquadramento della ricerca. *La parità di genere è sempre più riconosciuta come un fattore chiave per la crescita economica e lo sviluppo sostenibile. Inoltre, gli standard di rendicontazione di sostenibilità, come i Global Reporting Initiative Stadards (GRI) e gli European Sustainability Reporting Standards (ESRS), richiedono alle aziende di comunicare metriche legate alla diversità di genere. Tuttavia aspetti come l'allineamento di tali standard a sistemi di certificazione dedicati, come la certificazione UNI PdR 125:2022 (Certificazione di genere), sono ancora inesplorati.*

Obiettivo dello studio. *Questa ricerca analizza l'allineamento tra la Certificazione di genere e gli standard di rendicontazione della sostenibilità. L'obiettivo è verificare se e come la Certificazione di genere possa essere allineata agli standard, migliorando trasparenza e accountability sulle tematiche di genere.*

Metodologia. *La ricerca adotta un'analisi comparativa dei requisiti della Certificazione di genere con gli indicatori degli standard GRI e ESRS. L'analisi valuta il grado di sovrapposizione e compatibilità tra questi strumenti.*

Risultati. *I risultati evidenziano una forte corrispondenza tra i KPI della Certificazione di genere e i requisiti di rendicontazione degli standard.*

Limiti della ricerca. *La ricerca si basa su un'analisi comparativa e non include dati empirici provenienti da aziende certificate, che potrebbero fornire ulteriori approfondimenti sulla loro applicazione pratica.*

Implicazioni manageriali. *Le aziende che adottano sia la certificazione sia gli standard di rendicontazione possono rafforzare la credibilità della propria rendicontazione di sostenibilità.*

Originalità della ricerca. *Questo studio colma una lacuna nella letteratura, evidenziando le sinergie tra la Certificazione di genere e gli standard di rendicontazione della sostenibilità, con un contributo al dibattito sulla corporate social responsibility e la parità di genere.*

Key words: *parità di genere; rendicontazione di sostenibilità; UNI PdR 125:2022; GRI; ESRS.*

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1. Introduzione

La parità di genere è una tematica di crescente rilevanza a livello globale, riconosciuta non solo come un principio di giustizia sociale ma anche come un elemento strategico essenziale per promuovere la crescita economica e per il raggiungimento degli Obiettivi di Sviluppo Sostenibile (SDG) dell'Agenda 2030 definiti dalle Nazioni Unite (Al-Nasrallah, 2023; Yadav, 2023; Paoloni et al., 2024). Numerose evidenze empiriche dimostrano che le imprese con una maggiore parità di genere tendono a registrare una produttività economica più elevata, migliori prestazioni organizzative e strutture di governance più inclusive, contribuendo al benessere complessivo delle comunità (World Economic Forum, 2023; OECD, 2022; Velasco-Balmaseda et al., 2024). Inoltre, affrontare le disparità di genere è essenziale per contrastare la povertà, promuovere l'educazione e garantire un accesso equo alle risorse, tutti elementi fondamentali per la costruzione di società resilienti ed eque (UN Women, 2021).

In Italia, nonostante negli ultimi decenni siano stati compiuti progressi significativi, persistono ancora disparità, in particolare nel mercato del lavoro. Le donne affrontano spesso discriminazioni sistemiche, che si traducono in un divario salariale persistente, una sottorappresentazione nei ruoli dirigenziali e limitate opportunità di carriera (Hunt et al., 2018; European Institute for Gender Equality, 2023). Per affrontare queste criticità, il Governo Italiano ha introdotto la Certificazione della Parità di Genere UNI PdR 125:2022 (Certificazione di genere), uno strumento normativo volontario volto a incentivare e premiare le aziende che adottano pratiche concrete per la promozione dell'uguaglianza di genere. Questa certificazione non solo riconosce le aziende che implementano politiche di inclusione, ma stabilisce anche indicatori di performance di genere chiari e fornisce vantaggi economici e reputazionali, stimolando altre aziende a seguire l'esempio (Ministero delle Pari Opportunità e della Famiglia, Italia, 2022).

Il percorso per la parità di genere è parte della più ampia sfida globale per uno sviluppo sostenibile (Carroll e Shabana, 2010), percorso nel quale le aziende rivestono un ruolo chiave. Se queste in passato si concentravano prevalentemente sulle performance economiche, privilegiando il ritorno per gli azionisti rispetto alle preoccupazioni sociali, oggi il crescente riconoscimento della Corporate Social Responsibility (CSR) e l'allineamento delle strategie aziendali agli obiettivi di sostenibilità internazionali stanno modificando questo paradigma verso modelli di business attenti agli impatti sociali ed ambientali (United Nations, 2015). In questo contesto in continua evoluzione, la rendicontazione di sostenibilità sta diventando sempre più rilevante (Dincer e Dincer, 2024; Wagenhofer, 2024). La rendicontazione di sostenibilità è il processo attraverso il quale le aziende comunicano il loro impatto economico, ambientale e sociale, garantendo trasparenza sulle loro attività e impegni (Demartini et al., 2025). Questo perché una comunicazione chiara e trasparente delle pratiche aziendali non solo dimostra l'impegno delle aziende nella risoluzione delle sfide globali ma rafforza anche la fiducia nei confronti degli stakeholder. Infatti, secondo il Global Reporting Initiative (GRI), uno degli organismi internazionali più rilevanti in materia di rendicontazione di sostenibilità, le aziende che divulgano informazioni sui progressi raggiunti nella sostenibilità accrescono la loro credibilità e consolidano i rapporti con investitori, dipendenti e clienti (Miles, 2011; Al-Shaer e Zaman, 2016; GRI, 2021).

In questo contesto, la crescente attenzione alla sostenibilità e alla trasparenza richiede strumenti capaci non solo di misurare l'impegno aziendale in materia di equità di genere, ma anche di integrarlo efficacemente nelle strategie di rendicontazione di sostenibilità. La Certificazione di genere si configura come una possibile soluzione, fornendo un quadro concreto per la promozione di politiche aziendali inclusive. Tuttavia, resta da chiarire in che modo essa possa essere armonizzata con gli standard di rendicontazione di sostenibilità, garantendo un approccio integrato alla gestione della diversità e dell'inclusione. Questo apre una questione chiave: può la Certificazione di genere essere effettivamente allineata agli standard di rendicontazione di sostenibilità come il GRI e l'ESRS? Questo studio si pone come obiettivo quello di rispondere a questa domanda, analizzando come e in che misura la Certificazione di genere sia allineata agli standard di rendicontazione della sostenibilità,

e provando a colmare il gap oggi presente nella letteratura sulla rendicontazione di sostenibilità e l'integrazione con le certificazioni sociali (Dincer e Dincer, 2024).

2. Quadro normativo e teorico

2.1 Parità di genere nel mondo, in Europa, in Italia

La parità di genere costituisce un principio fondamentale per la giustizia sociale e lo sviluppo sostenibile. Tuttavia, la parità di genere nell'ambito della Corporate Social Responsibility (CSR) e dello sviluppo sostenibile è ancora caratterizzato da una frammentazione degli standard e dalla mancanza di un framework universale (Velasco-Balmaseda et al., 2024).

A livello internazionale, l'Agenda 2030 delle Nazioni Unite identifica la parità di genere come uno dei 17 Obiettivi di Sviluppo Sostenibile (SDG 5), sottolineando il suo ruolo chiave nella creazione di società più inclusive e resilienti (Yadav, 2023). Anche il Global Compact delle Nazioni Unite riconosce la necessità di integrare la parità di genere nelle strategie aziendali, promuovendo pratiche di business responsabili e sostenibili. Oltre agli SDGs, la Convenzione sull'eliminazione di ogni forma di discriminazione nei confronti della donna (CEDAW) adottata dall'ONU nel 1979 ha contribuito a rafforzare l'impegno internazionale per la parità di genere. I principi contenuti in questa convenzione hanno influenzato le normative europee e nazionali, portando a sviluppi normativi significativi nel corso degli anni.

L'Unione Europea ha promosso diverse iniziative per garantire la parità di genere, in particolare nel mondo del lavoro (Zacharenko, 2024). La Strategia per la parità di genere 2020-2025, ad esempio, definisce obiettivi specifici per aumentare l'occupazione femminile, migliorare la rappresentanza nei ruoli decisionali e ridurre il gender pay gap, favorendo così una maggiore inclusione nei contesti aziendali e istituzionali (Arabadjieva, 2021).

In Italia, l'articolo 3 della Costituzione sancisce l'uguaglianza di tutti i cittadini e le cittadine e impone alla Repubblica l'obbligo di rimuovere gli ostacoli che limitano tale parità, mentre l'articolo 37 riconosce il diritto delle donne lavoratrici a condizioni di lavoro e retribuzione pari a quelle degli uomini. Il Codice delle Pari Opportunità (D. Lgs. n.198/2006) è invece il principale riferimento normativo per la promozione della parità di genere. Aggiornato con la Legge 162/2021, introduce misure per la trasparenza retributiva e il monitoraggio delle politiche di genere nelle aziende. Infine, il Decreto Legislativo 80/2015 prevede disposizioni per favorire la conciliazione tra vita professionale e personale, con un focus particolare sulle lavoratrici. L'Italia ha inoltre recepito e sviluppato le normative europee, integrando strumenti specifici per la promozione della parità di genere. In questo contesto normativo si inserisce la Certificazione di genere, uno strumento introdotto per incentivare l'adozione di politiche di equità di genere attraverso un sistema di gestione strutturato. In particolare questa certificazione è stata promossa nell'ambito del Piano Nazionale di Ripresa e Resilienza (PNRR) e mira a supportare le aziende nella riduzione del divario di genere, migliorando l'accesso delle donne ai ruoli di leadership e promuovendo la parità salariale.

2.2 La Certificazione di genere

La Certificazione di genere è uno strumento normativo volontario introdotto in Italia nell'ambito del Piano Nazionale di Ripresa e Resilienza (PNRR), attraverso l'investimento 1.3 (M5C1), con l'obiettivo di promuovere la parità di genere all'interno delle organizzazioni. Questa certificazione non rappresenta solo un incentivo alle politiche di equità di genere, ma anche un passo avanti verso un quadro normativo più strutturato per garantire la sostenibilità sociale nelle aziende.

Il sistema di certificazione prevede che le aziende adottino un vero e proprio sistema di gestione per la parità di genere, calcolando indicatori e sviluppando politiche e pratiche improntate all'equità e alla non discriminazione. Per ottenere la certificazione, le aziende devono dimostrare la conformità

a una serie di requisiti definiti all'interno della Prassi di Riferimento UNI/PdR 125:2022 che fornisce linee guida sul sistema di gestione per la parità di genere. La certificazione si basa su una serie di criteri e Key Performance Indicators (KPI) che misurano le prestazioni aziendali in materia di equità di genere, suddivisi nelle seguenti aree:

- Cultura e strategia;
- Governance;
- Processi HR;
- Opportunità di crescita ed inclusione delle donne in azienda;
- Equità remunerativa per genere;
- Tutela della genitorialità e conciliazione vita-lavoro.

Il risultato dell'applicazione del sistema di misurazione è un punteggio compreso tra 0 e 100 che consente di valutare il livello di maturità dell'azienda in relazione alla parità di genere e i progressi compiuti nel tempo. La certificazione viene rilasciata da Organismi di Certificazione accreditati quando un'azienda dimostra di aver soddisfatto i requisiti minimi definiti dalla prassi, ossia raggiungendo un punteggio minimo di 60.

L'ottenimento della Certificazione di genere non rappresenta un traguardo statico, ma un percorso di miglioramento continuo: la certificazione ha infatti validità per tre anni, con un obbligo di monitoraggio annuale. Durante il monitoraggio, le aziende devono dimostrare di mantenere e migliorare gli standard raggiunti, attraverso un aggiornamento periodico delle politiche aziendali e delle pratiche di inclusione.

2.3 Gli standard di rendicontazione di sostenibilità

Gli standard di rendicontazione di sostenibilità sono uno strumento essenziale per garantire trasparenza, comparabilità e affidabilità nelle informazioni fornite dalle aziende in merito alle loro performance ambientali, sociali e di governance e facilitano la transizione verso un'integrazione più efficace dei principi di sostenibilità nella gestione aziendale (Wagenhofer, 2024).

Tra i principali framework utilizzati a livello europeo, emergono i consolidati Global Reporting Initiative (GRI) e i recenti European Sustainability Reporting Standards (ESRS), sviluppati nel contesto della Corporate Sustainability Reporting Directive (CSRD).

Il Global Reporting Initiative (GRI) è uno dei framework di rendicontazione della sostenibilità più diffusi a livello internazionale. Nato nel 1997 per migliorare la trasparenza aziendale, il GRI fornisce un insieme strutturato di standard di rendicontazione di sostenibilità che aiutano le aziende a divulgare in modo chiaro e sistematico il proprio impatto economico, ambientale e sociale (De Villiers et al., 2022).

Gli standard GRI si suddividono in tre categorie principali:

- Standard Universali, che includono principi generali di rendicontazione, la struttura della governance aziendale e il processo di definizione degli aspetti materiali;
- Standard Settoriali, che forniscono linee guida specifiche per diversi settori industriali;
- Standard Tematici, suddivisi in quelli relativi alla governance (serie 200), quelli ambientali (serie 300) e quelli sociali (serie 400), che coprono tematiche specifiche, tra cui la diversità di genere (GRI 405: Diversity and Equal Opportunity). Quest'ultimo si concentra sulle pari opportunità e sulla diversità all'interno delle aziende e richiede la divulgazione di informazioni sulla composizione della forza lavoro, la distribuzione di genere nei ruoli dirigenziali e il divario retributivo tra uomini e donne (Bananuka et al., 2022).

Gli European Sustainability Reporting Standards (ESRS) sono invece i nuovi standard europei per la rendicontazione di sostenibilità, sviluppati dall'European Financial Reporting Advisory Group (EFRAG) nell'ambito della CSRD. Questi standard sono progettati per garantire che le aziende forniscano informazioni dettagliate, comparabili e affidabili sulle loro performance ESG, contribuendo a migliorare la trasparenza nel mercato finanziario (Giner and Luque-Vílchez, 2022).

Gli ESRS si articolano in diverse categorie:

- ESRS 1 e ESRS 2 (Standard Trasversali): definiscono i principi generali di rendicontazione e le informative generali richieste a tutte le organizzazioni.
- Standard Tematici: ESRS G1 riguarda la governance e la condotta aziendale sostenibile; ESRS E1-E5 trattano tematiche ambientali, come il cambiamento climatico e la biodiversità; ESRS S1-S4 si focalizzano sulle questioni sociali, inclusa la parità di genere e le condizioni di lavoro. Tra questi, lo standard ESRS S1 è particolarmente rilevante per il tema della parità di genere, poiché richiede alle aziende di rendicontare informazioni dettagliate su:
- La distribuzione di genere tra i dipendenti e nei consigli di amministrazione;
- Le politiche di parità di genere e di non discriminazione;
- Il divario retributivo tra uomini e donne;
- Le iniziative per favorire la conciliazione tra vita privata e lavoro.

Sebbene GRI ed ESRS abbiano origini diverse, i due framework condividono obiettivi comuni e mostrano una progressiva convergenza nei criteri di rendicontazione. Gli ESRS integrano infatti molte delle linee guida sviluppate dal GRI. Questa sinergia rafforza il ruolo della rendicontazione ESG come strumento chiave per il raggiungimento degli obiettivi di sostenibilità e per la promozione di pratiche aziendali responsabili (Wagenhofer, 2024).

2.4 Teorie di Riferimento: Stakeholder Theory e Legitimacy Theory

L'evoluzione normativa nell'Unione Europea relativa alla sostenibilità, testimoniata dall'implementazione di diverse direttive, come la Corporate Sustainability Due Diligence Directive (CSDDD) e la Corporate Sustainability Reporting Directive (CSRD), ha rafforzato l'importanza della rendicontazione di sostenibilità. La CSRD introdotta nel 2022, imporrà infatti nel prossimo quadriennio a quasi 50.000 aziende l'obbligo di rendicontare dettagliatamente le proprie pratiche ESG, tra cui la gestione della parità di genere e dell'inclusione sociale. Questa direttiva rappresenta un importante passo avanti nella standardizzazione della rendicontazione di sostenibilità, con l'obiettivo di migliorare la trasparenza delle informazioni e promuovere il monitoraggio delle politiche aziendali come quelle sulla diversità e inclusione.

Le aziende saranno chiamate ad allineare le loro pratiche alle aspettative sociali in continua evoluzione e ciò favorirà il ruolo della Certificazione di genere non solo come strumento di conformità, ma anche come mezzo per costruire una solida reputazione aziendale e accedere a nuove opportunità di mercato. I sistemi di certificazione per la parità di genere infatti, quando strutturati in modo chiaro e misurabile, possono facilitare la standardizzazione delle pratiche aziendali e promuovere una maggiore trasparenza nei processi decisionali. Le aziende che implementano sistemi di certificazione per la parità di genere hanno maggiori probabilità di ottenere miglioramenti misurabili nella soddisfazione dei e delle dipendenti, nella retention e nella produttività, poiché creano ambienti di lavoro più equi e inclusivi (Tzanakou et al., 2021).

Il fine ultimo della certificazione non è solo quello di riconoscere e premiare le organizzazioni che si impegnano nella riduzione del divario di genere, ma anche di incentivare altre aziende a intraprendere lo stesso percorso, generando così un circolo virtuoso di adozione di buone pratiche a livello economico e sociale (Velasco-Balmaseda et al., 2023). La Certificazione di genere si inserisce quindi in un processo più ampio di trasformazione aziendale, in cui l'integrazione di pratiche di equità di genere con gli standard di rendicontazione di sostenibilità può contribuire a migliorare la reputazione aziendale e la trasparenza della rendicontazione sulla sostenibilità (Monteiro et al., 2024). Questa potenzialità, derivante dall'allineamento tra Certificazione di genere e rendicontazione di sostenibilità può essere spiegata attraverso due prospettive teoriche comunemente utilizzate per analizzare proprio la rendicontazione di sostenibilità: la Stakeholder Theory e la Legitimacy Theory (Herold, 2018; Dincer e Dincer, 2024).

La Stakeholder Theory (Freeman, 1984), sostiene che le aziende dovrebbero considerare gli interessi e il benessere di tutti gli stakeholder, e non concentrarsi esclusivamente sul valore per gli azionisti. Questa teoria evidenzia l'importanza della Certificazione di genere e della rendicontazione

di sostenibilità nel rafforzare i rapporti con gli stakeholder, dimostrando inclusività e responsabilità sociale (Bellucci et al., 2018). Le aziende che adottano politiche di equità di genere e comunicano in modo trasparente i loro progressi rispondono alle aspettative di stakeholder sempre più sensibili alla sostenibilità e alle pratiche aziendali etiche (Herold, 2018). Questa risposta contribuisce alla costruzione di fiducia e al successo a lungo termine, poiché stakeholder come investitori, dipendenti e clienti valutano sempre più le pratiche aziendali attraverso una lente ESG (Guerrero-Baena et al., 2024).

Oltre alla Stakeholder Theory, la Legitimacy Theory (Deegan, 2002) fornisce un ulteriore quadro interpretativo per comprendere l'importanza della Certificazione di genere e della rendicontazione di sostenibilità (Dincer e Dincer, 2024). La Legitimacy è definita come "la percezione generalizzata o l'ipotesi che le azioni di qualsiasi entità siano desiderabili, corrette o appropriate all'interno di un sistema socialmente costruito di norme, valori, credenze e definizioni" (Suchman 1995, p. 574). Secondo questa teoria, le aziende devono quindi conformarsi alle aspettative della società per mantenere la loro legittimità e il loro diritto di operare (Baldini et al., 2018). Le aziende, quindi, utilizzano strumenti come la Certificazione di genere e la rendicontazione di sostenibilità non solo per soddisfare requisiti normativi, ma anche per rafforzare la percezione di conformità alle aspettative sociali e ambientali (Simoni et al., 2020). Uno recente studio di Sun et al. (2022) ha dimostrato che le aziende adottano strategie di legittimazione, come la pubblicazione di report integrati, per dimostrare il loro impegno verso la giustizia sociale e ottenere un vantaggio competitivo. Inoltre, le aziende cercano di legittimare il proprio operato anche attraverso strategie di comunicazione visiva nei report di sostenibilità, utilizzando immagini e narrazioni per rafforzare il messaggio di impegno verso la sostenibilità (Ali et al., 2021).

L'integrazione tra Stakeholder Theory e Legitimacy Theory proposta in questo studio permette di comprendere come la Certificazione di genere, allineata alla rendicontazione di sostenibilità, non sia solo una risposta alle pressioni normative, ma una strategia proattiva per creare valore sociale e aziendale a lungo termine. Le organizzazioni che investono nella Certificazione di genere dimostrano infatti di conformarsi alle normative esistenti e, allo stesso tempo, rafforzano la propria immagine aziendale come entità responsabili e attente alle tematiche di equità di genere. Allo stesso tempo l'adozione della rendicontazione di sostenibilità porta a una maggiore trasparenza aziendale, riducendo i rischi di greenwashing e migliorando il rapporto con gli investitori (Dameri e Ferrando, 2022). Queste prospettive teoriche forniscono una comprensione del ruolo della Certificazione di genere e della rendicontazione di sostenibilità come strumenti complementari per l'equità sociale, la performance organizzativa e lo sviluppo sostenibile.

3. Certificazione e standard: Strumenti distinti ma complementari

La Certificazione di genere e gli standard di rendicontazione di sostenibilità sono strumenti distinti e apparentemente scollegati, ma che perseguono un obiettivo di lungo termine comune: supportare e guidare le aziende nell'assumere e dimostrare un impegno verso la sostenibilità sociale. Il quadro teorico presentato ha evidenziato come la Certificazione di genere, strumento specificamente italiano, si inserisca all'interno di un quadro normativo e strategico più ampio (Velasco-Balmaseda et al., 2023), che vuole promuovere la parità di genere come elemento chiave per la sostenibilità aziendale, ed impone alle aziende l'adozione di un sistema di gestione volto a integrare, promuovere e supportare le politiche di equità di genere nella propria realtà aziendale. I principali standard di rendicontazione di sostenibilità come GRI ed ESRS richiedono invece la rendicontazione di indicatori specifici per monitorare la diversità di genere nelle aziende. Il report di sostenibilità rappresenta infatti il mezzo attraverso cui le aziende comunicano il loro impegno in ambito ambientale, sociale ed economico.

Mentre la Certificazione di genere affronta il tema della parità di genere con maggiore dettaglio e operatività rispetto agli standard di rendicontazione di sostenibilità, questi ultimi individuano la parità

di genere come uno degli elementi fondamentali della più ampia rendicontazione ESG. In quest'ottica, la Certificazione di genere può quindi essere interpretata come un mezzo attraverso il quale concretizzare e rafforzare un impegno che viene poi formalmente rendicontato grazie agli standard e l'adozione combinata di questi strumenti permetterebbe alle aziende di:

- Strutturare meglio le proprie strategie di parità di genere, adottando KPI misurabili per il monitoraggio dei progressi.
- Rafforzare la credibilità nei confronti degli stakeholder, grazie a una maggiore trasparenza e accountability.
- Allinearsi ai requisiti normativi e migliorare l'accesso ai finanziamenti, poiché gli investitori sono sempre più orientati a sostenere aziende con solide pratiche di diversità e inclusione.

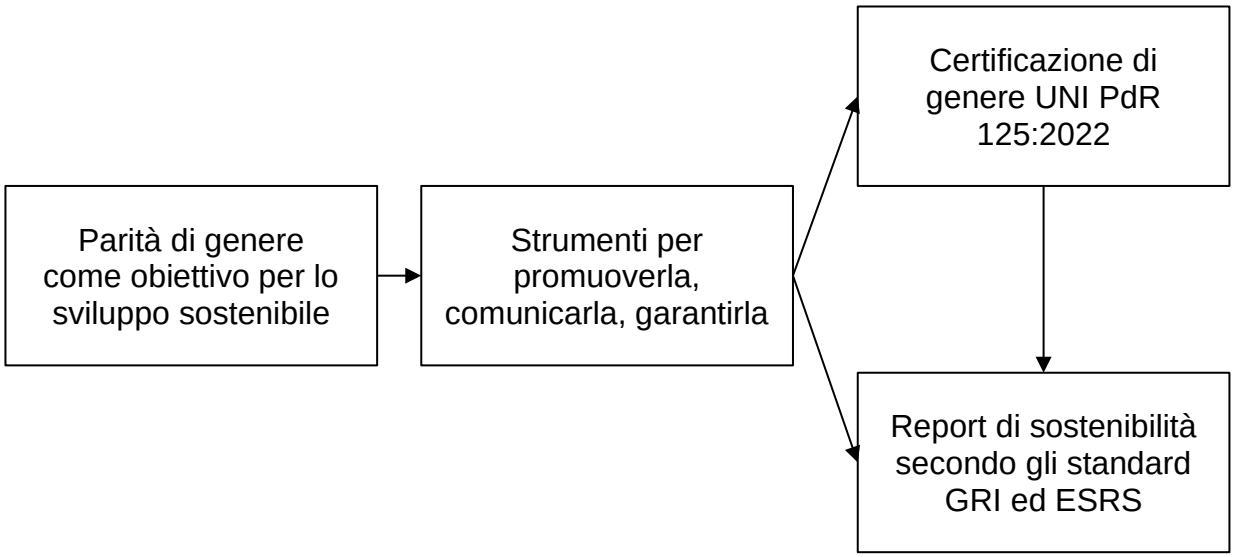
In sintesi, il presente studio ritiene che la Certificazione di genere e gli standard di rendicontazione di sostenibilità non devono essere considerati strumenti alternativi, ma complementari, in quanto entrambi contribuiscono a una gestione più efficace e trasparente della tematica diversità di genere all'interno delle aziende. Per sostenere questa tesi, è necessaria un'analisi approfondita di questi strumenti che confronti i requisiti della prassi UNI PdR 125:2022 con le informative richieste dagli standard di rendicontazione.

A partire da questa premessa, si è delineata la seguente domanda di ricerca:

La certificazione di genere è allineata agli standard di rendicontazione in modo che la conformità ad essa assicuri insieme la conformità all'altro, creando reciprocamente valore aggiunto?

Per rispondere a questa domanda sarà realizzata un'analisi comparativa tra la Certificazione di genere e gli standard di rendicontazione di sostenibilità.

Figura 1. Disegno della ricerca



Fonte: elaborazione degli autori

4. L'Analisi

Questo studio si basa su un approccio comparativo volto a esplorare l'allineamento tra la Certificazione di genere e gli standard di rendicontazione di sostenibilità GRI ed ESRS. L'obiettivo principale è verificare se questi strumenti siano complementari e se la conformità a uno di essi garantisca indirettamente la conformità all'altro, generando valore aggiunto.

L'analisi si articola in due fasi:

- **Analisi KPI**: confronto delle metriche e degli indicatori utilizzati nella Certificazione di genere e

negli standard di rendicontazione di sostenibilità. Questo confronto permette di valutare se gli strumenti forniscono misure coerenti e allineate per il monitoraggio della parità di genere. Per fare ciò sono stati individuati tutti gli indicatori della prassi, suddivisi per area, che richiedono una valutazione quantitativa, misurati in termini di delta % rispetto a un valore interno aziendale o al valore medio di riferimento nazionale o del tipo di attività economica, e qualitativa, misurati in termini di presenza o non presenza, senza distinzione per fascia dimensionale aziendale, e per ciascuno di essi si è individuato il corrispondente negli standard GRI ed ESRS.

L'analisi di questi indicatori consentirà di comprendere se gli strumenti condividano metodi di misurazione simili, e se le aziende che ottengono la Certificazione di genere siano in grado di soddisfare automaticamente le informative degli standard di rendicontazione di sostenibilità.

- **Analisi politiche, sistemi di monitoraggio e di gestione**: esame delle politiche, dei processi e delle dichiarazioni qualitative richieste dalla Certificazione di genere e dagli standard di rendicontazione di sostenibilità. L'obiettivo è verificare se l'ottenimento della Certificazione di genere rafforzi la rendicontazione qualitativa delle aziende e la loro capacità di dimostrare un impegno concreto verso la parità di genere.

Questa analisi permetterà di comprendere se la Certificazione di genere contribuisce a migliorare la qualità della rendicontazione di sostenibilità, garantendo maggiore trasparenza e coerenza nelle informazioni divulgate dalle aziende.

5. Risultati

L'analisi condotta evidenzia come la Certificazione di genere rappresenti un'opportunità concreta per le aziende italiane di strutturare le proprie politiche di parità di genere in modo più sistematico e misurabile. L'allineamento tra la Certificazione di genere e i principali standard di rendicontazione di sostenibilità, come il GRI e l'ESRS, risulta essere un elemento chiave per migliorare la coerenza e la trasparenza dei report aziendali sulla sostenibilità.

5.1 Analisi KPI

Un primo confronto tra la Certificazione di genere e gli standard ESRS e GRI riguarda gli indicatori di performance descritti nella prassi UNI PdR 125:2022. L'analisi dimostra che la Certificazione di genere prevede la rendicontazione di metriche più stringenti rispetto agli standard, garantendo un monitoraggio più dettagliato della parità di genere. Entrando nello specifico di ogni area:

- **Cultura e strategia (peso rispetto alla valutazione complessiva per la Certificazione di genere pari al 15%).** Quest'area si distingue per il suo approccio orientato all'implementazione pratica dei principi di inclusione e parità di genere. Questo ambito prevede esclusivamente indicatori qualitativi con l'obiettivo di assicurare che le politiche aziendali siano effettivamente integrate nella strategia e nei valori dell'organizzazione. Uno degli elementi chiave di questa area riguarda la formalizzazione e implementazione di un piano strategico per un ambiente di lavoro inclusivo. A differenza degli standard di rendicontazione di sostenibilità, che si limitano a richiedere la descrizione delle politiche di inclusione, la certificazione impone un impegno concreto nella definizione di un piano strutturato, dimostrando come la strategia aziendale incorpori misure specifiche per la parità di genere. Mentre gli ESRS richiedono alle aziende di comunicare le proprie politiche di diversità e inclusione, la Certificazione di genere si spinge oltre, imponendo la loro attuazione attraverso obiettivi chiari e verificabili. Sia la Certificazione di genere che lo standard ESRS chiedono di descrivere gli strumenti di dialogo e confronto anonimo messi a disposizione dei dipendenti. L'indicatore relativo alle attività di sensibilizzazione interna impone invece alle aziende di promuovere pratiche e linguaggi inclusivi, andando oltre gli obblighi di

rendicontazione sugli impatti sociali previsti da GRI e ESRS. Un aspetto innovativo nei KPI della Certificazione di genere riguarda la rappresentanza di genere nei panel e nei convegni aziendali, un requisito assente negli ESRS e nel GRI, che si concentrano sulla governance e sulla diversità senza entrare nel dettaglio della partecipazione agli eventi istituzionali. L'obbligo di formazione biennale su diversità e unconscious bias rafforza ulteriormente l'approccio della certificazione rispetto agli standard ESG. Il GRI 404-1 e gli ESRS S1-13 richiedono alle aziende di rendicontare le ore di formazione, ma senza specificarne il contenuto. La Certificazione di genere, invece, impone la realizzazione di interventi mirati per contrastare stereotipi di genere e bias inconsapevoli, garantendo un impatto più concreto sulle dinamiche aziendali. Infine, la Certificazione di genere introduce un elemento distintivo con la richiesta di promuovere le pari opportunità anche all'esterno dell'organizzazione, attraverso attività di comunicazione e coinvolgimento degli stakeholder su inclusione e parità di genere. Al contrario, gli ESRS non impongono obblighi specifici di advocacy.

- **Governance (peso rispetto alla valutazione complessiva per la Certificazione di genere pari al 15%)**. Quest'area introduce indicatori sia qualitativi sia quantitativi per misurare l'effettiva integrazione della parità di genere nella gestione aziendale. Il primo KPI qualitativo è relativo alla presenza di un presidio dedicato alla gestione e monitoraggio della parità di genere e rappresenta un requisito più stringente rispetto agli standard di rendicontazione. Mentre gli ESRS S1-1 e GRI 2-9 richiedono alle aziende di descrivere le politiche e gli organi di governance, la Certificazione di genere impone la creazione di una struttura organizzativa specifica, rendendo la governance della parità di genere più strutturata e operativa. Un altro elemento distintivo è l'indicatore che prevede la presenza di processi interni per identificare e gestire casi di non inclusività, che non trova una corrispondenza diretta negli standard di sostenibilità. Sebbene gli ESRS S1-2 e il GRI 406-1 prevedano la rendicontazione degli episodi di discriminazione e delle misure correttive adottate, la certificazione introduce un approccio preventivo, obbligando le aziende a predisporre strumenti di gestione strutturati per affrontare situazioni di esclusione o disparità. L'indicatore relativo alla definizione di un budget per l'inclusione e la parità di genere non è richiesto dagli standard di rendicontazione di sostenibilità, che si concentrano sulla comunicazione degli impatti senza imporre obblighi di rendicontazione di allocazione finanziaria. La Certificazione di genere introduce anche un vincolo sulla definizione di obiettivi legati alla parità di genere per i vertici aziendali e il management, che devono essere misurabili e valutabili. Questo requisito risulta più stringente rispetto agli ESRS G1-1 che chiedono alle aziende di descrivere la strategia di governance senza imporre obiettivi specifici sulla diversità nei ruoli dirigenziali. Il primo indicatore quantitativo richiesto dalla Certificazione di genere è invece il numero di esponenti del sesso meno rappresentato negli organi di amministrazione e controllo.
  Il confronto con gli standard GRI ed ESRS illustrato in Tabella 1, evidenzia indicatori simili, con la sola differenza che gli standard di rendicontazione di sostenibilità richiedono anche la comunicazione del rapporto medio tra i componenti di sesso femminile e maschile.

Tabella 1. Confronto tra KPI quantitativi per l'Area Governance

Area Governance		
Certificazione di genere	GRI	ESRS
Presenza di esponenti del sesso meno rappresentato nell'organo amministrativo e di controllo della organizzazione.	GRI 2-9: composizione del massimo organo di governo e comitati per genere. GRI 405-1 a.i: percentuale di persone all'interno degli organi di governance per genere.	ESRS 2, GOV-1 (20;21d): la composizione e la diversità degli organi di amministrazione, direzione e controllo e le percentuali ripartite per genere.

- **Processi HR (peso rispetto alla valutazione complessiva Certificazione di genere pari al 10%)**. Quest'area prevede esclusivamente KPI qualitativi e si distingue per l'approccio

prescrittivo nella Certificazione di genere che richiede alle aziende di adottare politiche e procedure strutturate per garantire la parità di genere, mentre gli ESRS e i GRI si limitano prevalentemente alla rendicontazione quantitativa di dati, come il numero di assunzioni, turnover e segnalazioni di episodi di discriminazione. Un primo elemento di differenziazione riguarda la gestione delle risorse umane, per cui la Certificazione di genere impone la formalizzazione di politiche su selezione, onboarding, condizioni contrattuali e valutazione delle performance, per garantire processi neutrali e inclusivi. L'indicatore sulla presenza di meccanismi di analisi del turnover è più stringente nella Certificazione di genere, poiché obbliga le aziende a monitorare attivamente eventuali squilibri di genere nelle uscite dal personale, prevedendo misure correttive. Il GRI 401-1, invece, si limita alla rendicontazione del tasso di turnover per genere. La formazione e valorizzazione del personale rappresenta un altro punto di differenza. La certificazione non solo richiede alle aziende di documentare l'erogazione di formazione, ma impone che i percorsi di sviluppo e leadership siano accessibili equamente a entrambi i generi. Il GRI 404-1 e gli ESRS S1-13, invece, si concentrano sulla misurazione del numero di ore di formazione erogate, senza verificare se i percorsi siano effettivamente inclusivi. Un aspetto rilevante riguarda la mobilità interna e avanzamento nelle posizioni manageriali, per cui la certificazione chiede alle aziende di implementare politiche attive per garantire equità nei percorsi di crescita. Il GRI 405-1 e gli ESRS S1-6 richiedono invece solo la rendicontazione della composizione di genere nei ruoli dirigenziali, senza obblighi specifici per favorire la presenza femminile in tali posizioni. Per quanto riguarda la tutela della maternità, la certificazione introduce obblighi specifici per garantire il mantenimento del livello retributivo dopo il congedo, mentre il GRI 401-3 richiede solo il monitoraggio del tasso di rientro e fidelizzazione post-maternità. Infine, per quanto riguarda l'indicatore sulla prevenzione di molestie e mobbing, il GRI 406-1 richiede la rendicontazione del numero di episodi segnalati, mentre la Certificazione di genere indica di definire prassi aziendali e referenti interni dedicati alla prevenzione e gestione di tali episodi. L'ESRS S1-1 (24a) chiede di rendere noto se si dispone di politiche specifiche volte a eliminare la discriminazione, comprese le molestie, e a promuovere le pari opportunità e altre soluzioni a sostegno della diversità e dell'inclusione.

- **Opportunità di crescita ed inclusione delle donne in azienda (peso rispetto alla valutazione complessiva per la Certificazione di genere pari al 20%)**. In quest'area la Certificazione di genere richiede esclusivamente il calcolo di indicatori quantitativi, elencati in Tabella 2. Il primo indicatore previsto dalla Certificazione di genere è la percentuale di donne rispetto al totale dell'organico. Questo trova corrispondenza sia nello standard GRI, il quale chiede di rendicontare il numero di dipendenti suddividendoli per genere, che nello standard ESRS che specifica di comunicare sia il numero che la percentuale della composizione per genere della forza lavoro. Quest'ultimo standard introduce però anche l'importanza del tema dell'intersezionalità nella diversità, suggerendo di misurare anche il numero di persone con disabilità nella forza lavoro suddiviso per genere. Gli indicatori successivi analizzano specificatamente il numero di donne con qualifica di dirigente, responsabili di unità organizzative, in prima linea di riporto al vertice e con delega di budget. Entrambi gli standard, invece, chiedono di analizzare più genericamente la suddivisione per genere e categorie contrattuali. Per quanto riguarda l'analisi numerica della partecipazione delle donne in azienda, la prassi di riferimento e i due standard sono abbastanza simili e sono volti similmente a evidenziare un'eventuale presenza di discriminazione.

Tabella 2. Confronto tra KPI quantitativi per l'Area Opportunità di crescita ed inclusione delle donne in Azienda

Area Opportunità di crescita ed inclusione delle donne in azienda		
Certificazione di genere	GRI	ESRS
Percentuale di donne nell'organizzazione rispetto alla totalità dell'organico (e rispetto al benchmark dell'industria di riferimento)	GRI 2-7: numero di dipendenti ripartiti per genere	ESRS S1-6: caratteristiche dei dipendenti dell'azienda.
	GRI 405-1 a.b: percentuale di dipendenti per genere.	ESRS S1-12 (80): percentuale di dipendenti con disabilità precisandone la ripartizione per genere.
Percentuale di donne nell'organizzazione con qualifica di dirigente	GRI 405-1: percentuale di persone all'interno degli organi di governance per genere.	ESRS S1-9 (64): la distribuzione di genere tra i membri dell'alta dirigenza.
Percentuale di donne nell'organizzazione responsabili di una o più unità organizzative rispetto al totale della popolazione di riferimento		ESRS S1-6: caratteristiche dei dipendenti dell'azienda.
Percentuale di donne presenti nella prima linea di riporto al Vertice		
Percentuale di donne presenti nell'organizzazione con delega su un budget di spesa/investimento		

- **Equità remunerativa per genere (peso rispetto alla valutazione complessiva per la Certificazione di genere pari al 20%)** In quest'area i KPI sono tre e tutti quantitativi (Tabella 3). Il primo indicatore riguarda la percentuale di differenza retributiva a parità di livello inquadramentale e competenze. Questo aspetto è affrontato anche dal GRI che richiede di calcolare il rapporto tra retribuzione media di uomini e donne per categoria d'impiego, e dagli ESRS che impongono la comunicazione del divario retributivo orario lordo tra generi. La Certificazione di genere introduce poi un secondo indicatore specifico sulle promozioni di donne su base annua per analizzare eventuali fenomeni di "tetto di cristallo". Gli standard GRI ed ESRS richiedono invece la percentuale sia per genere che per categoria ma di dipendenti che subiscono periodicamente valutazioni di prestazione e sviluppo professionale. Infine, il terzo indicatore riguarda la percentuale di donne con remunerazione variabile, aggiungendo uno specifico riferimento verso le aziende sulla comunicazione a dipendenti delle procedure e dei criteri seguiti per l'attuazione delle politiche retributive nella parte variabile del salario. Lo standard GRI richiede allo stesso modo di rendicontare il rapporto tra il salario di base e la retribuzione delle donne rispetto agli uomini suddividendo per categoria d'impiego e di descrivere il rapporto tra il salario di un/a neoassunto/a e un salario minimo, considerando anche il genere. Similmente, lo standard ESRS richiede un'analisi del divario percentuale di retribuzione tra uomini e donne misurato come divario nella retribuzione oraria media lorda.

Tabella 3. Confronto tra KPI quantitativi per l'Area Equità remunerativa per genere

Area Equità remunerativa per genere		
Certificazione di genere	GRI	ESRS
Percentuale di differenza retributiva per medesimo livello inquadramentale per genere e a parità di competenze	GRI 405-2: rapporto tra il salario di base e la retribuzione delle donne rispetto agli uomini per ciascuna categoria di dipendenti.	ESRS S1-16: percentuale del divario retributivo tra dipendenti di sesso femminile e dipendenti di sesso maschile.
Percentuale di promozioni di donne su base annua	GRI 404-3: percentuale sul totale dei dipendenti per genere e per categoria di dipendenti che è stata oggetto di valutazione periodica delle proprie prestazioni e sviluppo professionale	ESRS S1-13: Richiede il monitoraggio delle promozioni per genere e livelli professionali
Percentuale di donne con remunerazione variabile per assicurare la corresponsione del salario variabile in maniera equa, rendendo note ai lavoratori e alle lavoratrici le procedure e i criteri seguiti nell'attuazione delle politiche retributive per quel che riguarda la parte variabile del salario	GRI 202-1: quando una percentuale significativa di dipendenti è retribuita secondo le regole del salario minimo, rendicontare il corrispondente rapporto.	Non specificato direttamente, ma rientra nelle informazioni generali sulle politiche di retribuzione e uguaglianza

- **Tutela della genitorialità e conciliazione vita-lavoro (peso rispetto alla valutazione complessiva per la Certificazione di genere pari al 20%).** L'ultimo gruppo di KPI è dedicato

alla conciliazione vita-lavoro e alla genitorialità. La certificazione prevede indicatori qualitativi che valutano la presenza di servizi e misure di supporto. Un elemento chiave è la richiesta di servizi dedicati al rientro post maternità/paternità come piani di welfare aziendale, smart working, coaching e part-time reversibile. La Certificazione di genere introduce infatti un focus sulle policy aziendali per la tutela della genitorialità, andando oltre le previsioni contrattuali (CCNL), per incentivare la creazione di programmi di engagement e percorsi di accompagnamento per genitori. A livello di indicatori quantitativi, descritti in Tabella 4, la Certificazione di genere chiede di calcolare il rapporto tra i beneficiari uomini effettivi sul totale dei beneficiari potenziali dei congedi di paternità e il numero di giorni effettivi presi rispetto a quelli previsti dalla legge. Gli standard GRI presentano un'analisi ancora più approfondita rispetto alla prassi di riferimento, richiedendo il monitoraggio del tasso di rientro e di fidelizzazione dei dipendenti che usufruiscono del congedo parentale. Gli standard ESRS richiedono invece solo di divulgare informazioni sulla percentuale di dipendenti che hanno preso il congedo familiare per genere.

Tabella 4. Confronto tra KPI quantitativi per l'Area Tutela della genitorialità e conciliazione vita lavoro

Area Tutela della genitorialità e conciliazione vita-lavoro		
Certificazione di genere	GRI	ESRS
Rapporto tra il numero dei beneficiari uomini effettivi sul totale dei beneficiari potenziali dei congedi di paternità nei primi dodici anni di vita del bambino obbligatori	GRI 401-3 a.b: numero di dipendenti che avevano diritto/hanno usufruito del congedo parentale, suddivisi per genere. suddivisi per genere.	ESRS S1-15 (93a.b): percentuale di dipendenti aventi diritto che hanno diritto/ hanno usufruito di congedi per motivi familiari, e una ripartizione per genere.
Rapporto tra numero di giorni medio di congedo di paternità obbligatorio fruiti e il totale di numero di giorni potenziale previsto dalla legge	GRI 401-3 c.d: numero di dipendenti che sono tornati al lavoro al termine del congedo parentale (e che erano ancora alle dipendenze dell'organizzazione 12 mesi dopo essere rientrati al lavoro), suddivisi per genere. GRI 401-3 e: tassi di rientro al lavoro e di fidelizzazione dei dipendenti che hanno usufruito del congedo parentale	ESRS S1-15 (91): in quale misura i dipendenti hanno diritto al congedo per motivi familiari e ne usufruiscono.

Il confronto tra i KPI della Certificazione di genere e gli standard di rendicontazione di sostenibilità dimostra una significativa convergenza nei temi trattati, suggerendo che le aziende certificate possiedano già molte delle informazioni necessarie per effettuare la redazione del report di sostenibilità. Tuttavia, la principale differenza risiede nella natura stessa dei due strumenti: mentre gli standard di rendicontazione, come GRI ed ESRS, richiedono alle aziende di divulgare informazioni sulle proprie politiche e performance, la Certificazione di genere impone un approccio più vincolante, prevedendo metriche più stringenti e obiettivi specifici da raggiungere. Questo aspetto la rende uno strumento più operativo e incisivo, poiché non si limita a una semplice trasparenza informativa, ma richiede un effettivo impegno delle aziende nel migliorare e mantenere nel tempo le proprie pratiche di equità di genere.

5.2 Analisi politiche, sistemi di monitoraggio e di gestione

Un ulteriore confronto tra i requisiti legati alla parità di genere contenuti negli standard di rendicontazione e i requisiti contenuti nella Certificazione di genere è possibile analizzando le richieste qualitative. Questo tipo di confronto è più complesso in quanto da un lato gli standard di rendicontazione di sostenibilità hanno l'obiettivo verificare la presenza di eventuali politiche e il loro contenuto, mentre dall'altro la Certificazione di genere fornisce una serie di linee guida da seguire per implementare un vero e proprio Sistema di Gestione per la parità di genere all'interno dell'azienda.

La Certificazione di genere richiede prima di tutto che vi sia una politica aziendale per la parità di genere che sia la base per il relativo sistema di gestione, all'interno della quale l'azienda possa esprimere il suo impegno e i suoi intenti nei confronti di tale tema. Similmente è possibile trovare una corrispondenza negli standard GRI (GRI 2, 2-23) ove viene richiesto di descrivere gli impegni

assunti in generale rispetto ai diritti umani, considerando anche tutte le categorie di stakeholder, tra cui i gruppi vulnerabili. Anche negli standard ESRS si trova una corrispondenza in quanto viene richiesto nello standard ESRS S1, S1-1 di descrivere tutte le politiche presenti a tutela dei diritti umani, tra cui quelle volte a eliminare le discriminazioni e promuovere le pari opportunità. Inoltre, nello stesso obbligo informativo viene chiesto di verificare che le politiche vengano attuate attraverso procedure specifiche per garantire la prevenzione della discriminazione, mitigata e impedita una volta individuata, nonché per promuovere la diversità e l'inclusione in generale.

Un aspetto rilevante richiesto poi dalla Certificazione di genere è la redazione di un piano strategico per la parità di genere dove l'azienda, attraverso l'individuazione dei punti di forza e di debolezza, definisce quelli che possono essere degli obiettivi che si impegna a raggiungere entro un determinato periodo. Gli standard di rendicontazione di sostenibilità non richiedono di sviluppare un'analisi focalizzata sulla parità di genere, ma chiedono all'azienda di svolgere un'analisi degli impatti, dei rischi e delle opportunità non solo verso l'interno della propria organizzazione, ma anche verso l'esterno e quindi verso tutti gli stakeholder. In questo processo, che consente di identificare i temi più rilevanti, definiti materiali, l'azienda potrebbe individuare la parità di genere come tematica di prioritaria e per la quale comunicare eventuali iniziative, misure o obiettivi specifici.

La prassi di riferimento indica poi una serie di requisiti essenziali che l'azienda deve implementare ed inserire nei suoi processi con il fine di ottenere un completo Sistema di Gestione per la parità di genere. Tali requisiti sono volti a regolamentare tutte le procedure interne e quindi non trovano una esatta corrispondenza poiché, come anticipato, il fine ultimo degli standard di rendicontazione è quello di rendicontare e comunicare la propria performance sociale, mentre la prassi è supporto per costruire interamente un Sistema di Gestione che rivoluzioni totalmente l'approccio in ogni processo aziendale verso le tematiche della parità di genere ed evitare così discriminazioni.

In conclusione, il confronto evidenzia che la Certificazione di genere introduce requisiti più stringenti e operativi rispetto agli standard di rendicontazione di sostenibilità, trasformando la parità di genere da un elemento di semplice rendicontazione a un processo sistematico di gestione aziendale. Gli strumenti sono però complementari e ottenere la Certificazione di genere offre un vantaggio competitivo alle aziende verso la redazione del report di sostenibilità in quanto dispongono già di dati strutturati e di un sistema di gestione che garantisce continuità e verificabilità. Questo non solo facilita la conformità agli standard GRI ed ESRS, ma permette anche di dimostrare un impegno concreto e strutturato nella promozione della parità di genere.

6. Discussione

L'analisi condotta ha evidenziato che l'allineamento tra la Certificazione di genere e gli standard di rendicontazione di sostenibilità non solo è possibile, ma vantaggioso per le aziende. La corrispondenza tra contenuti e requisiti di questi due strumenti dimostra come possano coesistere e rafforzarsi reciprocamente, generando un valore aggiunto per l'azienda.

Questo risultato è in linea con la Stakeholder Theory (Freeman, 1984), secondo cui le aziende devono rispondere alle aspettative degli stakeholder adottando pratiche trasparenti e sostenibili. Le aziende che adottano la Certificazione di genere e redigono un report di sostenibilità secondo gli standard ESRS o GRI ottengono numerosi benefici: maggiore attrazione di talenti, maggiore reputazione e affidabilità, aumento della soddisfazione e della produttività dei e delle dipendenti, maggiore attrattività per gli investitori, aumento della fiducia degli stakeholder, miglioramento delle performance aziendali e maggiore competitività nel mercato globale (Fernandez-Feijoo, Romero e Ruiz-Blanco, 2014). Le aziende che già redigono il report di sostenibilità e riconoscono la materialità del tema della parità di genere dovrebbero quindi essere incentivate ad adottare la Certificazione di genere. Questo strumento non solo rafforzerebbe la loro credibilità, ma fornirebbe anche una struttura solida per raccogliere e monitorare i dati richiesti dagli standard GRI ed ESRS (Miles, 2011). Sebbene la certificazione comporti un investimento iniziale in termini di risorse economiche e di tempo, i

benefici derivanti dalla sua adozione sono in grado di superare ampiamente i costi, soprattutto considerando l'aumento di valore generato nel lungo periodo (Bravo e Reguera-Alvarado, 2018). D'altro canto, un'azienda già certificata per la parità di genere troverà agevole la redazione del report di sostenibilità, poiché disporrà già di strumenti per la misurazione e il monitoraggio delle proprie performance sociali e di governance in materia di diversità di genere.

Integrare questi due strumenti potrebbe però risultare complesso. L'analisi ha infatti mostrato come la Certificazione di genere e gli standard di rendicontazione di sostenibilità non condividano solo obiettivi comuni, ma anche alcune differenze chiave:

- Focalizzazione: la Certificazione di genere si concentra sulla parità di genere, mentre gli standard di rendicontazione di sostenibilità hanno un approccio più ampio, includendo anche dimensioni ambientali e di governance.
- Struttura operativa: la Certificazione di genere, in quanto certificazione, impone obblighi precisi e un sistema di gestione dettagliato, mentre gli standard di rendicontazione di sostenibilità forniscono linee guida più generali per la realizzazione del report di sostenibilità.
- Sistema di monitoraggio: la Certificazione di genere prevede audit periodici per verificare l'effettiva implementazione delle politiche di parità di genere, mentre gli standard di rendicontazione di sostenibilità sono prevalentemente strumenti che permettono trasparenza su base volontaria.

L'importanza crescente dello sviluppo sostenibile nel panorama aziendale globale suggerisce che, in futuro, la convergenza tra diverse linee guida, standard e strumenti di certificazione sarà inevitabile. Questo aspetto è strettamente connesso alla Legitimacy Theory (Suchman, 1995), che evidenzia come le aziende debbano conformarsi alle aspettative sociali per mantenere la propria legittimità. Il confronto ha poi dimostrato una maggiore corrispondenza con gli ESRS recentemente sviluppati dall'UE. Questo è dovuto al fatto che gli ESRS sono stati progettati per il contesto europeo, riflettendo più fedelmente le priorità normative della regione, mentre gli standard GRI, di natura globale, risultano meno specifici rispetto alle tematiche di uguaglianza di genere. La maggiore compatibilità tra Certificazione di genere e standard ESRS conferma l'importanza di un approccio strategico integrato per la rendicontazione della sostenibilità.

L'analisi condotta conferma quindi che la Certificazione di genere e il report di sostenibilità non sono strumenti separati, ma interdipendenti. La loro integrazione consente di creare un sistema di gestione più robusto, migliorando la trasparenza, la coerenza e la credibilità delle aziende che operano in un'ottica di sostenibilità. La Certificazione di genere e gli standard di rendicontazione di sostenibilità rappresentano quindi due strumenti complementari che, se utilizzati congiuntamente, permettono alle aziende di raggiungere obiettivi più ambiziosi in termini di equità di genere e responsabilità sociale d'impresa.

7. Conclusioni

La riduzione del divario di genere, specialmente nel mondo del lavoro, rappresenta un obiettivo cruciale che deve essere perseguito, promosso e garantito su numerosi fronti e da molteplici attori, con un ruolo particolarmente significativo attribuito alle aziende. Queste ultime, infatti, rivestono una funzione determinante nel processo di realizzazione.

L'analisi condotta ha dimostrato come la Certificazione di genere e gli standard di rendicontazione di sostenibilità rappresentino strumenti complementari, in grado di rafforzare l'impegno delle aziende nella promozione della parità di genere e nella costruzione di una rendicontazione trasparente e credibile. La Certificazione di genere, attraverso la definizione di criteri operativi e indicatori di performance chiari, offre alle aziende un modello strutturato per l'integrazione delle politiche di equità di genere. Allo stesso tempo, gli standard internazionali come il GRI e gli ESRS richiedono la rendicontazione dettagliata di pratiche e risultati in materia di diversità e inclusione, aumentando la trasparenza e l'affidabilità delle informazioni fornite agli stakeholder (Monteiro et al., 2024).

L'integrazione tra questi due strumenti non è solo una strategia di conformità normativa, ma si configura come un'opportunità per le aziende di migliorare il proprio posizionamento competitivo, rafforzare la propria reputazione e attrarre investimenti sostenibili. La presenza di politiche di parità di genere ben strutturate si traduce in una maggiore credibilità aziendale, in un miglioramento della fiducia degli stakeholder e in un incremento della performance economica e sociale delle organizzazioni. L'allineamento tra Certificazione di genere e standard di rendicontazione di sostenibilità si pone quindi come un elemento chiave per le aziende che desiderano sviluppare una strategia di sostenibilità efficace e integrata.

Sul piano delle prospettive future, si prevede una progressiva armonizzazione tra i diversi standard di rendicontazione di sostenibilità e una crescente convergenza con le diverse certificazioni in materia sociale, ambientale e di governance. Le nuove direttive europee, come la CSRD, spingono sempre più le aziende a fornire informazioni dettagliate sulle proprie pratiche di diversità e inclusione, rendendo necessario un maggiore allineamento tra certificazioni e gli obblighi di disclosure.

In conclusione, la Certificazione di genere e gli standard di rendicontazione di sostenibilità si configurano come strumenti sinergici e strategici per la promozione della parità di genere nel mondo del lavoro. Il loro utilizzo combinato consentirà alle aziende di rispondere in modo più efficace alle richieste di trasparenza, accountability e sostenibilità, contribuendo a una crescita inclusiva e responsabile.

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Track 14
Tourism & Culture Management

Exploring the cultural heritage dimension of the country image: A textual analysis of web narratives across twenty-four countries[1]

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Abstract

Frame of the research. *This study examines how nations with rich cultural resources structure their institutional communication to enhance the understanding of cultural heritage's role within the promotion of country image.*

Purpose of the paper. *The study investigates the role of cultural heritage within the general framework of country image and proposes an explorative categorization of the constitutive dimensions of the "cultural heritage image".*

Methodology. *The empirical research is based on a lexical analysis of the institutional web communication of twenty-four countries ranked in the Anholt-Ipsos Nation Brand Index 2023 (Ipsos, 2023).*

Results. *The textual analysis enabled the analytical identification of the constituent aspects of the cultural heritage image, revealing a network of nodes centered on three macro-dimensions (Tangible cultural heritage, intangible cultural heritage and national identity), and 13 major conceptual categories (i.e., historic sites, cultural institutions, natural environment, craftmanship, visual arts, performing arts, literature, language, gastronomy, traditions, sports, people, diversity, equity and inclusion).*

Research limitations. *The main limit of the study is related to the size and variety of the selected documents.*

Managerial implications. *The study can support both policy makers and companies in the definition of international marketing strategies aiming to emphasize the role of cultural heritage in the perception of international audiences.*

Originality of the paper. *The study contributes to the international marketing literature by filling scientific gaps related to the categorization of the constituent components of cultural heritage image connected to the macro dimension of country image.*

Key words: *country image, cultural heritage, cultural heritage image, textual analysis, cross-country study.*

[1] Study carried out as part of the project ""Is old really gold?" International consumers' perceptions and attitudes towards Italian cultural heritage and long-lasting brands", PRIN 2022, ERC SH1 Sector, Project Code: 20227RMKFP, CUP MASTER I53D23002590006, CUP D53D23006220008 (UNINT), funded by the European Union – NextGenerationEU.

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1. Introduction

In recent years, a country's image and reputation have become increasingly significant in marketing literature, which aims to create models for analyzing and measuring various components of image, as well as in nation branding strategies designed to enhance the prominence and identity of national systems in global markets. An established reputation generates resources by the fact that it is difficult to be imitated by other contexts. Non-duplicability derives from the possession of unique resources that have been formed and consolidated over time. In these terms, the reputational component becomes a barrier to mobility, in so far as it allows the country to consolidate its position at the international level, facilitating the activation of relationships, partnerships and strategic alliances with the different publics that populate the broad reference context. Reputation has, therefore, a cognitive value and efficacy, and its goodness derives from the comparison between the country's behavior and performance, and its social and value identity. In this view, we can observe an active role of the cultural environment in the foreign policy and attractiveness of a nation. In fact, within the framework of globalization and cultural convergence, the authenticity of cultural heritage serves as a significant asset for establishing a unique identity and fostering a feeling of community, thereby influencing tourism and various economic sectors of the nation (Poor & Snowball, 2010). For example, in economics, there has been much discussion about how cultural heritage affects a country's prosperity (Rizzo & Throsby, 2006). This contribution is acknowledged as originating from both intangible components, such as habits, abilities, and practices like music, dance, theater, and cuisine, which are maintained and passed down through the generations, as well as from tangible cultural assets, such as monuments, heritage sites, buildings, and artwork (Unesco, 2003). Furthermore, tourism and management research has made the marketing and management of arts and heritage destinations a specific subdiscipline (Millar, 1989; Colbert & St-James, 2014). With respect to the international marketing literature, studies in this field have extensively explored the impact of country image on foreign consumers' perceptions and behaviors. Country image is broadly defined as "the sum total of all the descriptive, inferential, and informational beliefs that a person has about a particular country" (Martin & Eroglu, 1993: 193). This concept encompasses a collection of generalized perceptions about a nation's political maturity, economic progress, industrial development, as well as its traditions, culture, and population. However, although several definitions of country image consider cultural heritage as a constituent dimension of the construct, for example, Verlegh and Steenkamp (1999: 525) define country image as a set of "mental representations of a country's people, products, culture and national symbols", cultural heritage has received relatively little attention in the international marketing literature, despite expanding recognition in adjacent domains (Mainolfi *et al.*, 2024). The literature review reveals only recently two proposals to systematize the cultural component (Hakala *et al.*, 2011; Rojas-Mendez, 2013), which, however, appear to be elaborated with a predominantly inductive approach, unable to exhaust the theoretical domain of the construct. Based on these scientific gaps, the goal of this study is to develop a preliminary framework for comprehending the image of national cultural heritage, led by the international marketing perspective. The study aims at identifying the primary conceptual categories that may represent a tool to measure the cultural heritage image. The results of a lexical analysis of online communication around cultural heritage are then presented in the study. The primary goal of the study was to compare the content structure commonly employed in cultural heritage promotion to identify key themes that may shape the image of the cultural heritage of a nation.

2. The role of cultural heritage dimension in country image literature

The theoretical foundation of this study is rooted in a well-established body of literature, closely linked to the country-of-origin phenomenon. Extensive research in this field suggests that country image acts as an extrinsic cue that consumers rely on to evaluate foreign-produced goods (Eroglu &

Machleit, 1989; Papadopoulos *et al.*, 2018). Within this broad domain, numerous studies have aimed to identify the key factors that contribute to the formation of country image (Han, 1989; Martin & Eroglu, 1993; Parameswaran & Pisharodi, 1994). Initially, this concept was primarily defined through cognitive elements, reflecting rational beliefs about various national attributes. However, more recent scholarship has confirmed the multidimensional nature of country image, incorporating an affective dimension - capturing the emotional associations with a country - and a conative dimension, which represents the willingness to engage with it (D'Astous & Ahmed, 1999; Laroche *et al.*, 2005). Within this cognitive-affective framework, several general definitions of country image have integrated aspects of a nation's cultural heritage. For example, Bannister and Sanders (1978, p. 152) defined country image as "the generalized image created by such variables as representative products, economic and political maturity, historical events and relationships, traditions, industrialization, and degree of technological virtuosity." Similarly, Allred *et al.* (1999, p. 36) also pointed out that "the perception of a country is based on its economic condition, political structure, culture, conflicts with other countries, working conditions, and position toward environmental issues."

Although some scholars seem to recognize a broader role for culture as a distinctive component of a nation's competitive identity, as "the cultural aspect of the national image is irreplaceable and irreproducible because it is uniquely tied to the country itself; it is reassuring because it links the country's past with its present, (...); and it is uplifting because it shows the spiritual and intellectual qualities of the country's people and institutions" (Anholt, 2007, p. 133), studies have limited the interpretation of the cultural heritage image to a simple evaluation of some population traits (Verlegh, 2001; Van Ittersum *et al.*, 2003) or to a specific attribute of tourism destination image related to the endowment of cultural attractions and sites (Gallarza *et al.*, 2002). Only relatively few studies have sought to operationalize the cultural heritage aspect within the broader country image construct (Hakala *et al.*, 2011; Rojas-Méndez, 2013; Buhmann, 2016; Buhmann & Ingenhoff, 2015). A literature review (see tab. 1) on country image reveals only recently two proposals for systematizing the cultural component, but these are elaborated with a predominantly inductive approach and do not appear able to exhaust the theoretical domain of such an extremely complex construct. The first attempt is contained in a study by Hakala *et al.* (2011) in which it is acknowledged that "studies on national cultural heritage are scarce" (Hakala et al, 2011, p. 448) and a measurement system is proposed based on two dimensions: homogeneity (homogeneity), understood as the degree of dominance of a single language and religion, and endurance (endurance), measured through the number of Unesco awards obtained by a given country. The second is reported in a more recent study by Rojas-Mèndez (2013), in which the author, using the free elicited response technique with respect to perceptions referred to 26 different nations, associates the culture and heritage dimension with a wide range of attributes (monuments, traditions, historical figures, gastronomy, religion, education, sports and colors), limiting himself, however, to a simple listing devoid of attempts at systematization and operationalization. An additional contribution is provided by Jung *et al.* (2014), who include a "cultural assets" dimension within their country image framework. Nevertheless, the study does not present a fully developed measurement scale, as the items related to cultural assets are adapted from previous literature and mainly serve to assess the influence of cultural perceptions on brand evaluation, rather than to comprehensively operationalize the cultural dimension of country image. In 2016 Buhmann proposed a comprehensive model for measuring country image, identifying four key dimensions: functional, normative, aesthetic and emotional. The aesthetic dimension involves beliefs regarding a country cultural and natural attractiveness and including opinions about the beauty of the natural environment, the appeal of national culture and the richness of its traditions. However, some limitations prevent its generalizability and usability. The author does not clarify how the items submitted to the measurement scale validation process were obtained. Moreover, the model was tested using students' samples from specific countries, such as Switzerland, thus compromising the model's cross-national validity.

Coming out of the more purely academic sphere, a further proposal for measuring the role of cultural heritage in the perceived image of a nation is that contained in the Anholt-Ipsos Nations

Brand Index (Ipsos, 2023), which places the heritage and culture dimension among the pillars underlying the recognition and strength of a nation's brand. However, the limited variety of dimensions used, linked mainly to the endowment of tangible cultural resources - natural beauty, monumental attractions, history and art - does not seem able to represent the complex nature of a nation's cultural identity and sense of place, understood as "the ways of living developed by a community and passed on from generation to generation, including customs, practices, places, objects, artistic expressions and values" (Icomos, 2002, p. 21).

Tab. 1: Main operationalizations of the country image construct

Dimensions	Operationalisations	Contributions
Cognitive country image	*People facets* (e.g., friendly and likable; artist and creative; well-educated; hard working)	Parameswaran *et al.* (1987); Parameswaran & Pisharodi (1994); Papadopoulos *et al.* (2000)
	Economy (e.g., raised standard of living; quality of products; economic environment; level of industrialisation)	Marting & Eroglu (1993); Parameswaran & Pisharodi (1994); Pappu *et al.* (2007)
	Technology (e.g., technical skills, technological research)	Martin & Eroglu (1993)
	Politics (e.g., political stability, participation in international affairs)	Heslop *et al.* (2010); Knight *et al.* (2003)
	Climate (e.g., human, nature and climate factor)	Van Ittersum *et al.* (2003)
	Social context (e.g., individual rights and freedom, alignment with own country)	Heslop *et al.* (2010); Passow *et al.* (2005)
	Cultural assets (e.g., This country possesses its own cultures that are differentiated from those of other countries, this country has affluent cultural assets, this country has cultural symbols which represent this country)	Jung *et al.* (2014)
	Culture heritage (e.g., homogeneity and endurance; national culture, gastronomy, sports, history, attractions, traditions, colours, religion)	Buhmann & Ingenhoff (2015); Rojas-Mendez (2013); Hakala *et al.* (2011)
	Aesthetic dimension (e.g., cultural goods, culinary, history and tradition, landscape and scenery)	Buhmann (2016); Buhmann & Ingenhoff (2015)
	Sustainability (e.g., environmental pollution controls)	García-de-Frutos & Ortega-Egea (2015); Heslop *et al.* (2010); Passow *et al.* (2005)
Affective country image	*Positive and negative country affect* (e.g., positive feelings, pleasant feelings, enthusiastic feelings, distrustful, irritated, hostile)	Aydin *et al.* (2021); Harmerling *et al.*, (2015); Verlegh (2001); Brijs (2006)
	Intergroup affect and stereotype (BIAS) (e.g., contempt and admiration)	Maher & Carter (2011)
	Emotional dimension (e.g., country fascination, sympathy, attractiveness)	Buhmann & Ingenhoff (2015)

Source: Adapted from Mainolfi *et al.* (2024).

3. Revealing the cultural heritage dimension of country image: a web-based textual analysis of the communication of twenty-four countries

In order to contribute to a correct interpretation of the role of cultural heritage within the theoretical domain of country image (cultural heritage image), and at the same time to highlight the thematic structure of institutional communication adopted by nations characterized by a high endowment of cultural resources, in this study a textual analysis was conducted on the institutional web-based cultural heritage communication as chosen by twenty-four prominent nations. The inductive approach was chosen because of the widespread use of contemporary communication systems, which reveal the quirks and signaling components of a country's cultural heritage, albeit with wildly disparate modalities and results (Napolitano *et al.*, 2015; Marino & Mainolfi, 2013). From a methodological point of view, the study was developed through three main phases: data collection, analysis and interpretation of results.

3.1 Sample and data collection

Twenty-four nations that were ranked in the Anholt-Ipsos Nations Brand Index 2023 (Ipsos, 2023), one of the most widely used metrics for evaluating the power of a national brand, were the subject of the textual analysis. The selection of countries was made by first including the top ten countries according to the Nation Brand Index (Ipsos, 2023) and then adding countries, one after the other, so that each continent was represented by at least three countries. Consequently, the sample is composed as follows: Europe (France, Italy, Germany, Sweden, Switzerland, United Kingdom), Africa (Egypt,

Morocco, South Africa), Asia (China, Japan, South Korea), Middle East (Israel, Qatar, UAE), North America (Canada, Mexico, USA), Oceania (Australia, New Zealand, Vanuatu[6]), South America (Argentina, Brazil, Peru).

In the first stage, the units of analysis were identified by consulting documents published on the official websites of the national bodies responsible for managing and promoting the cultural heritage of twenty-four prominent countries. These documentary units became the "data" for the research. Although they may contain incomplete information due to the formal nature of their representation, they nonetheless serve as an invaluable source of knowledge about the phenomenon under investigation. As mentioned, this study prioritized data collection from websites, which primarily facilitate asynchronous, static communication, designed to be publicly accessible with limited opportunities for interaction. Websites were chosen over other communication channels due to their ability to present multimedia narratives, timelines, and historicized representations of a nation's heritage (Cerquetti & Romagnoli, 2023). The primary focus of this phase was analyzing the websites of the Ministries of Culture, Tourism, and Cultural Heritage. Given the diversity of governance structures across countries, the analysis was also extended to the websites of Ministries of Foreign Affairs, which, in many cases, host sections dedicated to promoting the cultural sector. Additionally, in cases where a specific ministry was absent, the presence of government departments responsible for cultural protection and promotion was verified. Following this approach, the analysis also included communication documents related to institutional experiences of country branding.

From a procedural perspective, within each analyzed website, texts used to describe or narrate the characteristics and distinctive qualities of cultural heritage were selected. To enable comparison of the syntax adopted by different countries, only texts written in English were selected and downloaded. The initial keywords that guided the selection of texts were: "cultural heritage," "heritage," "culture," "traditions," and "history." However, given the exploratory nature of the study, the selection criteria were refined and validated throughout the research process, incorporating additional keywords such as "cultural identity," "people," and "community". In line with the objectives of the study, technical texts describing the architectural, historical, and artistic value of cultural assets and activities were excluded. Instead, priority was given to the role that cultural assets play within the system of values and symbols of the national community. Following this approach, the scope of the data collection process was rigorously defined and limited.

3.2 Corpus analysis

The selected texts were analyzed using NVivo 11 software, which facilitated data segmentation and archiving. The textual analysis was conducted in three iterative phases (Bolasco, 2005; Carley, 1993). The first phase involved data pre-processing through text normalization. Textual forms were identified, counted, and subsequently standardized to account for orthographic variations, such as the uniform spelling of names, acronyms, and abbreviations. This was followed by an evaluation of the vocabulary, comprising about 10,000 word-types and a total of about 95,450 word-tokens. This procedure was instrumental in selecting a set of significant words (theme words) to facilitate content interpretation. The general vocabulary was then refined by removing "empty" words (stop words), which are non-significant for the analysis as they serve only instrumental or grammatical functions (e.g., conjunctions, prepositions, adverbs) (Riviezzo *et al.*, 2014). Subsequently, the data were decomposed through an open coding process guided by the identification of the most frequently occurring words. As expected, the most frequent word-types included "culture" (1,261 occurrences), "heritage" (957 occurrences), and "arts" (781 occurrences). Other notable word-types included "nation" (751 occurrences), "works" (484 occurrences), "people" (412 occurrences), "museums" (393 occurrences), "tourism" (382 occurrences), "community" (355 occurrences), "design" (300

[6] For Oceania, since there were not three countries (the NBI has only 50 positions, so it does not rank all countries), the country with the highest number of tangible and intangible UNESCO sites was chosen, so in addition to Australia and New Zealand, Vanuatu was added.

occurrences), “historic” (315 occurrences), and “traditions” (222 occurrences). The word cloud generated through textual analysis provides a clear and effective visual representation of the most recurrent terms in communications related to cultural heritage (Figure 1).

Fig. 1: The word cloud

Source: Authors’ elaboration.

Among the frequently occurring word types not previously highlighted, the terms “creative,” “artists,” and “films” are also noteworthy. This finding underscores the significance of artistic expressions and the creative industries in cultural heritage, reflecting the vital role of artists, film productions, and musical performances in shaping cultural identity and enriching the socio-cultural fabric of communities. Table 2 presents the ten most frequently occurring words in the institutional communication documents of various countries, revealing key trends and differences in how cultural heritage is leveraged and promoted. As can be seen from this partial analysis, several countries, including Canada, France, Germany, UK, South Korea and Italy, demonstrate a strong emphasis on “heritage” and “cultural”, reflecting a shared commitment to preserving and promoting both tangible and intangible cultural heritage. Moreover, the words “arts” and “culture” are present in countries such as Japan, the United Kingdom, the USA and Australia, underscoring a universal commitment to promoting the arts as an integral part of national identity and international dialogue.

As expected, reference to tourism is a cross-country theme, and this is evident from the presence of the words such as “tourism” (France, Italy, Canada, USA, Japan, South Africa, New Zealand), “tourist” (Mexico), “visitors” (New Zealand) and “destination” (Brazil). This trend aligns with a broader global movement toward valuing cultural heritage as a fundamental component of national branding and tourism appeal. Countries like Sweden, Switzerland, Egypt, Israel highlight the presence of the word “museum”, showing a focus on places deputed to the enjoyment of cultural assets. Noteworthy is the term “people” present in 7 countries (UK, Canada, USA, Brazil, China, South Korea, South Africa) to denote the relevance of the population, seen not only as the creator but also the beneficiary of the actions and projects aimed at enhancing the nation’s cultural capital. Australia and Canada stand out for the use of terms like “aboriginal” and “indigenous” and show a commitment to educating and preserving indigenous stories and cultures. Moreover, in the case of Canada the copresence of words like “reconciliation” and “people” also highlight a specific effort to recognize and respect indigenous communities. Thanks to the multicultural structure of these countries, this result confirms the social value of culture and creative industries (intangible cultural

heritage) in contributing to social cohesion. South American countries, like Mexico and Peru, demonstrate a special emphasis on culinary traditions.

3.3 Content analysis

In order to bring out the broader thematic structure underlying the different conceptual categories related to the cultural heritage theme, for each country, the selected texts were coded and an analysis of the words and phrases adjacent to the theme words (high-frequency words) was carried out. The analysis of the texts made it possible to analytically identify the constituent elements of the cultural heritage image, revealing a system of nodes centered on 13 conceptual categories from which it was possible to trace 54 sub-categories, linking coded phrases and paragraphs and representing the main themes of the corpus. The conceptual sub-categories represent a decomposition of the text into homogeneous parts characterized by similarity of subject matter. In-depth analysis of these sub-nodes enabled the definition of the metatext, synthesizing the original text into meaningful segments that to varying degrees are found in different countries (Table 3). Through a process of abstraction, from the analysis of the subcategories, the main categories were defined. The categories include the characteristic elements of the bidimensional perspective normally associated with the cultural heritage concept. However, results show a move beyond the dyadic nature of the concept to embrace a three-dimensional one in which there is also an emphasis on aspects more closely related to the population and the national identity. Therefore, these dimensions include tangible cultural heritage, intangible cultural heritage, and national identity, highlighting the deep interconnection between cultural elements and the collective identity of a nation.

Tab. 2: The 10 most frequent words by country

Europe	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
France	Heritage	Culture	Cultural	National	Ministry	Tourism	Public	Architecture	Monuments	Directorate
Germany	Foundation	Cultural	Heritage	World	Unesco	Intangible	Sites	Convention	Inscribed	International
Italy	Historical	Tourism	Heritage	Cultural	National	Law	Places	Activities	Artistic	Assets
Sweden	Castle	Language	Palace	Jewish	Museum	Arts	Culture	Government	Force	Century
Switzerland	Art	Film	Works	Museum	Dance	World	Include	Theatre	International	Design
UK	Heritage	Historic	Creative	National	People	Places	Local	Culture	Future	Support
North America										
Canada	Indigenous	Heritage	Tourism	Parks	Industry	Reconciliation	Work	Partners	People	Council
Mexico	City	State	Cultural	Cuisine	Culture	World	Natural	Tourist	Towns	One
USA	Arts	Cultural	Tourism	National	Travel	Communities	People	Strategy	Support	Organizations
South America										
Argentine	City	One	Country	Shows	South	World	Cultural	Culture	Football	History
Brazil	Country	People	World	Brand	Home	Nature	New	Cultural	Destinations	History
Peru	World	Grow	Latin	Sector	First	Economy	Gastronomy	Picchu	Country	Inca
Asia										
China	People	Day	Festival	Groups	National	Republic	Years	Area	Ethnic	One
Japan	Cultural	Properties	Arts	Culture	Travel	International	Information	Tourism	National	Local
South Korea	Heritage	Cultural	National	People	Designated	KHS*	Music	Country	Sea	Historic
Africa										
Egypt	World	Cairo	Seas	Museum	Desert	City	Temple	Prorectorate	Waters	Nature
Morocco	Culture	Heritage	City	Modern	Nature	Districts	Marrakech	Lively	Medina	Traditions
South Africa	Heritage	National	Cultural	Act	Resources	Tourism	Nation	People	Brand	Culture
Middle East										
Israel	Museum	Jewish	Center	First	Land	State	Water	Archaelogical	City	Historic
Qatar	Culture	Author	Ministry	Palestine	Design	Century	Gulf	Heritage	World	Cultural
UAE	Art	Arab	Culture	World	Intangible	Public	Centre	Countries	Traditions	Human
Oceania										
Australia	Aboriginal	Arts	Capital	New	Indigenous	Cultural	Islander	First	Government	Music
New Zealand	Heritage	Tourism	Wāhi	Visitors	Māori	Tapu	Cultural	Historic	International	Culture
Vanuatu	Local	Events	Islands	Markets	Music	Mata	Drawings	Sand	Chief	Arts

Notes: * KHS (Korea Heritage Services).

Source: Authors' elaboration.

Specifically, with reference to the tangible aspects, we find that historic sites, natural environment and cultural institutions define the tangible presence of the cultural heritage. Alongside natural resources and historical sites, cultural institutions hold immense importance. The former are considered tangible expressions of the country's historic, artistic and natural heritage, while the latter are indispensable venues for transmitting the country's history to future generations. This distinction aligns with the dynamic view of cultural heritage, wherein the creation and vitality of cultural assets are increasingly important, alongside their safeguarding and transmission. Moreover, cultural institutions often serve a dual role: not only do they facilitate access to and enjoyment of cultural assets, but, when they possess significant history and longevity, they themselves become cultural-historical landmarks. And we refer specifically to museums, which in fact appear to be the most relevant textual category.

An eloquent example from Japan's communication highlights this: "As core institutions involved in the preservation and transmission of history and traditional culture, each museum collects objects according to its own individual collection policy to ensure that its collection is systematically and historically balanced".

In terms of tangible elements, some countries highlight the significance of landscapes and natural scenery, recognizing them not only as essential components of tourist destination image but also as vital factors enhancing the quality of life within the natural and historical environment. With respect to the intangible macro-dimension, the conceptual framework surrounding the intangible aspects of cultural heritage is considerably more complex in line with the recent approach of the "living heritage" proposed by several scholars (Lenzerini, 2011; Poulios, 2014), which underscores the importance of intangible assets for the survival and transmission of a community's distinctive traditions, skills, and qualities. The key innovation in defining heritage does not stem from distinguishing between tangible and intangible categories but rather from a gradual shift in perspective, from viewing cultural expressions as static objects to understanding them as dynamic cultural processes (Bortolotto, 2006). Categories four to eleven can be associated with the intangible cultural heritage, namely: craftsmanship, visual arts and audio-visuals, performing arts, literature, language, gastronomy, traditions, sports. The first category is craftsmanship. Surprisingly, this dimension doesn't show a relevant presence within the corpus. However, references highlight that craft techniques are seen as valuable qualities that signal the work and creativity of the local community. Next two categories are related to creative industries, namely visual arts and audio-visuals, and performing arts. The first category includes a diverse array of artistic expressions, ranging from sculptures and paintings, enduring testaments to artistic history, to contemporary films and video productions, which convey narratives across time and space, preserving cultural identity in universally accessible formats beyond linguistic and geographical boundaries. Among its subcategories, architecture and design, as well as film heritage and production, receive the highest number of references, underscoring their significant role in shaping a nation's cultural identity.

The second category, performing arts, holds a crucial place in a country's cultural communication, as its evocative and persuasive nature offers a unique gateway to understanding and experiencing national identity. Music, dance and theater are the main artistic expressions that emerged from the analysis and appear to be fundamental as they are deeply connected to the country's cultural identity by being able to pass on its stories and values. This is clearly demonstrated in the descriptions provided by some countries, such as Australia, which emphasizes: "Artistic expression, whether painting, dance, song or story, is integrally connected to cultural knowledge and relationships with a person's country, be it land or sea". The seventh category is "literature". Poetry and other literary works seem to be another pertinent conceptual category that can explain the "true essence" of the national identity that has to be communicated internationally. Furthermore, nations that place a strong emphasis on national literature in their communications offer comprehensive details on the most well-known poets and authors, demonstrating a sense of pride in their country's literary achievements and authors.

The linguistic component is closely related to the literature dimension. Language is the eighth category. Some nations appear to respect their native languages more than others, either because of their universal appeal, extensive use abroad, or long-term preservation. It's interesting to note that Sweden and Australia likewise place a strong emphasis on the existence of linguistic diversity and language communities, as well as the protection that follows. Gastronomy represents the ninth category. Remarkably, the corpus does not demonstrate how important this theme is to cultural transmission. However, Latin American countries are those that emphasize the role of local gastronomy also as a driver of tourism development, for example: "The Peruvian gastronomy is divided in zones or regions, each with typical gastronomy, becoming in a special gastronomic destination" (Peru). "Traditions" is the tenth conceptual category. Folklore (festivals, celebrations) is identified as a recurrent theme in the analysis. These events are seen as a valued cultural expression of local communities to the extent that they have become a distinguishing emblem. The last category of the intangible cultural heritage is "sport". Sports activities are associated with the development of the country as a tourist destination and also with the discovery of the country's natural and scenic heritage, for example: "Our wide range of sporting events will keep everyone entertained with adrenaline pumping action from marathons and round island relays to open water swims, rowing competitions" (Vanuatu). In some cases, then, the nation promotes sports to support social cohesion especially for the younger generation, for example: "To provide an enabling environment for the sport, arts and culture sector to foster an active, creative, winning and socially cohesive nation" (South Africa). Finally, the last two categories, "People" and "Diversity, equity & inclusion", refer to the essence of the country in terms of local communities, diversity and equity. Regarding the first aspect, countries seem to leverage on population traits to emphasize the national identity of the country and to let emerge the warm and friendly nature of its citizens. Specifically, these aspects are judged crucial when presenting the tourist vocation of the country. For example, the Egypt communication states: "Friendliness and smiles are infectious in Siwa, Egypt's most remote desert oasis". At the same time, this category is used and promoted to signal the vital bond between cultural heritage and local communities from two perspective. On the one hand, the population is considered the living part of cultural heritage, the actual creator; on the other hand, nations are committed to ensuring that cultural heritage is accessible and usable in various forms to the population as the lifeblood of progress and development. As a result, the communication style becomes more emotive and adopts national storytelling methods through which the nation presents itself, therefore highlighting its real identity and hoping to transmit it outside free from distortions. This aspect is also connected to the next conceptual category: diversity, equity, and inclusion. Diversity promotes the fusion of traditions, languages, and artistic practices, enriching a nation's cultural heritage and making it more dynamic and representative of a wide range of experiences. Countries recognize the value of the diversity that characterizes them - whether linguistic, demographic, or cultural - and the need to protect and enhance it.

The meeting of diverse perspectives stimulates innovation in areas such as art, literature, and music, giving rise to new cultural expressions and fostering social progress. For example, Canada's communication states: "We believe that Canada's diversity, its greatest asset, is also, what touches travellers' hearts most deeply. To that end, we are committed to inclusive leadership within our workforce, workplace, and interactions with partners and travellers alike". Inclusion, instead, allows the histories and experiences of all communities to be recognized and valued, preventing the marginalization of minority groups and ensuring a more complete and true-to-life historical narrative. An inclusive society fosters mutual respect and cohesion among diverse groups, promoting a sense of common belonging that enhances the stability and well-being of the nation. Inclusion ensures that everyone could contribute to the national culture, overcoming discrimination and barriers that might limit talent and participation. A country, that values diversity and inclusion, presents itself as a strong cultural player on the international stage, fostering intercultural dialogue and improving its image in the world.

Tab. 3: Conceptual categories and sub-categories of the cultural heritage image communicated by the countries

Cultural heritage macro-dimensions	Conceptual categories	Sub-conceptual categories	No. of countries	No. of references	Main references
Tangible cultural heritage	(1) Historic sites	Monuments	11	75	It contributes to the policy of safeguarding and enhancing monuments and sites likely to be listed or already classified as Historic Monuments for their historical, aesthetic or cultural interest (France). The Government of Canada's objective is to preserve its built heritage Federal built heritage comprises the places, buildings and monuments that have been recognized as having heritage value.
		Historic buildings	6	18	English Heritage cares for over 400 historic buildings, monuments and sites - from world-famous prehistoric sites to grand medieval castles, from Roman forts on the edges of the empire to a Cold War bunker (UK).
		Historic sites	7	21	We protect an internationally important collection of historic sites and artefacts which span six millennia, from the ancient past to the present day and include palaces, houses, hill figures, castles, abbeys, industrial sites, Roman forts and even deserted medieval villages (UK). National historic sites have a separate designation process under the Historic Sites and Monuments Act (Canada).
		Churches and religious buildings	6	105	Stories are wrapped up in a building; its use, adaptation, and renewal of sacred spaces over centuries of social, economic and cultural change make historic churches exciting places to visit (UK). The palace is a piece of art in itself – and so too is its resident place of worship, the Royal Chapel (Sweden). The widening of the definition of heritage towards key achievements of the twentieth century (industrial heritage, works of art, housing, public and religious buildings, tourist and sports facilities) (France).
	(2) Cultural institutions	Museums	19	323	There is virtually no other country on earth with as many museums per head of the population as Switzerland (Switzerland). The program increases access to arts and cultural experiences for audiences outside major cities and encourages partnerships between museums and galleries across the collections sector (Australia). As core institutions involved in the preservation and transmission of history and traditional culture, each museum collects objects according to its own individual collection policy to ensure that its collection is systematically and historically balanced (Japan).
		Collections	12	169	Switzerland is a country of collectors. A major part in the art market has long been played by the great industrial families, some of whom assembled important collections. Examples include the collections of Oskar Reinhart in Winterthur and Emmanuel Hoffmann in Basel (Switzerland). St Catherine Monastery in Sinai is Home to the famous "burning bush" and some of the most renowned collections of religious documents and icons in the world (Egypt).
		Archives	11	45	The Directorate-General for Heritage and Architecture defines, coordinates and evaluates the State's action in the conservation, communication and enhancement of public archives (France).
		Libraries	14	59	The Swedish Arts Council is a government agency founded in 1974. We support arts and culture in many different forms – literature, museums, libraries, performing arts, music, reading promotion, arts, culture in schools, crafts etc (Sweden).
		Art galleries	9	56	We also strive to exchange information with and provide specialist/technical guidance and advice to other museums and galleries within Japan and overseas (Japan). There are also numerous galleries and auctions as well as international and regional fairs to delight the hearts of art enthusiasts from all over the world (Switzerland)
		Exhibitions	12	110	The latest round of the Visions of Australia program is now open with up to $1 million in funding available to assist quality exhibitions tour the country (Australia).
	(3) Natural environment	National parks and gardens	17	249	Our main activity is to take care of the special places that we have received as donations, inheritances or that have been granted to us in management: woods and coasts, parks and gardens, castles and historical residences, villas and abbeys, but also small assets with a high identity value such as a historical shrine or the old barber's shop in the city (Italy). With a multitude of gardens and parks throughout the emirates, it is sure to have something for everyone (UAE)
		Landscapes	18	112	This dynamic has been driven by European visitors, the first to return to France, to discover or rediscover its art of living, its culture, its many landscapes but also a renewed offer, responding to their growing aspirations in terms of sustainable tourism (France).
		Sea and coasts	16	160	Tourism Australia acknowledges the Traditional Aboriginal and Torres Strait Islander Owners of the land, sea and waters of the Australian continent, and recognises their custodianship of culture and Country for over 60,000 years (Australia).
		Lakes	10	58	Views from the top include the nearby lakes and dunes, and it's also a great place to spot some rare eagles or falcons (Egypt). This heritage includes large numbers of coastal fish traps, submerged prehistoric landscapes, rock paintings, and archaeology associated with inland waters such as lakes and rivers (South Africa).
		Ecosystems and biodiversity	8	30	The knowledge generated by scientists and supporting staff within the division and in collaboration with external associates informs park management and promotes the conservation of biodiversity, landscapes and associated heritage assets (South Africa).
Intangible cultural heritage	(4) Craftmanship	Artisans	2	3	The Local Festivals component provides funding to local groups for recurring festivals that present the work of local artists, local artisans, local heritage performers, and local cultural carriers (Canada).
		Craft techniques	1	2	In Japan, "Intangible Cultural Properties" refers to stage arts, music, craft techniques, and other intangible cultural assets that possess high historic or artistic value for the country (Japan).
		Handicrafts	2	4	Endeavouring to inspire professionals and enthusiasts in arts, literature and music locally and internationally, we also work to preserve traditional artistic practices and handicrafts (UAE).
	(5) Visual arts and audio-visuals	Sculptures	9	29	There are two stone galleries to explore within the exhibition hall. The sculptures and busts are displayed in the exact same spots they were placed in the 1790s. Each sculpture is a thing of beauty, but Endymion – created by the artist of the same name – is considered the standout piece (Sweden).
		Drawings	7	25	The museum in Berne therefore has the world's largest and most important collection of paintings, water-colours and drawings by this artist, whose works can be assigned to many movements: expressionism, constructivism, cubism, primitivism and even surrealism (Switzerland).
		Paintings	11	35	Many of the paintings, including centuries-old portraits of kings and queens, hang in the gallery within the beautiful Bernadotte Apartments (Sweden).
		Architecture and design	10	185	America's historic sites are irreplaceable. From icons of architecture to birthplaces of activists, historic sites are physical reminders of the diversity of our experiences and the history we share (USA).
		Photography	11	91	ENIT's Historical Archive relates to the activities of the Italian National Tourism Board from 1919 – the year of its foundation – to the present day and consists of about 4,000 ML documents and over 200,000 images including slides, photographs, negatives, videos and historical poster (Italy).
		Architects	7	62	From the early 20th century onwards, this country has produced several daring and visionary architects who have achieved global renown (Switzerland).
		Film heritage and production	12	165	The Swiss film scene is flourishing as never before: measured by market share and cinema tickets bought, 2013 was the most successful year for the Swiss cinema since 2006, the year when "Late Bloomers" was such a hit (Switzerland). Australia is a popular and world-class destination for filmmaking because of our lifestyle and spectacular and diverse locations (Australia).
	(6) Performing arts	Music	15	172	Switzerland is brimming over with music, with the largest number of music festivals by area of any European country – and the dance scene is equally impressive (Switzerland). Music surrounds our islands like the ocean celebrating a fantastic range of outdoor music concerts happening every year from January to December (Vanuatu).
		Performances	13	48	U.S. department of arts and culture contributes to the strength and vibrancy of the movement for collective liberation by resourcing and mobilizing cultural organizers and artists. We do this through political education, connecting cultural organizers and movement, policy engagement and play and performance (USA).
		Dance and ballet	13	142	Artistic expression, whether painting, dance, song or story, is integrally connected to cultural knowledge and relationships with a person's country, be it land or sea (Australia). Fishing, hunting and traditional lore are central to Torres Strait Island culture and are reflected through ceremony, song, dance and spirituality (South Africa).

		Concerts	**6**	**17**	The House of Electronic Arts focuses on the conservation, archiving and documentation of digital art. Its exhibitions, concerts, lectures, guided tours and workshops address an extensive public (Switzerland). concerts and festivals are held at heritage sites and on the grounds of historic houses - from Ragley Hall, Kenwood House and Audley End to Hampton Court and Windsor Great Park21(UK).
		Theatre	**12**	**106**	Furthermore, the National Theatre conducts training workshops and other activities to train the respective successors of traditional performing arts, such as Nohgaku, Bunraku (puppet theater), Kabuki, and traditional popular entertainment (Japan).
		Musicians and composers	**8**	**40**	Lyrics sung by Swiss pop musicians and rock bands are more often in English nowadays, otherwise no honours or money are to be had at international level (Switzerland).
	(7) Literature	Literature	**7**	**52**	Australian literature is vital to our cultural and intellectual life and communicating Australian stories (Australia).
		Writers	**7**	**38**	Max Frisch (1911–1991) is known as one of Switzerland's greatest writers (Switzerland).
		Poetry	**4**	**17**	We are a nation of dream-weavers; we make music, art, architecture, poetry, pottery and plays (UK).
		Poets	**4**	**19**	Snow-covered eucalypts, huts in mountain settings and mountain landscapes are distinctive Australian images captured by numerous artists and photographers. The mountain landscapes have inspired poets, writers, musicians and film makers (Australia).
	(8) Language	Language	**17**	**147**	The ILA supports First Nations Australians to express, conserve and maintain their cultures through languages and arts activities (Australia). Romansh literature has been in existence since the 16th century. This language is written in several dialect forms. Romansh is the fourth official national language of Switzerland (Switzerland).
		Dialect	**4**	**34**	Dialects, poems and stories that express the history of the Emirate (UAE). People in the German-speaking region of Switzerland speak various Alemannic dialects such as Baseldeutsch, Berndeutsch, Bündnerdeutsch, St.-Galler-Deutsch, Walliserdeutsch and Zürichdeutsch (Switzerland).
		Language diversity	**2**	**2**	The Act is also intended to protect the Swedish language and language diversity in Sweden, and the individual's access to language (Sweden).
		Language groups	**2**	**4**	The Torres Strait is divided into two language groups: Mirriam Mer is the dominant language in the eastern Torres Strait and originates from Papua New Guinean influence (Australia). This rich and dynamic graphic tradition has developed as a means of communication among the members of some 80 different language groups inhabiting the central and northern islands of Vanuatu (Vanuatu).
	(9) Gastronomy	Food products	**16**	**49**	Australia's success as a destination has been built on the combination of our world class natural beauty and unique wildlife as well as our welcoming people and exceptional food and wine (Australia)
		Local gastronomy	**4**	**11**	In major cultural expressions, in rhythms and dances, in gastronomy, in visual arts, in architecture, in religiosity and in the construction of our history, the historical influence of the black population is present throughout the country (Brazil). The Peruvian gastronomy is divided in zones or regions, each with typical gastronomy, becoming in a special gastronomic destination (Peru).
	(10) Traditions	Festivals	**14**	**128**	Our mission is to encourage people to discover the charm of Japanese culture while enjoying programs of cultural content, including art exhibitions, performing arts, and art festivals (Japan).
		Traditions	**16**	**50**	The unique culture and traditions shaped by the nature, climate, and people of Japan over centuries can be found in every corner of this island nation (Japan).
		Ceremonies	**9**	**24**	The diversity of these assets reflects the breadth of the Australian Government's interests in the National Capital and provides the setting for ceremonies, activities and events that Australians expect to occur in their capital (Australia). Today, hanbok is more often worn for special occasions than as casual clothes, such as wedding ceremonies, children's first birthdays, and seasonal holidays including the Lunar New Year's Day and Chuseok (South Korea).
	(11) Sport	Sport activities and events	**12**	**39**	State to support and coordinate their works it was responsible for setting terms and standards for the establishment of clubs, centers, committees and associations for youth and sports and issuing license for them (Qatar). To preserve and maintain this great posture, the government has through its Department of Sports, Arts and Culture, launched programmes to support its people within these creative sectors through their Annual Performance Plan (South Africa).
National identity	**(12) People**	Community	**17**	**301**	Values sit at the center and cultural organizers, community organizations and movements coalesce around participatory decision making, rigor and care (USA). It makes the Ministry of Culture a nurturing project committed to the challenges facing the country community by strengthening its national identity (Qatar).
		Friendliness	**4**	**8**	Friendliness and smiles are infectious in Siwa, Egypt's most remote desert oasis (Egypt). Enjoy every Moroccan product in a friendly atmosphere (Morocco).
		Opportunities	**15**	**117**	Together, the Arts Endowment's activities support bringing meaningful arts experiences to all Americans, helping to ensure that everyone in the country has the opportunity to live artful lives (USA). The Visions of Australia program promotes the National Cultural Policy, *Revive*, by providing opportunities for audiences across the country to engage with our vibrant arts and culture landscape (Australia).
		Identity	**7**	**132**	Our main activity is to take care of the special places that we have received as donations, inheritances or that have been granted to us in management: woods and coasts, parks and gardens, castles and historical residences, villas and abbeys, but also small assets with a high identity value such as a historical shrine or the old barber's shop in the city (Italy)
		Minorities	**3**	**11**	The Ministry of Culture in Sweden is responsible for issues regarding culture, media, democracy, human rights, minorities, national minorities including Sami culture and language (Sweden).
	(13) Diversity, equity and inclusion	Equity and inclusion	**2**	**39**	Our mandate from President Biden is clear: we must address the four intersecting challenges of COVID-19, economic recovery, racial equity and climate change. Read our priorities to learn how we will meet the scope of our challenges and the multiple, overlapping crises (USA).
		Diversity	**12**	**58**	The Bureau of Educational and Cultural Affairs (ECA) of the United States Department of State strives to embed diversity, equity, inclusion, and accessibility (DEIA) in all aspects of its work (USA)
		Sustainability	**10**	**22**	We have identified four major priorities going forwards - Inspiration, Conservation, Involvement and Financial Sustainability (UK). The Strategy also applies a holistic approach to tourism development, including incorporating sustainability- and community-based development and management strategies (USA).
		Disability	**2**	**17**	ECA is committed to addressing barriers based on race, ethnicity, colour, national origin, sex, age, disability, sexual orientation, gender identity or expression, religion, geographic location, education, income, socio-economic status, and other diversity dimensions, that may hinder inclusion in the organization (USA).

4. Discussion and conclusion

Over the past decades, the concept of cultural heritage has undergone a profound transformation, driven by the increasing engagement of academic disciplines that have traditionally maintained a peripheral interest in the subject. As previously noted, cultural heritage has experienced a notable semantic evolution, expanding beyond the classical notion of individual artistic "genius" to embrace a more inclusive framework that acknowledges the collective role of communities in defining, safeguarding, and promoting heritage. This democratization of cultural heritage has introduced new analytical dimensions, enriching its conceptual foundations with interdisciplinary insights and novel theoretical perspectives. More significantly, cultural heritage has transcended its conventional role as

a mere repository of historical and artistic value, evolving into a strategic asset that contributes to national identity formation, social cohesion, and economic development at both regional and global levels. However, despite the conceptual advancements in the study of cultural heritage, a persistent gap remains between the intricate system of meanings associated with a nation's cultural image and the institutional mechanisms through which these meanings are structured and disseminated. This disjunction is particularly evident in the field of international marketing and nation branding studies (Mainolfi *et al.*, 2024; Napolitano *et al.*, 2015). Although research on country image has generated a substantial body of literature over the past five decades (Papadopoulos *et al.*, 2018; Heslop *et al.*, 2010; Pappu *et al.*, 2007), it has largely overlooked a systematic analysis of cultural heritage's role in shaping perceptions of international audiences. This oversight is reflected both in the absence of conceptual models that explicitly integrate cultural heritage as a measurable construct and in the limited understanding of how a country's cultural image influences consumer attitudes and decision-making processes.

This study seeks to address this gap by bridging cultural heritage studies and the country image literature. It pursues a dual objective: first, to develop an initial conceptualization of the cultural heritage image as a theoretical domain, and second, to explore the role of cultural elements in the communication strategies employed by advanced nation branding systems. Given the exploratory nature of the research, a grounded methodological approach was adopted, allowing theoretical categories to emerge inductively from empirical analysis of secondary sources selected based on their relevance and originality.

The findings derived from the statistical-lexical analysis of institutional communication materials from twenty-four selected countries provide significant insights into both the diversity of cultural heritage components and the sophistication of communication strategies related to cultural variables. The empirical results confirm the relevance of the intangible components (Unesco, 2003) that incisively connote the discourses and narratives conveyed by countries in official communication. Most interesting is the variety and breadth of thematic cores that emerged ranging from arts to language, from craftsmanship to sports testifying to the multifaceted and fascinating complexity of the phenomenon.

Notably, national identity emerged as a third fundamental component, framed around the characteristics of a country's population and its cultural diversity - both of which are increasingly regarded as integral elements of heritage that warrant preservation and promotion. Across nearly all the countries analyzed, official communication regarding cultural heritage exhibits a complex and multidimensional narrative structure that extends beyond the mere enumeration of tangible cultural assets. The methodological framework adopted in this study facilitated the identification of thirteen key subcategories that underpin the cultural heritage image, encompassing historical-artistic sites, cultural institutions, natural environment, craftsmanship, visual arts and audio-visuals, performing arts, literature, language, gastronomy, traditions, sport, people, diversity, equity and inclusion.

These findings underscore the increasing integration of cultural heritage into national branding efforts and highlight the necessity for more nuanced theoretical and empirical frameworks to capture its impact on international perceptions. Specifically, the study contributes to an advancement of knowledge of the country image construct by delving into the role of cultural heritage in shaping the perceptions boasted toward a country. This result is extremely relevant as it systematizes the interpretive boundaries of the cultural heritage dimensions and draws a line of inquiry for the proposal of a measurement scale for the cultural heritage image.

5. Managerial implications and future research

From a managerial perspective, the use of cultural heritage as a strategic marketing lever is becoming increasingly relevant, especially for companies belonging to nations with a rich and globally recognized historical heritage. In particular, companies that embody national brands that are

considered "prototypical" can capitalize on the image of their country's cultural heritage to build a distinctive set of associations that uniquely connect national identity with local products (Anholt, 2002; Banerjee, 2008). A thorough understanding of the constituent dimensions of cultural heritage image also proves essential for policymakers who aim to increase their nation's international attractiveness and align promotional strategies with a unique repertoire of tangible and intangible associations. Prominent cultural emblems, such as the Eiffel Tower, Italian gastronomy, and Shakespeare's literary corpus, are not merely "cultural assets," but convey symbolic meanings that serve as conceptual aggregators for different categories of products and services, thus consolidating national branding strategies (Kavaratzis & Ashworth, 2015).

As for the contribution and originality of this research, it is, to the best of the authors' knowledge, one of the first studies to integrate the concept of cultural heritage in the context of international marketing, with the aim of identifying a conceptual framework suitable for representing the multiplicity of contents and images evoked by national cultural heritage. Given the limited attention given to this topic to date, the results obtained warrant a more in-depth analysis of the perceptual modes of cultural heritage image and the related enhancement strategies adopted by both public institutions and businesses (Moilanen & Rainisto, 2009). Future research could validate the conceptual categories identified in this study through the consumer perspective by developing a transnational measurement scale similar to those commonly used in country image studies. Such an approach would not only allow for a more rigorous comparison of cultural heritage images across different nations but also allow for a deeper understanding of the role it plays in foreign consumers' perceptions of national productions. The results of this survey would be particularly useful for companies and territories where the image of national cultural heritage, particularly in its intangible and identity components, is a strategic competitive advantage in international markets (Dinnie, 2015).

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Neutralità Carbonica, Sostenibilità e Climate Change nel Settore della Ristorazione: Uno Studio Supply-side in Sardegna[1]

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Abstract

Frame of the research. *Il settore della ristorazione e l'intera filiera alimentare contribuiscono in maniera significativa alle emissioni di gas serra, rendendo fondamentale l'adozione di strategie sostenibili per mitigarne l'impatto ambientale. In questo contesto, i ristoranti possono rivestire un ruolo decisivo nella transizione verso modelli più sostenibili, adottando pratiche quali l'uso di prodotti locali, l'ampliamento dell'offerta vegetariana e vegana e la riduzione degli sprechi alimentari.*

Purpose of the paper. *Adottando una prospettiva supply-side, lo studio si propone di analizzare le pratiche di sostenibilità implementate da un campione di ristoratori sardi e le principali criticità riscontrate nella loro applicazione.*

Methodology. *Lo studio adotta un exploratory sequential mixed method. Nella fase qualitativa iniziale, interviste in profondità con chef, manager e proprietari di ristoranti permettono di esplorare in modo dettagliato le strategie/pratiche sostenibili adottate e le criticità percepite. I risultati di questa fase, insieme alla letteratura esistente, sono utilizzati per costruire un questionario impiegato successivamente per condurre uno studio quantitativo su un campione di ristoratori sardi con l'obiettivo di generalizzare quanto più possibile i risultati emersi.*

Results. *L'analisi identifica le pratiche sostenibili più diffuse tra i ristoratori (tra cui la valorizzazione di prodotti locali e stagionali, la lotta contro lo spreco alimentare e l'offerta di piatti plant-based), nonché le principali barriere che ne ostacolano l'implementazione.*

Research limitations. *Lo studio si basa su un campione di convenienza circoscritto a un'area geografica specifica, limitando la generalizzabilità dei risultati. Inoltre, si focalizza sull'adozione di azioni e pratiche che riguardano aspetti strettamente riconducibili alla gestione della ristorazione in senso stretto.*

Managerial implications. *La ricerca fornisce raccomandazioni pratiche per i ristoratori, interessati a integrare modelli di gestione sostenibile, e per i policy maker, coinvolti nella promozione di politiche pubbliche e incentivi finalizzati a facilitare la transizione verso un sistema alimentare più responsabile, contribuendo così alla riduzione delle emissioni e alla mitigazione del cambiamento climatico.*

Originality of the paper. *Nonostante l'attenzione crescente verso la sostenibilità, la letteratura offre ancora limitate evidenze empiriche sulla diffusione di tali iniziative e sulle barriere che ne ostacolano l'implementazione, specialmente in contesti specifici come quello italiano e, più specificatamente, in Sardegna, una regione caratterizzata da peculiarità culturali e geografiche distintive.*

Keywords: *ristorazione; climate change; mixed-method design; sostenibilità; turismo*

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First author: Introduzione, Analisi qualitativa, Analisi quantitativa, Conclusioni
Second author: Literature Review, Metodologia, Analisi quantitativa, Conclusioni
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1. Introduzione

Nel corso del tempo, la concentrazione di gas serra nell'atmosfera, in particolare di CO2, ha generato (prima) e acuito (poi) il problema del cambiamento climatico e del riscaldamento della superficie terrestre. In questo contesto, l'attività di produzione, trasformazione e consumo alimentare è considerata una delle principali responsabili del cambiamento climatico. Studi recenti dimostrano come l'agricoltura, l'allevamento e gli attuali sistemi alimentari comportino un significativo consumo di risorse naturali, la degradazione del suolo e un impatto negativo sull'ambiente e sulla salute umana. Questi effetti sono principalmente dovuti alle elevate emissioni di gas serra generate da tali attività, stimate pari a circa un terzo delle emissioni globali, e al considerevole contributo allo spreco alimentare (Arrieta & González, 2018; Castañé & Antón, 2017; Zurek *et al.*, 2021).

Affinché l'intero sistema alimentare possa essere riorientato verso modelli a minore impatto ambientale, è necessario un coordinamento tra i comportamenti adottati da tutti i soggetti coinvolti lungo l'intera supply chain alimentare, sia dal lato dell'offerta che della domanda (Okumus, 2019; Willet *et al.*, 2019). In questo scenario, il settore della ristorazione assume un ruolo centrale nella promozione di comportamenti sostenibili, anche grazie alla sua capacità di influenzare le scelte alimentari e i comportamenti dei consumatori. La letteratura identifica diverse strategie che le imprese della ristorazione possono adottare per ridurre le emissioni di CO2 e, di conseguenza, nel raggiungimento dell'obiettivo della neutralità carbonica/climatica[4], un traguardo che certamente contribuirebbe in modo significativo anche alla mitigazione del cambiamento climatico (Munir 2022). Tali strategie sono identificabili in: maggiore utilizzo di prodotti locali nella lavorazione dei piatti (Presenza & Del Chiappa, 2013), inserimento di opzioni vegetali all'interno dei menù (Madanaguli *et al.*, 2022; Riverola *et al.*, 2022) e, infine, impegno nel contrastare lo spreco alimentare (Filimonau *et al.*, 2019).

Tuttavia, nonostante l'interesse crescente verso questi temi, esiste una lacuna significativa nella letteratura riguardo le pratiche effettivamente adottabili e/o adottate dalle imprese della ristorazione e le barriere che ne ostacolano l'implementazione. Questa carenza è particolarmente evidente a livello nazionale, ma ancor più nel contesto regionale sardo. La Sardegna, infatti, è stata considerata un contesto adatto per la ricerca, poiché lo sviluppo turistico dell'isola, come in molte altre destinazioni costiere e insulari, è fortemente influenzato (e minacciato) dall'innalzamento del livello del mare e dall'aumento delle temperature marine, conseguenze del riscaldamento globale e dei cambiamenti climatici (Scott *et al.*, 2019).

Per colmare questa lacuna, la ricerca si propone di analizzare come i ristoratori sardi percepiscano e affrontino le sfide legate alla transizione climatica nel settore della ristorazione, con particolare attenzione alle strategie sostenibili adottate e alle barriere incontrate. In questa prospettiva, si intende rispondere alle seguenti domande di ricerca:

- Quali pratiche vengono maggiormente adottate da parte dei ristoratori sardi per rendere la gestione più sostenibile?
- Quali sono le principali barriere all'adozione di pratiche sostenibili nel settore della ristorazione?

Per raggiungere tali obiettivi, la ricerca adotta un exploratory mixed-method approach (Teddlie & Tashakkori, 2009; Creswell & Plano Clark, 2017), articolato in due fasi. La prima fase qualitativa prevede la realizzazione di 18 interviste in profondità con chef, manager e proprietari di ristoranti sardi per esaminare le strategie sostenibili adottate e le difficoltà incontrate. I risultati di questa fase vengono utilizzati, insieme ad una revisione della letteratura esistente, per costruire il questionario utilizzato per realizzare una successiva indagine quantitativa su un campione di 142 ristoratori sardi con l'obiettivo di "generalizzare" quanto più possibile i risultati all'intero settore della ristorazione regionale (Creswell & Plano Clark, 2017). L'integrazione di metodologie qualitative e quantitative consente di beneficiare delle potenzialità offerte da entrambe le tecniche di rilevazione (profondità

[4] Si ricorda che la neutralità carbonica rappresenta il raggiungimento dell'equilibrio tra le emissioni di anidride carbonica prodotte e quelle ridotte e assorbite ("zero emissioni nette"). Il concetto di neutralità climatica è molto simile a quello di neutralità carbonica, ma esteso a tutti i gas serra (non solo all'anidride carbonica).

delle informazioni nel caso della ricerca qualitativa, e maggiore generalizzabilità nel caso di quella quantitativa) consentendo di ottenere, al contempo, risultati più robusti, meno soggetti a bias e, soprattutto, capaci di aumentare la rilevanza delle implicazioni manageriali che ne possono conseguire. In questo modo, si intende offrire un contributo rilevante sia sul piano accademico che manageriale, aumentando la comprensione delle dinamiche alla base dell'adozione delle pratiche sostenibili nella ristorazione e rafforzando le implicazioni per le imprese e i policy maker.

2. Literature review

L'intera filiera alimentare - dalla produzione alla trasformazione, dal trasporto al consumo, fino allo smaltimento dei rifiuti - è considerata responsabile di una parte consistente delle emissioni di CO2, contribuendo così agli effetti del cambiamento climatico (Willet *et al.*, 2019; Riverola *et al.*, 2022). Tra le principali criticità ambientali associate a questa industria, lo spreco alimentare riveste un ruolo di primaria importanza. Secondo recenti stime, in Europa vengono generati annualmente circa 59 milioni di tonnellate di rifiuti alimentari (131 kg per abitante), di cui il 46% proviene proprio dalla catena di approvvigionamento alimentare: nel dettaglio, il 19% dalla produzione di alimenti e bevande, l'11% dai ristoranti e dai servizi di ristorazione, l'8% dalla vendita al dettaglio e altre forme di distribuzione e, infine, un ulteriore 8% dalla produzione primaria (Eurostat, 2024).

Negli ultimi anni, la sostenibilità è diventata un tema centrale nel settore della ristorazione e, più in generale, nell'industria dell'ospitalità, a causa dell'elevato impatto ambientale in termini di emissioni di gas serra e consumo di risorse naturali ed energetiche (WTTC, 2023). A livello globale, il problema appare particolarmente rilevante negli Stati Uniti, dove si stima che il settore dell'ospitalità generi annualmente circa 13,6 milioni di tonnellate di rifiuti alimentari. Anche nel Regno Unito, lo spreco alimentare prodotto dal settore dell'ospitalità rappresenta una problematica significativa: secondo il WRAP (2013), le perdite economiche associate a tali sprechi ammontano a circa 2,5 miliardi di sterline, sottolineando l'urgenza di implementare misure efficaci per migliorare l'efficienza nella gestione delle risorse e ridurre l'impatto ambientale del settore.

L'attenzione della letteratura alle tematiche della sostenibilità economica, ambientale e socioculturale si è dunque presto estesa anche al turismo gastronomico (Del Chiappa, 2018). Le imprese di ristorazione, attori chiave dell'industria turistica, si trovano di fronte alla sfida di ridurre il proprio impatto ambientale - in particolare le emissioni di CO2 - e di mitigare gli effetti del cambiamento climatico, rispondendo al contempo alla crescente domanda dei turisti per opzioni di consumo più sostenibili. I turisti, infatti, mostrano una crescente consapevolezza riguardo alle implicazioni economiche, ambientali e culturali delle loro scelte alimentari nelle destinazioni visitate (Cantele & Cassia, 2020; Han, 2021).

Ridurre le emissioni di CO2 nel settore rappresenta dunque una sfida cruciale che richiede un impegno congiunto di tutti gli attori coinvolti lungo l'intera filiera alimentare (Okumus, 2019; Willet *et al.*, 2019). In questo contesto, promuovere modelli di produzione, distribuzione e consumo sostenibili richiede un'azione coordinata tra operatori pubblici e privati (Zurek *et al.*, 2022). In particolare, si ritiene che i ristoranti possano svolgere un ruolo fondamentale nel favorire la transizione da sistemi di produzione e consumo tradizionali verso altri più sostenibili, riducendo le emissioni e contribuendo alla mitigazione degli effetti del cambiamento climatico (Radwan *et al.*, 2010; Castañé & Antón, 2017; Kim & Hall, 2020; Moon *et al.*, 2020; Fonseca & Carnicelli, 2021; Oriade *et al.*, 2021; Riverola *et al.*, 2022). Affinché questo sia possibile è necessario coinvolgere attivamente tanto i dipendenti (Alberton *et al.*, 2020) quanto i clienti (Kim & Hall, 2020), promuovendo una cultura della sostenibilità condivisa. Il perseguimento di tali obiettivi, a sua volta, favorisce l'affermazione di modelli di sviluppo economico-turistico maggiormente sostenibili e capaci di garantire livelli di salute e di benessere economico-sociale maggiore (Sudbury-Riley & Kohlbacher, 2016). Di conseguenza, per gli operatori turistici diventa sempre più strategico costruire la propria competitività attraverso iniziative che migliorino la sostenibilità del modello turistico

locale, allineandosi alle aspettative dei clienti e contribuendo, allo stesso tempo, a mitigare gli effetti negativi del cambiamento climatico sul settore turistico, sulla società e sull'intero pianeta (Moon *et al.*, 2020; Elkhwesky *et al.*, 2022).

Ponendo l'attenzione alla pratiche di gestione sostenibile più strettamente attinenti alla gestione, lavorazione e consumo degli alimenti, la letteratura ha individuato tre principali strategie che gli operatori del settore della ristorazione possono mettere in campo per contribuire al contenimento delle emissioni di gas serra e alla mitigazione degli effetti del cambiamento climatico, ossia: un maggior uso di prodotti locali nella lavorazione dei piatti e nei menù (Presenza & Del Chiappa, 2013); l'impegno a contrastare lo spreco alimentare (Filomenau *et al.*, 2019); l'offerta di menù vegetariani e vegani (o l'inserimento di opzioni vegetariane/vegane all'interno dei menù tradizionali) (Madanaguli *et al.*, 2022; Riverola *et al.*, 2022).

Con riferimento alla prima di queste pratiche, diversi studi hanno evidenziato come l'approvvigionamento di prodotti alimentari da mercati distanti dal luogo di consumo, specialmente quando avviene via aerea e/o su strada, determina un consumo elevato di carburanti di origine fossile ed è quindi responsabile della produzione di grandi quantità di gas serra che contribuiscono in maniera importante al cambiamento climatico (Caputo *et al.*, 2013). In questo contesto, prevedere un maggior uso di prodotti locali (*low miles food*) nella lavorazione dei piatti e dei menù rappresenta una delle principali strategie attraverso cui i ristoranti possono contribuire a mitigare gli effetti del cambiamento climatico, supportando al contempo l'economia del territorio e valorizzando l'identità e l'autenticità del luogo (Presenza & Del Chiappa, 2013).

Inoltre, come evidenziato in precedenza, la letteratura ha evidenziato come lo spreco alimentare contribuisca in maniera significativa alle emissioni di gas serra (Eurostat, 2024). Dunque, riuscire a ridurlo consente di mitigare gli effetti del cambiamento climatico e favorire uno sviluppo maggiormente sostenibile (Munir, 2022). Per riuscire in tale intento, le imprese ristorative devono prestare particolare attenzione al cibo commestibile che, lungo l'intera filiera alimentare, non viene consumato per errori nella pianificazione degli acquisti delle materie prime e dello stoccaggio, durante la manipolazione/lavorazione del cibo e la preparazione dei piatti nonché per i residui che normalmente si producono in queste fasi e/o, infine, per come vengono organizzate le attività di servizio e di distribuzione al cliente. A tutto ciò si aggiunge lo spreco alimentare che viene prodotto nella fase del consumo da parte del cliente (Okumus, 2019).

Per ridurre lo spreco alimentare lungo la filiera e valorizzare gli scarti, le azioni possibili sono molteplici. Tra le strategie per ridurre lo spreco, si può migliorare la gestione delle scorte, ottimizzare la pianificazione degli acquisti, ridurre il numero di opzioni nel menù (basandosi sulla rilevazione delle preferenze dei clienti), migliorare la conservazione degli alimenti (ad esempio, etichettando e conservando correttamente i prodotti) e formare il personale di cucina sulle pratiche anti-spreco. Inoltre, si possono adottare metodi per monitorare e misurare lo spreco alimentare, passare da formule di buffet a libero servizio a buffet servito, ridurre le porzioni e sensibilizzare i clienti sull'impatto delle loro scelte alimentari (ad esempio, indicando il footprint dei piatti nel menù). Per quanto riguarda il recupero degli scarti, le opzioni includono l'utilizzo di scarti di materie prime in nuove preparazioni (ad esempio, brodi da lische di pesce o ossa), la donazione del cibo avanzato, il riciclo per l'alimentazione animale o per fertilizzanti, e l'uso delle *doggy bag* per il cibo non consumato (Radwan *et al.*, 2010; Okumus, 2019; Cantele & Cassia, 2020; Kim & Hall, 2020; Ocampo *et al.*, 2021; Elkhwesky *et al.*, 2022; Munir, 2022).

Studi recenti hanno dimostrato una connessione tra le scelte alimentari, i sistemi alimentari necessari per produrle e il conseguente impatto sulle emissioni di gas serra (Joyce *et al.*, 2014). In particolare, le diete contenenti un maggior numero di piatti vegetali hanno un impatto ambientale significativamente inferiore, in termini di emissioni di gas serra, rispetto ai piatti di origine animale (Leuenberger *et al.*, 2010; Joyce *et al.*, 2014, Parkin & Attwood, 2022).

In questo senso, un altro importante contributo che la ristorazione può dare ai fini del contenimento delle emissioni di gas serra e della mitigazione del cambiamento climatico è quello di adottare strategie di *menù design* che, pur non basandosi su menù completamente vegetariani e/o vegani,

privilegino una maggiore presenza di piatti a base vegetale e includano l'indicazione del footprint associato alla produzione delle singole proposte presenti in menù (Betz *et al.*, 2022). In ogni caso, è importante che il menù preveda un'offerta piuttosto ampia di pietanze a base vegetale rispetto a quelle a base di carne. A questo proposito, uno studio recente ha evidenziato come il numero di opzioni "veg" disponibili influenzi positivamente la propensione dei consumatori a scegliere effettivamente piatti di questo tipo (Parkin & Attwood, 2022).

Sebbene le tre aree strategiche su cui i ristoratori possono intervenire per rendere più sostenibile la gestione delle attività, contenendo le emissioni di gas serra e mitigando gli effetti del cambiamento climatico, siano di indubbio valore, esistono barriere (sia dal lato dell'offerta che della domanda) che ne ostacolano l'implementazione. Ad esempio, con riferimento all'uso di prodotti locali nella preparazione dei piatti, i ristoratori segnalano difficoltà nell'approvvigionamento da produttori locali, spesso di piccole dimensioni, che faticano a garantire la consegna dei prodotti secondo gli standard di quantità, qualità e tempo necessari. Inoltre, spesso chef e ristoratori ritengono che i clienti non sempre riconoscano il valore di un'offerta gastronomica basata sull'uso di prodotti locali (Del Chiappa & Presenza, 2013). Con riferimento a strategie di *menù design* maggiormente orientati alla presenza di opzioni "veg", spesso si fa riferimento ad una cultura alimentare che, specie in alcuni contesti geografici, risulta fortemente influenzata da un'economia agropastorale, orientata alla produzione e al consumo di piatti a base di carne (Willet *et al.*, 2019). Oppure, ancora, si fa riferimento a consumatori poco consapevoli del legame esistente tra stile alimentare, emissioni di gas serra e cambiamento climatico, oppure alla scarsa reperibilità di chef sufficientemente creativi e preparati in materia di cucina "veg" (Cantele & Cassia, 2020; Kim & Hall, 2020; Ocampo *et al.*, 2021). In merito alla riduzione dello spreco alimentare, spesso si riscontra una scarsa consapevolezza del problema dal lato dell'offerta, soprattutto tra le aziende di piccole dimensioni (Fonseca & Carnicelli, 2021). Oppure, anche quando il problema è riconosciuto, si lamentano difficoltà organizzative e costi elevati per fronteggiare, ad esempio, la gestione automatizzata delle scorte, gli approvvigionamenti e lo stoccaggio degli alimenti, per misurare e monitorare nel tempo la produzione dello spreco alimentare e usare tale base informativa per impostare obiettivi temporali di "rientro" (Cantele & Cassia, 2020). Un'ulteriore criticità riguarda la difficoltà di educare e sensibilizzare il cliente finale su queste tematiche, ostacolando così l'adozione di pratiche più sostenibili (Jones & Comfort, 2020).

3. Metodologia

Il presente studio adotta un *exploratory sequential mixed method*, in cui la ricerca qualitativa costituisce la base per lo sviluppo della successiva fase quantitativa (Creswell & Plano Clark, 2017; Teddlie & Tashakkori, 2009). Tale approccio consente di integrare i punti di forza di entrambe le metodologie, garantendo una comprensione più approfondita e strutturata del fenomeno oggetto di studio. In particolare, i risultati delle interviste condotte durante la fase qualitativa permettono di guidare la progettazione della fase quantitativa, permettendo di identificare in modo più preciso e dettagliato le pratiche di sostenibilità potenzialmente adottabili dalle imprese ristorative, nonché i principali limiti alla loro implementazione (Creswell & Plano Clark, 2017). I metodi *mixed method* esplorativi sono impiegati nella ricerca per esplorare la complessità della realtà, combinando l'analisi qualitativa, che approfondisce i comportamenti individuali e organizzativi ma risulta difficile da generalizzare, e l'analisi quantitativa, che offre risultati più oggettivi e generalizzabili ma limita la capacità di esplorare in profondità i comportamenti. Integrando queste metodologie, è possibile ottenere risultati più "robusti e completi", superando i limiti di ciascun approccio preso singolarmente.

Nel caso specifico, la fase qualitativa ha previsto interviste in profondità con chef, restaurant manager e/o proprietari di ristoranti sardi. I risultati di queste interviste, insieme alle evidenze della letteratura, sono stati utilizzati per costruire un questionario per la fase quantitativa, finalizzata a

generalizzare i risultati a livello regionale e a comprendere meglio le pratiche di sostenibilità e le difficoltà nel loro impiego nel settore della ristorazione (Creswell & Plano Clark, 2017).

4. Analisi qualitativa

L'indagine qualitativa è stata condotta tramite la realizzazione di interviste in profondità, utilizzando un protocollo di intervista sviluppato sulla base della letteratura nazionale e internazionale pertinente al tema. Le interviste sono state realizzate coinvolgendo direttamente operatori della ristorazione attivi nel contesto regionale sardo e sono state realizzate sia face-to-face che tramite l'ausilio di piattaforme digitali (Microsoft Teams, Skype, Google Meet e WhatsApp) per garantire una maggiore flessibilità nella partecipazione.

Nel periodo compreso tra maggio e agosto 2023, sono state condotte complessivamente 18 interviste, un numero considerato adeguato secondo la letteratura di riferimento. Come sottolineato da Saunders (2012), infatti, un numero di interviste compreso tra 12 e 30 è considerato sufficiente per questa tipologia di analisi. Inoltre, il numero di interviste raccolto ha permesso di raggiungere la cosiddetta data saturation, ovvero il punto in corrispondenza del quale ulteriori interviste non fornirebbero informazioni aggiuntive rispetto al fenomeno indagato (Patton, 2002; Saunders & Townsend, 2016).

Le interviste, della durata media di 50 minuti, sono state audio-registrate e trascritte integralmente, generando un corpus di 59.524 parole.

I dati raccolti sono stati successivamente analizzati in modo aggregato, garantendo l'anonimato degli intervistati e per soli scopi di natura scientifica. L'analisi dei dati è stata condotta utilizzando il metodo dell'analisi tematica (Braun & Clarke, 2006), con l'obiettivo di identificare i temi - ricorrenti e/o innovativi - presenti all'interno delle interviste. Questa analisi è stata guidata dalla letteratura esistente (Okumus, 2019; Kim & Hall, 2020; Elkhwesky *et al.*, 2022; Di Pierro *et al.*, 2023) e si è concentrata principalmente su aspetti legati alla sostenibilità nel settore turistico-ricettivo e, in particolare, nella ristorazione, con un focus sulla gestione del food waste.

Nelle interviste sono state coinvolte persone che, a vario titolo, operano nel settore della ristorazione; tra questi, 14 proprietari di ristoranti (di cui 5 ricoprono anche il ruolo di chef), tre cuochi e uno food analyst. Nel complesso tutti gli intervistati si sono dichiarati sensibili al tema della sostenibilità e sono risultati impegnati in azioni e interventi di varia natura perlopiù finalizzati a contribuire alla sostenibilità ambientale. Tuttavia, solo 7 intervistati su 18 hanno dimostrato una comprensione chiara del concetto di neutralità climatica. Questi ultimi si sono dichiarati consapevoli della necessità di intraprendere azioni e accorgimenti per contribuire al raggiungimento di tale obiettivo, ma hanno anche riferito di credere che la responsabilità maggiore debba ricadere sui grandi player istituzionali e sulle grandi aziende.

Dall'analisi tematica sono emersi numerosi temi che confermano quanto già evidenziato dalla letteratura pregressa riguardo alle pratiche e azioni che possono essere adottate per ridurre l'impatto in termini di emissioni di CO2. Al contempo, lo studio ha anche permesso di individuare nuove prospettive (pratiche di sostenibilità) non ancora evidenziate dalla letteratura, probabilmente legate anche al contesto geografico e socio-culturale dei rispondenti.

Di seguito vengono evidenziati i temi più rilevanti che introducono aspetti innovativi rispetto alla letteratura precedente. Tra questi, spiccano le pratiche volte alla valorizzazione dei prodotti locali e stagionali, come ad esempio la predisposizione di menù che raccontano storie e tradizioni attraverso i piatti. La scelta di privilegiare prodotti locali è, infatti, motivata anche dalla consapevolezza che questo contribuisca significativamente a valorizzare e promuovere l'identità territoriale e sostenere le realtà produttive locali.

"E' quella (cucina) che si adatta di più al contesto" (ID8)

> "Utilizzare prodotti di filiera, prodotti locali che valorizzino l'identità e le produzioni che abbiamo in Sardegna" (ID16)

Oltretutto, i prodotti locali sono percepiti dai rispondenti come qualitativamente superiori, più freschi e genuini rispetto a quelli importati e, quindi, capaci di contribuire ad una cucina di maggiore qualità.

> "Io sono il primo che va a puntare sul prodotto locale, per quale motivo? Sono sicuro che abbiamo dei prodotti genuini e sani… un prodotto locale io lo ritengo migliore rispetto a quello che viene da fuori" (ID17)

Un'altra pratica diffusa riguarda l'inserimento nei menù di informazioni sull'origine delle materie prime, oltre all'acquisto di carne da allevamenti biologici. Viene privilegiato l'utilizzo di prodotti del territorio, piuttosto che l'acquisto di prodotti nazionali e internazionali e, in quest'ottica, si tende a reinterpretare piatti nazionali e internazionali utilizzando ingredienti locali.

> "Per me sostenibilità vuol dire consumare prodotti locali e stagionali…fare questo significa avere meno consumi anche di quelli che possono essere, per esempio, gli idrocarburi per gli spostamenti delle merci oppure di consumare anche a meno acqua per l'irrigazione, eccetera" (ID13)

> "Secondo me un ristorante per essere sostenibile deve utilizzare i prodotti del territorio, cioè non può far venire la frutta dalla Spagna o dal nord Africa perché così vuol dire anche inquinamento perché in qualche modo ce la devono portare la frutta." (ID18)

Dall'analisi qualitativa emergono, inoltre, pratiche utili per contrastare lo spreco alimentare. Tra queste, spiccano la possibilità di offrire menù degustazione, piatti in porzioni diverse e la tendenza a consigliare ai clienti di ordinare piatti per gradi. Un'altra strategia riguarda il lavoro su prenotazione, con una preferenza per il menù servito, soprattutto quando si ricorre al servizio a buffet.

> "Io mi muovo molto con il menu degustazione, anziché fare i menù degustazione classici con tutto al centro tavola, come si fa nella maggior parte dei locali delle coste qua in Sardegna, io faccio dei piatti belli mirati, a ognuno il suo … appunto per evitare troppi sprechi, poi se qualcuno vuole il bis glielo facciamo più che volentieri però mettere tutto sul tavolo perché ne avanzi e venga buttato nella spazzatura non mi va" (ID2)

> "Noi lavoriamo solo su prenotazione quindi sai già quante persone vengono, non sprechi niente" (ID1)

Altre pratiche riguardano l'informazione ai clienti sullo spreco alimentare e sulle azioni adottate dal ristorante per contrastarlo. Spesso gli intervistati hanno fatto riferimento alla centralità che l'uso della tecnologia e delle nuove tecniche di lavorazione, conservazione e stoccaggio possono avere nel contenere lo spreco alimentare. Tra le pratiche per ridurre gli sprechi, vi è l'adozione di tecniche di lavorazione/conservazione per prolungare la vita delle materie prime e utilizzare piatti semilavorati/precotti per la preparazione di piatti alternativi, oltre che l'utilizzo di diverse tecniche di conservazione.

> "La nostra è una cucina che racconta la tradizione sarda con i piatti tipici realizzati usando attrezzature di ultima generazione che ci aiutano a mantenere tutte le proprietà nutrizionali e organolettiche dei prodotti… quando un prodotto c'è in abbondanza ormai lo possiamo

> comprare, lo possiamo lavorare, lo abbattiamo, lo sotto-vuotiamo e lo conserviamo in maniera efficace" (ID2)

> "Utilizziamo prodotti anche tipici ma li lavoriamo in maniera diversa, usiamo tecniche di cucina avanzate tipo il sottovuoto e la bassa temperatura" (ID6)

Altre pratiche per ridurre l'impatto delle imprese ristorative in termini di emissioni di CO2 riguarda la valorizzazione di una cucina plant-based. Ad esempio, valutando la possibilità di prevedere menù interamente vegani e menù interamente vegetariani. In questo senso, risulta essere interessante il punto di vista riportato da uno degli intervistati che risulta orientato completamente ad un'offerta ristorativa "veg" e biologica. Secondo tale intervistato la combinazione di prodotti vegani e biologici (certificati) risulta essere la chiave per garantire il benessere e la salute delle persone e la sostenibilità, specie ambientale.

> "Beh, intanto, se tutti i ristoranti fossero come noi non esisterebbero più gli allevamenti intensivi che sono come i principali produttori di anidride carbonica e di danni all'ambiente. Non esisterebbero pesticidi, il campo non verrebbe irrorato in maniera pesante da pesticidi, perché la nostra alimentazione è certificata… noi siamo più avanti di tante altre realtà… i prodotti locali, purtroppo in Sardegna non c'è la cultura del biologico per cui c'è veramente poco molto molto poco. Si può fare Km0 ma spesso quello che si acquista è pesticidizzato… dunque poco importa farlo. Adesso che stiamo facendo arrivare i prodotti da Roma e questo è molto triste, però se la Sardegna non si adegua…" (ID11)

La quasi totalità degli intervistati ha dichiarato che esistono diversi tipi di barriere e ostacoli all'affermazione di una ristorazione davvero sostenibile, orientata al contenimento delle emissioni di gas serra e, quindi, alla mitigazione del problema del cambiamento climatico. I risultati dell'analisi qualitativa svolta dimostrano come siano diverse le barriere di riferimento e gran parte di esse non sono state ancora sviluppate dalla letteratura. A questo proposito, oltre alle barriere di natura economica e relative alle difficoltà burocratiche percepite, si annoverano la necessità di una maggiore formazione-informazione, innanzitutto per il personale, ma anche ai cittadini e alle imprese di ogni settore sui temi della sostenibilità, della neutralità climatica e del cambiamento climatico e sulle possibili azioni e pratiche che si possono adottare a riguardo.

> "Purtroppo, mi rendo conto che è un problema culturale, un problema di educazione, non è facilmente gestibile e risolvibile in tempi brevi, però io credo che uno degli elementi maggiori per andare a provare a contrastare questo fenomeno sia la formazione e quindi la sensibilizzazione" … una buona educazione che dovrebbe iniziare dalle scuole.. è un problema culturale su cui bisogna incidere pesantemente" (ID18)

> "Ci vorrebbe un po' più di, come posso dire, di informazione… vede io adesso questa cosa che lei mi ha spiegato [la neutralità climatica] non la conoscevo" (ID16)

Gli intervistati hanno riferito anche di barriere specifiche che si trovano a fronteggiare nel tentativo di massimizzare l'utilizzo di prodotti locali, ridurre lo spreco alimentare e, soprattutto, promuovere una ristorazione orientata alla riduzione dell'uso di carne e pesce e alla promozione di uno stile alimentare "veg". In particolare, spesso si è fatto riferimento al fatto che la cultura locale sia fortemente centrata sull'uso della carne e del pesce e, inoltre, al "danno" economico che il passaggio, in tutto o in parte significativa, ad una ristorazione "veg" potrebbe avere sull'intera filiera della produzione, lavorazione e vendita di carne/pesce. Inoltre, essendo la Sardegna conosciuta nell'immaginario turistico perlopiù per le sue tradizioni culinarie basate sull'uso prevalente di carne

e pesce, passare ad una ristorazione più "veg" equivarrebbe a disattendere le aspettative di questa tipologia di clientela.

> "Credo che ci sia bisogno di tanto tempo… non siamo ancora proprio predisposti, la maggior parte della gente, per quanto se ne dica, ha voglia di mangiare la tradizione e il tipico che tutti conosciamo bene, insomma non puoi fare un menù solo vegetariano o vegano, poi probabilmente ci si arriverà bene…ma adesso come adesso siamo famosi per i formaggi, siamo famosi per i salumi, siamo famosi per le carni, siamo famosi per il pescato, siamo famosi per tantissime cose che non sono sicuramente tutto quello che è vegano o vegetariano … non è la nostra tradizione, soprattutto nella ristorazione" (ID2)

> "Improponibile, improponibile. Nell'agriturismo che fai? Il tofu? No. Cosa fai? Formaggio vegano? No. Eh, dai. È assurdo! Per me, adesso, è assurdo. All'interno del ristorante puoi dare la proposta ma non può essere una strada da prendere per cambiare il mondo…cioè, non si può affidare questo lavoro a noi ristoranti" (ID8)

Alcuni ristoratori/chef fanno poi esplicito riferimento al fatto che secondo loro la dimensione del mercato interessato alla ristorazione "veg" è ancora tutto sommato modesta.

> "Sì, abbiamo una sezione nel menù proprio dedicata ai vegetariani e in parte anche ai vegani e comunque siamo sempre aperti a tutte le richieste dei clienti… ma la maggior parte dei nostri clienti non apprezzerebbe e richiede sempre cibi di origine animale in qualche modo" (ID6)

> "I clienti sono dei grandi carnivori e gli piace tanto il pesce, quindi.. se io da domani decidessi di fare una cucina vegana o vegetariana, son sicuro che non avrei un numero di ospiti così elevato da poter andare avanti" (ID17)

Infine, a volte è il fatto stesso che il ristoratore e/o lo chef non sia orientato personalmente alla filosofia del vegetarianismo e/o veganismo, o che il personale non sia formato in materia di spreco alimentare e ristorazione "veg", ad impedire che si faccia la scelta di orientare in questa direzione il tipo di ristorazione in cui si opera.

> "A me non interessa mangiare vegetariano o vegano, a volte lo mangio, ma non è quello che mi interessa, .mi interessa vendere il mio pensiero di cucina e il mio pensiero di cucina non è quello" (…) "Non c'è personale con le competenze per poterlo fare" (ID2)
> "Molto dipende dalla mentalità, da quanto è visionario il ristoratore…ci sono aziende virtuose…ma questo accade perché hanno al comando persone che ci credono in questa filosofia, che la sposano…" (ID4)

5. Analisi quantitativa

A partire dai risultati emersi dall'analisi tematica dello studio qualitativo, e integrando con scale già esistenti in letteratura, è stato costruito un questionario, successivamente somministrato ad un database di ristoratori sardi (si veda tabella in appendice). Questo database è stato precedentemente predisposto in collaborazione tra il team di ricerca e alcune associazioni di categoria regionali.

Il questionario è stato suddiviso in quattro sezioni. Nelle prime tre sezioni, ai rispondenti è stato chiesto di riferire quanto la loro azienda adottasse azioni volte a favorire l'uso e la valorizzazione di prodotti locali e stagionali (15 azioni), a contrastare lo spreco alimentare (27 azioni) e, infine, a favorire una maggiore presenza di piatti veg nei propri menù (5 azioni). Le risposte sono state raccolte utilizzando una scala likert a 5 punti (dove 1=Decisamente no, 2=più no che sì, 3= Né sì né no, 4=Più

sì che no, 5=Decisamente sì), dando la possibilità di selezionare l'opzione "NA" ovvero "Non Applicabile". Nell'ultima sezione, i rispondenti sono stati invitati a fornire informazioni di carattere generale sul loro profilo socio-demografico (genere, età, livello d'istruzione, ecc.) e, inoltre, sulle caratteristiche del loro ristorante (tipologia di ristorazione/cucina, numero di coperti, localizzazione della struttura, ecc.).

La raccolta dati è stata realizzata nel periodo ottobre-novembre 2023 prevedendo due recall. Al termine della raccolta dati sono stati ottenuti 170 questionari; di questi, 28 sono stati eliminati in quanto non completi e non utilizzabili ai fini della raccolta dati generando, quindi, un campione di 142 questionari correttamente utilizzabili ai fini delle analisi statistiche. La tabella seguente mostra le principali caratteristiche del campione coinvolto, sia in termini di caratteristiche dei rispondenti sia in termini di caratteristiche dell'impresa ristorativa nel quale sono impiegati.

Come si evince dalla tabella 1, la maggior parte dei rispondenti è di sesso maschile (60,5%), seguita dal 37% di sesso femminile, mentre una percentuale ridotta (2,5%) di rispondenti ha preferito non rispondere. La fascia d'età più rappresentata è quella tra i 35 e i 44 anni (31,9%), seguita dalle fasce 45-54 (25,2%) e 55-64 (23,5%). Percentuali marginali riguardano i rispondenti con più di 65 anni (5%) e quelli nella fascia 19-24 anni (1,7%). Per quanto riguarda il titolo di studio, la maggioranza dei rispondenti dichiara di possedere un diploma di scuola superiore (50,4%); seguono coloro che hanno conseguito una laurea (26%) o una licenza di scuola media (14%). Una piccola percentuale ha ottenuto un master o un dottorato (7%), mentre una frazione minima (3%) ha dichiarato di avere altri titoli di studio. Analizzando il ruolo ricoperto all'interno dell'azienda, i rispondenti si indentificano principalmente come soci del ristorante (29%), seguiti dai proprietari unici (26%), dai manager (23%) e dagli chef (22%).

Tab. 1: Le caratteristiche del campione

CARATTERISTICHE DEI RISPONDENTI		CARATTERISTICHE DEL RISTORANTE	
Genere		**Numero di coperti**	
Maschile	60%	≤ 20	8%
Femminile	37%	21-50	38%
Preferisco non rispondere	3%	51-100	54%
Età		**Localizzazione**	
19-24	2%	Zona costiera/balneare	59%
25-34	13%	Città	24%
35-44	32%	Zona montana/entroterra	17%
45-54	25%	**Tipologia di ristorazione**	
55-64	23%	Ristorante	43%
>65	5%	Pizzeria	24%
Livello di istruzione		Ristorante-pizzeria	13%
Licenza media	14%	Bistrot	6%
Diploma	50%	Trattoria	4%
Laurea	26%	Osteria	3%
Master/dottorato	7%	Altro	28%
Altro	3%	**Tipologia di cucina***	
Ruolo ricoperto nel ristorante		Regionale	48%
Socio	29%	Classica	37%
Proprietario unico	26%	Tipica rivisitata	32%
Manager	23%	Tipica	28%
Chef	22%	Altro	86%

*La somma non è uguale a 100% in quanto i rispondenti potevano selezionare più opzioni di risposta

Fonte: Nostra elaborazione su dati campionari

Relativamente alle caratteristiche del ristorante in cui operano, la maggior parte delle attività ha un numero di coperti compreso tra 50 e 100 posti (53,4%). Seguono i ristoranti con 21-50 coperti (38,1%) e quelli con meno di 20 posti (8,2%). Dal punto di vista della localizzazione geografica, la maggior parte delle attività si trova in zone costiere o balneari (59,3%); seguono i ristoranti situati in città (24,1%) e in aree montane o dell'entroterra (16,7%).

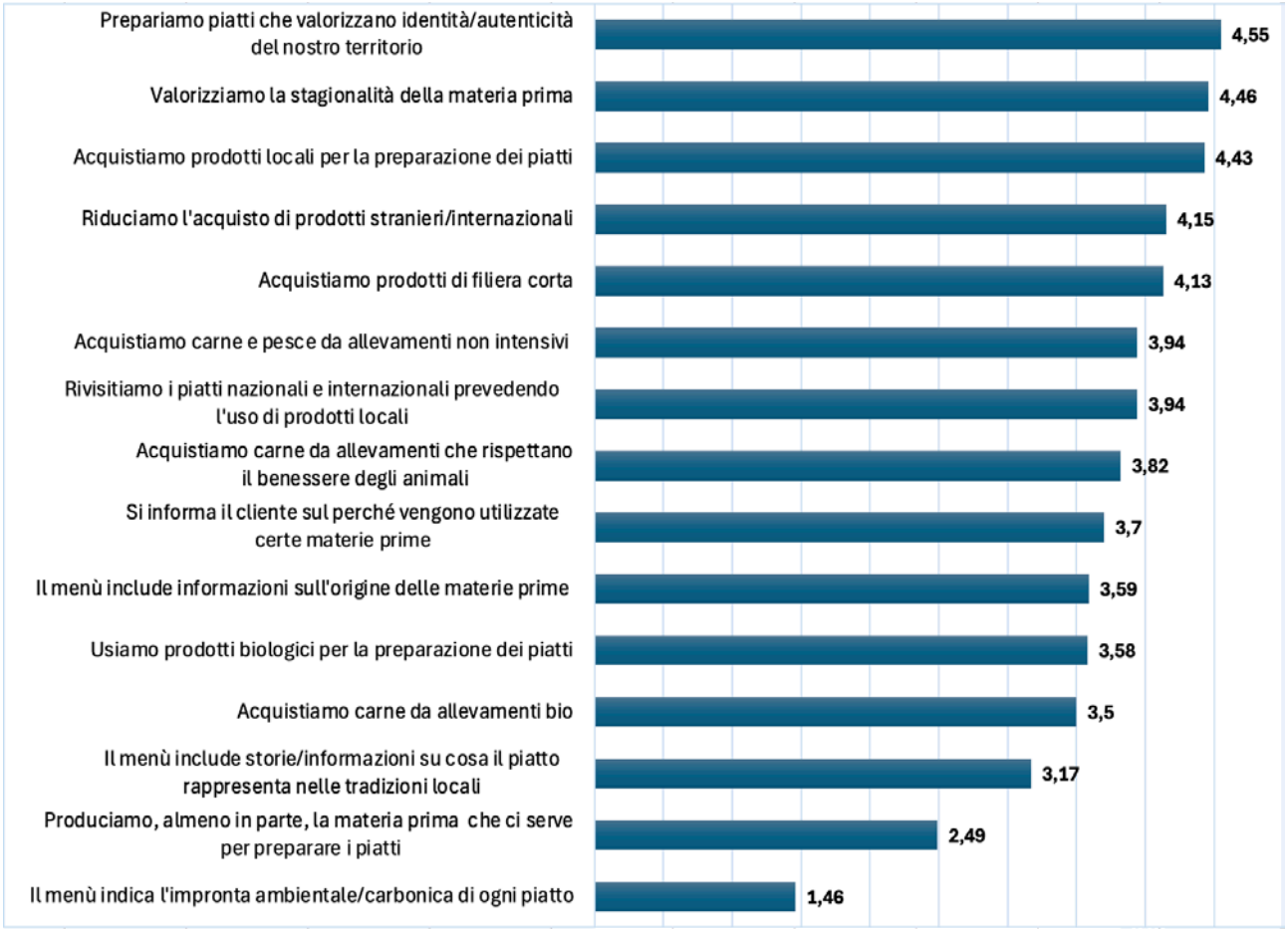
Per quanto riguarda la tipologia di ristorazione, prevalgono i ristoranti tradizionali (43,2%), e i ristoranti-pizzeria (12,6%). In percentuali più modeste sono rappresentati format ristorativi alterativi come bistrot (6%), trattorie (4%) e osterie (3%). Le attività ristorative sono specializzate perlopiù in cucina locale/regionale (47,9%), cucina classica (36,6%), tipica rivisitata (31,7%) e cucina tipica 'tradizionale' (28,2%). L'86% dei rispondenti, inoltre, dichiara di proporre altre tipologie di cucina: non mancano coloro che offrono alternative vegetali, siano esse vegetariane (24,6%) o vegane (17,6%), oppure altre opzioni culinarie quali cucina gourmet (14,8%) e internazionale (12%).

Nei paragrafi seguenti verranno presentati i risultati ottenuti dall'analisi quantitativa, indicando per la media di risposta per ciascun item. Ogni paragrafo sarà dedicato a una delle macro-categorie di pratiche sostenibili individuate in precedenza: valorizzazione dei prodotti locali (paragrafo 5.1), azioni per contrastare lo spreco alimentare (paragrafo 5.2), offerta di piatti plant-based (paragrafo 5.3) e, infine, barriere all'implementazione di pratiche sostenibili (paragrafo 5.4).

5.1 La valorizzazione dei prodotti locali

Una prima strategia che i ristoranti possono adottare per contribuire al raggiungimento della neutralità climatica consiste nel prediligere e valorizzare i prodotti locali e stagionali nella preparazione dei piatti e dei menù (Grafico 1).

Fig. 1: Adozione delle pratiche per la valorizzazione di prodotti locali e stagionali (valore medio)



Fonte: Nostra elaborazione su dati campionari

Tra le azioni maggiormente implementate spicca la preparazione di piatti che valorizzano l'identità e l'autenticità del territorio (M: 4,55), seguita dalla promozione della stagionalità della materia prima (M: 4,46) e dall'acquisto di prodotti locali per la preparazione dei piatti (M: 4,43). In misura più

moderata, vengono ridotti gli acquisti di prodotti stranieri o internazionali (M: 4,15) e privilegiati prodotti a filiera corta (M: 4,13). Analogamente, l'acquisto di carne e pesce da allevamenti non intensivi e la rivisitazione di piatti nazionali e internazionali con l'uso di prodotti locali ottengono entrambi una media di 3,94.

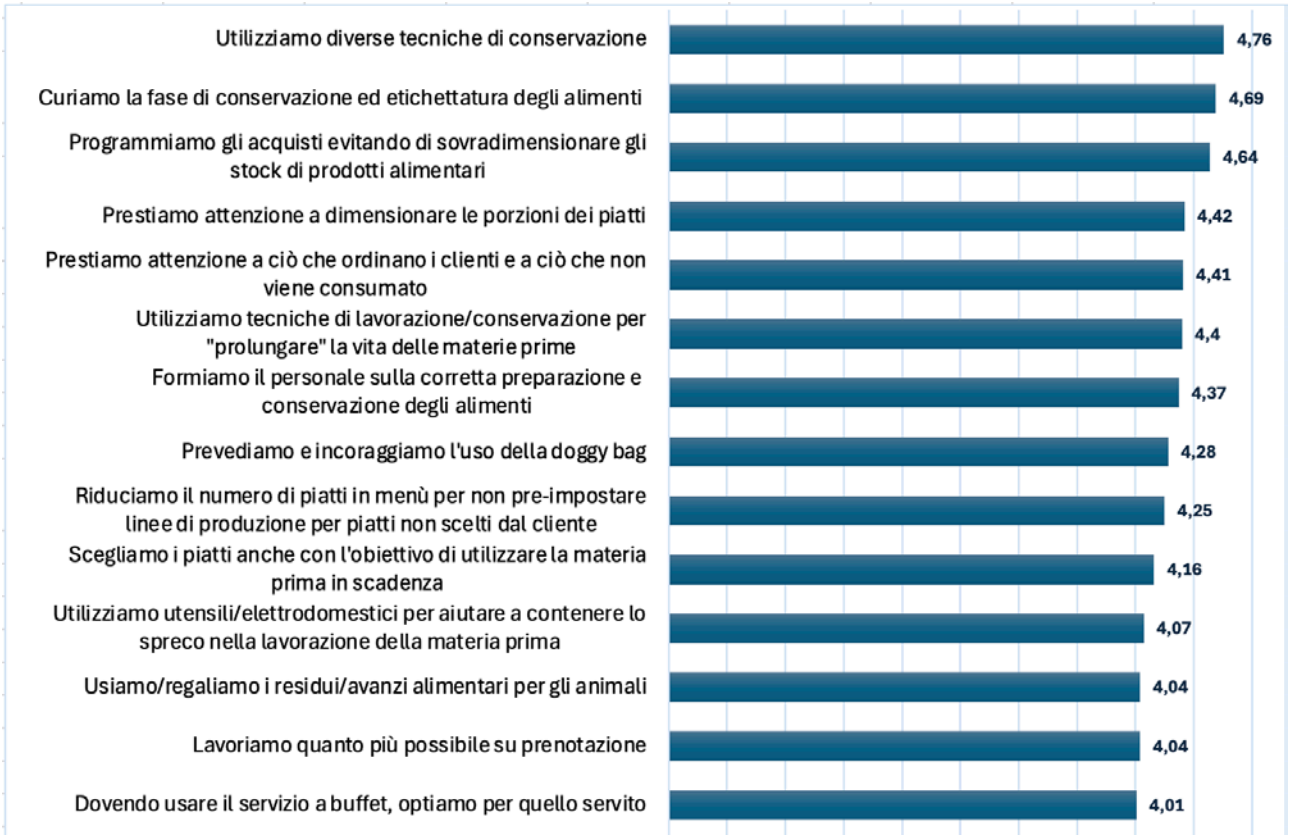
Meno frequenti sono pratiche come l'acquisto di carne da allevamenti che rispettano il benessere animale (M: 3,82) o l'informazione del cliente sull'utilizzo di determinate materie prime (M: 3,7). L'inclusione nel menù di informazioni sull'origine delle materie prime (M: 3,59) o l'utilizzo di prodotti biologici per la preparazione dei piatti (M: 3,58) risultano anch'esse implementate in misura inferiore rispetto alle pratiche principali.

Pratiche più specifiche, come l'acquisto di carne da allevamenti biologici (M: 3,5) o l'inserimento nel menù di storie che illustrano il significato dei piatti nella tradizione locale (M: 3,17), sono meno comuni. Infine, iniziative come la produzione diretta, almeno parziale, delle materie prime utilizzate per i piatti (M: 2,49) o l'indicazione dell'impronta ambientale o carbonica di ogni piatto nel menù (M: 1,46) appaiono ancora poco adottate.

5.2 Azioni per contrastare lo spreco alimentare

Numerose sono le azioni che i ristoranti possono adottare per contenere lo spreco alimentare e contribuire alla neutralità climatica e alla sostenibilità (Grafico 2 e 3).

Fig. 2: Adozione delle pratiche utili a contrastare lo spreco alimentare (valore medio)



Fonte: Nostra elaborazione su dati campionari

Dall'analisi emerge come i ristoratori attribuiscano particolare importanza alla gestione efficiente delle materie prime e degli approvvigionamenti. Tra le attività più comuni spiccano infatti l'utilizzo di diverse tecniche di conservazione (M: 4,76), la cura nella fase di etichettatura e conservazione degli alimenti (M: 4,69) e la programmazione/pianificazione degli acquisti per evitare di accumulare

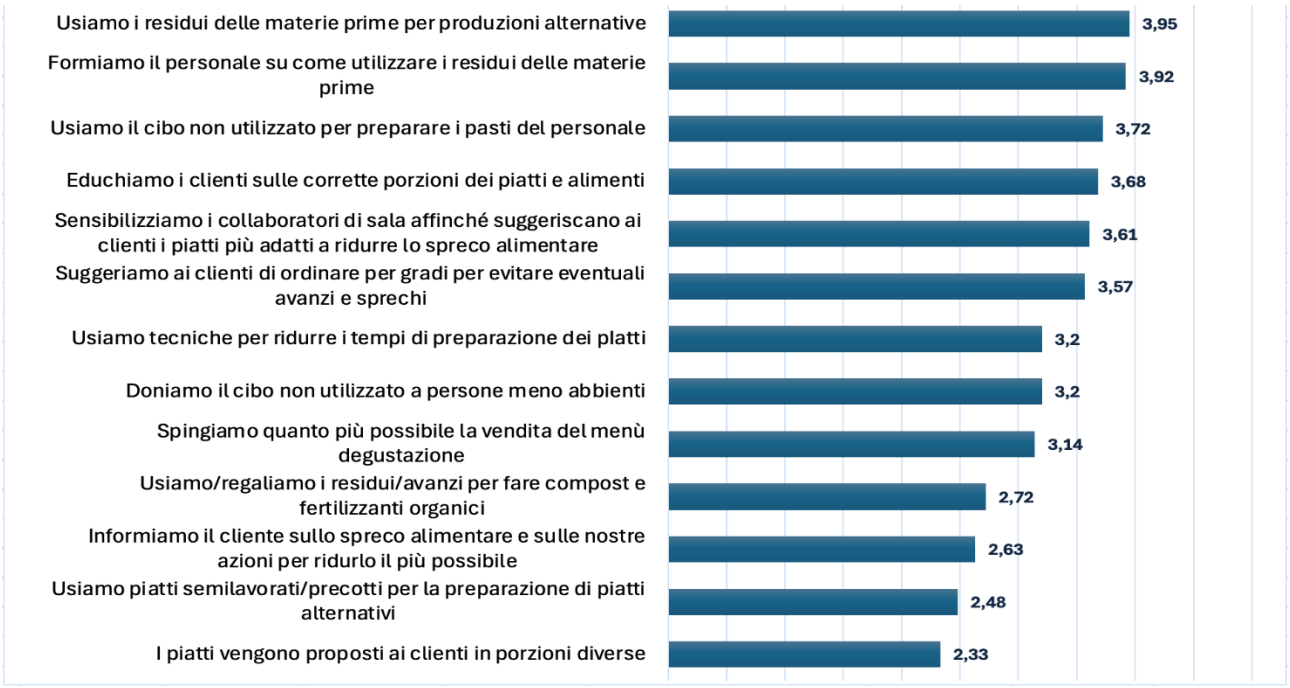
scorte eccessive (M: 4,64). Particolare attenzione è dedicata al dimensionamento delle porzioni dei piatti (M: 4,42) e al monitoraggio di ciò che viene ordinato e non consumato dai clienti (M: 4,41). Inoltre, l'adozione di tecniche di lavorazione e conservazione per prolungare la durata delle materie prime risulta molto apprezzata (M: 4,4) e la formazione del personale sulla corretta gestione degli alimenti (M: 4,37), a dimostrazione di un approccio orientato a prevenire lo spreco alimentare.

Pratiche come l'utilizzo della doggy bag (M: 4,28) o la razionalizzazione del numero di piatti nel menù per limitare la produzione di piatti poco richiesti dai clienti (M: 4,25) sono piuttosto diffuse. Molto spesso i ristoranti cercano inoltre di recuperare la materia prima in scadenza per la preparazione di piatti specifici (M: 4,16), tendono a utilizzare utensili o elettrodomestici per ottimizzare la lavorazione delle materie prime e ridurre gli scarti durante la lavorazione (M: 4,07), destinano gli avanzi e/o i residui alimentari all'alimentazione di animali (M: 4,04) e, infine, lavorano su prenotazione (M: 4,04). Inoltre, quando si opta per il servizio a buffet, viene preferito quello servito (M: 4,01).

Come si evince dal grafico successivo (Grafico 3), pratiche meno diffuse includono l'uso dei residui per produzioni alternative (M: 3,95) e la formazione del personale sul riutilizzo delle materie prime (M: 3,92). Altri approcci meno applicati sono quelli relativi all'utilizzo del cibo avanzato per la preparazione dei pasti del personale (M: 3,72) o all'educazione dei clienti sulle porzioni appropriate (M: 3,68).

Infine, altre pratiche risultano adottate in misura ancora più modesta, tra queste spiccano: la donazione di cibo non utilizzato a persone meno abbienti (M: 3,2), la trasformazione dei residui in compost o fertilizzanti organici (M: 2,72) e, infine, l'informazione al cliente sulle azioni intraprese per ridurre lo spreco alimentare (M: 2,63).

Fig. 3: Adozione delle pratiche utili a contrastare lo spreco alimentare (valore medio)



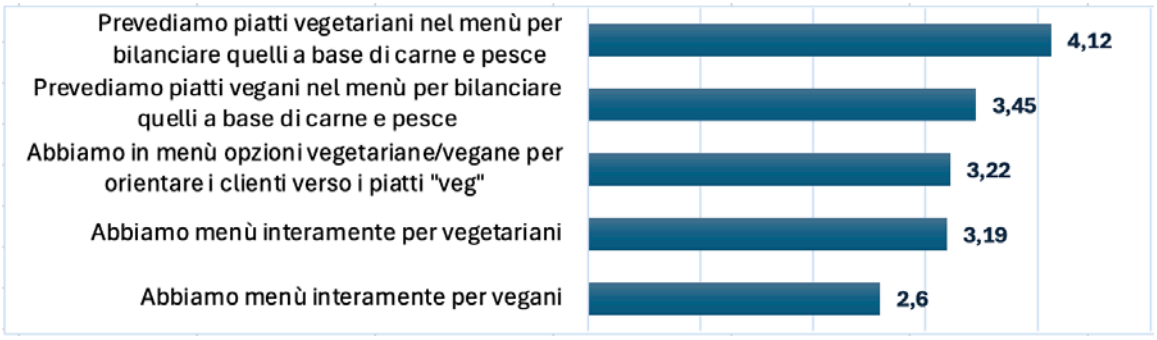
Fonte: Nostra elaborazione su dati campionari

5.3 Offerta di piatti plant-based

Come sottolineato più volte, è abbastanza diffusa l'idea che favorire la presenza di piatti plant-based rappresenti una scelta meno impattante in termini di produzione di emissioni di CO2 rispetto ad un tipo di ristorazione "meat-based". In questo senso, l'adozione di piatti vegetariani e vegani nei menù rappresenta una strategia emergente nel settore della ristorazione, mirata a bilanciare le

proposte tradizionali con alternative più sostenibili e adatte a un pubblico sempre più diversificato (Grafico 4).

Fig. 4: Offerta di piatti plant-based (valore medio)



Fonte: Nostra elaborazione su dati campionari

I risultati evidenziano che l'introduzione di piatti vegetariani risulta la pratica più diffusa (M: 4,12). L'offerta di piatti vegani, invece, è meno frequente (M: 3,45) a indicare una maggiore difficoltà o un minor interesse nell'ampliare la proposta verso alternative completamente prive di ingredienti di origine animale. Nonostante ciò, molti ristoratori riconoscono l'importanza di orientare i clienti verso opzioni vegetariane o vegane, includendo nei menù piatti "veg" specifici per sensibilizzare e incentivare il consumo di tali proposte (M: 3,22). Modesta risulta la disponibilità di menù interamente vegetariani (M: 3,19) e ancor meno diffusa la pratica di disporre di menù interamente vegani (M: 2,6).

5.4 Le barriere che ostacolano l'adozione di pratiche a favore della neutralità climatica e della sostenibilità

Lo studio evidenzia una serie di ostacoli che limitano l'implementazione di pratiche sostenibili e orientate alla neutralità climatica nel settore della ristorazione. Le barriere emerse sono riconducibili a vari fattori (istituzionali, d'impresa e di mercato) che riflettono sia le percezioni e le difficoltà degli operatori del settore, sia le caratteristiche del contesto territoriale.

Le principali difficoltà sono essenzialmente di natura culturale (Grafico 5) e sono riconducibili ad una mancanza di conoscenza e consapevolezza sul tema della sostenibilità e della neutralità climatica (M: 4,03). Parallelamente, segue la convinzione dei rispondenti circa il fatto che il territorio regionale possiede ancora un forte radicamento all'uso e al consumo della carne (M: 4,02) e del pesce (M: 3,54); una circostanza, quest'ultima, che riflette l'identità gastronomica del territorio e le aspettative dei clienti, spesso orientate verso piatti tradizionali a base di carne (M: 3,5).

Un ulteriore ostacolo significativo è rappresentato dalle difficoltà burocratiche che si affrontano nel fare gli investimenti necessari per favorire la transizione verso una ristorazione più sostenibile (M: 3,83) e, inoltre, dalla complessità dalle normative da rispettare (M: 3,59). Anche la carenza di formazione del personale si colloca tra le principali barriere per la riduzione delle emissioni di CO_2 (M: 3,51), per la preparazione di piatti vegetariani e vegani (M: 3,14) e per la gestione dello spreco alimentare (M: 2,69).

La mancanza di risorse economiche e organizzative per adottare pratiche sostenibili rappresenta un'altra criticità (M: 3,47), così come la difficoltà di reperire prodotti coltivati senza pesticidi (M: 3,48) o prodotti locali con regolarità e standard di qualità adeguati (M: 3,22). Inoltre, la domanda di piatti vegetariani e vegani risulta ancora limitata (M: 3,28), mentre la riduzione del consumo di pesce (M: 3,2) e carne (M: 3,05) viene percepita come una minaccia per l'economia produttiva locale.

Altri ostacoli comprendono il maggior tempo necessario per preparare piatti più sostenibili (M: 3,06) e, inoltre, la convinzione che gli operatori sembrano avere nel ritenere che il loro impegno individuale non farebbe la differenza nel mitigare il cambiamento climatico (M: 2,59) e, in ogni caso,

nel sostenere che gli effetti delle pratiche sostenibili si manifesterebbero solo nel lungo periodo (M: 2,96). Inoltre, la filosofia alimentare di alcuni chef o proprietari non rispecchia quella della ristorazione vegetariana o vegana (M: 2,89) e, al contempo, il personale non risulta essere adeguatamente formato per valorizzare i prodotti locali (M: 2,5).

Fig. 5: Le barriere all'implementazione di pratiche che contribuiscono alla neutralità climatica (valore medio)

Fonte: Nostra elaborazione su dati campionari

6. Conclusioni

Negli ultimi anni è cresciuta la consapevolezza sulla responsabilità che le attività legate alla supply chain all'interno del settore alimentare hanno nel contribuire a generare emissioni di gas serra. Per questo motivo, contrastare e mitigare la produzione di CO2 richiede un'azione coordinata e sinergica tra tutti gli attori e le organizzazioni della filiera alimentare (Okumus, 2019; Willet *et al.*, 2019). In

questo scenario, i ristoranti giocano un ruolo centrale, non solo per il modo in cui organizzano la loro operatività per soddisfare le esigenze dei clienti, ma anche per la loro capacità di influenzare e orientare i comportamenti di consumo (Munir, 2022).

Con riferimento a ciò che si fa per favorire l'uso di prodotti locali e stagionali, tra le azioni maggiormente implementate spiccano le seguenti: preparare piatti che valorizzino l'autenticità del territorio e che si basino sull'acquisto e l'uso di prodotti di stagione, regionali e di filiera corta e anche di carne e pesce provenienti da allevamenti non intensivi o comunque bio. Al contrario, tra le meno adottate si può far riferimento alla pratica di autoprodurre ciò che viene poi utilizzato nella preparazione dei piatti o, ancora, quella di indicare l'impronta carbonica di ogni piatto nei menù.

Al fine di contrastare quanto più possibile lo spreco alimentare, le azioni maggiormente adottate riguardano la programmazione quanto più efficace possibile degli acquisti, la programmazione della lavorazione dei piatti e della creazione dei menù per dare priorità all'uso dei prodotti prossimi alla scadenza, prestare attenzione a dimensionare le porzioni dei diversi piatti in menù, adottare tecniche di etichettatura e conservazione degli alimenti efficaci e innovative, formare il personale su come trattare i prodotti e, infine, prevedere l'uso delle doggy bag. Al contrario, tra le azioni meno adottate possiamo certamente citare quella di proporre i diversi piatti ai clienti in porzioni diverse, di preparare prodotti semilavorati e/o precotti, di usare i residui e gli scarti alimentari per produrre fertilizzanti organici e di informare/sensibilizzare i clienti sul tema dello spreco alimentare e delle azioni che il ristorante adotta per contrastarlo.

Infine, per incentivare l'offerta di piatti "veg", la pratica più diffusa è l'inserimento di piatti vegetariani nei menù, sebbene la proposta di piatti vegani risulti meno comune. Tendenzialmente, si cerca di bilanciare l'offerta vegetale con piatti a base di carne e pesce. Sebbene la presenza di menù interamente vegetariani sia relativamente adottata, la creazione di menù esclusivamente vegani è meno frequente.

Per quanto riguarda le barriere che ostacolano la diffusione di pratiche sostenibili e la riduzione delle emissioni di CO2, emergono soprattutto ostacoli di natura culturale. In primo luogo, si riscontra una carenza di conoscenza e consapevolezza riguardo ai temi della sostenibilità e della neutralità climatica, seguita da una forte tradizione enogastronomica che continua a privilegiare l'uso di carne e pesce. A queste barriere culturali si aggiunge, in alcuni casi, un senso di "scoraggiamento" derivante dalla convinzione che gli effetti positivi delle scelte sostenibili siano visibili solo nel lungo periodo. Non meno rilevanti sono le difficoltà di natura burocratica e normativa: molti partecipanti allo studio evidenziano come le complessità amministrative e legislative possano ostacolare l'adozione di pratiche sostenibili che contribuiscano alla mitigazione del cambiamento climatico. Un ulteriore ostacolo è la difficoltà nell'accedere alle risorse economiche e organizzative necessarie per effettuare gli investimenti e le scelte indispensabili per orientare la ristorazione verso un modello più sostenibile. Le barriere di mercato sono altrettanto significative; in particolare, i ristoratori lamentano la difficoltà di reperire sul mercato regionale prodotti coltivati senza pesticidi o provenienti da filiere corte che soddisfino gli standard qualitativi e quantitativi richiesti.

I risultati dello studio contribuiscono in maniera significativa ad arricchire il dibattito scientifico sulla ristorazione sostenibile e sul suo ruolo nel favorire il raggiungimento degli obiettivi di neutralità climatica. Al contempo, lo studio fornisce indicazioni utili per policy maker, associazioni di categoria, ristoratori e imprese della filiera alimentare, suggerendo aree di intervento (ad esempio, interventi di sburocratizzazione, semplificazione normativa, incentivi fiscali e crediti di imposta, formazione, ecc.) per stimolare una maggiore adozione delle pratiche sostenibili e per rimuovere le principali barriere che attualmente ne rallentano l'implementazione.

Lo studio, tuttavia, non è privo di limiti. In primo luogo, si basa su un campione di convenienza, focalizzato su un contesto geografico circoscritto; circostanza, questa, che limita la generalizzabilità dei risultati. Future ricerche potrebbero ampliare l'indagine a un contesto geografico più ampio (cross-regionale, nazionale e/o internazionale) e puntare a ottenere un campione più rappresentativo delle imprese ristorative analizzate. In secondo luogo, lo studio si focalizza sull'adozione di pratiche che riguardano aspetti più strettamente riconducibili alla gestione della ristorazione in senso stretto.

Future indagini potrebbero estendere il focus includendo un ventaglio di pratiche più ampio, abbracciando aspetti come l'uso di energie rinnovabili, materiali di bioedilizia, ecc. Inoltre, lo studio quantitativo si basa su analisi statistiche descrittive. Ricerche future potrebbero utilizzare tecniche inferenziali per una comprensione più approfondita dei fattori che influenzano l'adozione delle pratiche sostenibili. Infine, lo studio non ha esaminato se le caratteristiche dell'impresa (come la dimensione) o le caratteristiche demografiche dei rispondenti (ad esempio, età o anni di esperienza nel settore) possano influenzare l'adozione delle pratiche sostenibili e la percezione delle barriere ad esse associate. Un'analisi di questo tipo sarebbe un'ulteriore direzione di ricerca da esplorare in studi futuri.

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Appendice

Adozione delle pratiche per contribuire alla neutralità climatica	**Fonte**
Il menu include storie/informazioni su cosa il piatto rappresenta nelle tradizioni locali	Del Chiappa & Puligheddu (2023)
Il menù include informazioni sull'origine delle materie prime	Del Chiappa & Puligheddu (2023)
Valorizziamo la stagionalità della materia prima	Okumus (2019) Kim & Hall (2020) Di Pierro *et al.* (2023)
Acquistiamo prodotti di filiera corta	Elkhwesky *et al.* (2022) Di Pierro *et al.* (2023)
Prepariamo piatti che valorizzano l'identità/autenticità del nostro territorio	Del Chiappa & Puligheddu (2023)
Acquistiamo prodotti locali per la preparazione dei piatti	Okumus (2019) Kim & Hall (2020) Di Pierro *et al.* (2023)
Acquistiamo carne da allevamenti che rispettano il benessere degli animali	Di Pierro *et al.* (2023)
Acquistiamo carne da allevamenti bio	Del Chiappa & Puligheddu (2023)
Il menù indica l'impronta ambientale/carbonica di ogni piatto	Kim & Hall (2020)
Si informa il cliente sul perché vengono utilizzate certe materie prime	Okumus (2019)
Acquistiamo carne e pesce da allevamenti non intensivi	Di Pierro *et al.* (2023)
Produciamo, almeno in parte, la materia prima che ci serve per preparare i piatti	Elkhwesky *et al.* (2022)
Usiamo prodotti biologici per la preparazione dei piatti	Kim & Hall (2020)
Rivisitiamo i piatti nazionali e internazionali prevedendo l'uso di prodotti locali	Del Chiappa & Puligheddu (2023)
Riduciamo l'acquisto di prodotti stranieri/internazionali	Del Chiappa & Puligheddu (2023)
Usiamo/regaliamo i residui/avanzi alimentari per gli animali	Radwan (2010) Okumus (2019)
Riduciamo il numero di piatti in menù per non pre-impostare linee di produzione per piatti non scelti dal cliente	Okumus (2019) Kim & Hall (2020)
Prestiamo attenzione a dimensionare le porzioni dei piatti	Okumus (2019) Kim & Hall (2020)
Spingiamo quanto più possibile la vendita del menù degustazione	Del Chiappa & Puligheddu (2023)
Formiamo il personale su come utilizzare i residui delle materie prime	Okumus (2019) Kim & Hall (2020) Elkhwesky *et al.* (2022)
Usiamo i residui delle materie prime per produzioni alternative	Okumus (2019)
I piatti vengono proposti ai clienti in porzioni diverse	Del Chiappa & Puligheddu (2023)
Suggeriamo ai clienti di ordinare per gradi per evitare eventuali avanzi e sprechi	Del Chiappa & Puligheddu (2023)
Lavoriamo quanto più possibile su prenotazione	Del Chiappa & Puligheddu (2023)
Dovendo usare il servizio a buffet, optiamo per quello servito	Del Chiappa & Puligheddu (2023)
Utilizziamo utensili/elettrodomestici per aiutare a contenere lo spreco nella lavorazione della materia prima	Okumus (2019)
Sensibilizziamo i collaboratori di sala affinché suggeriscano ai clienti i piatti più adatti a ridurre lo spreco alimentare	Okumus (2019) Kim & Hall (2020)
Prevediamo e incoraggiamo l'uso della doggy bag	Okumus (2019) Elkhwesky *et al.* (2022)
Usiamo tecniche per ridurre i tempi di preparazione dei piatti	Okumus (2019)
Usiamo il cibo non utilizzato per preparare i pasti del personale	Okumus (2019)
Informiamo il cliente sullo spreco alimentare e sulle nostre azioni per ridurlo il più possibile	Del Chiappa & Puligheddu (2023)
Doniamo il cibo non utilizzato a persone meno abbienti	Okumus (2019) Elkhwesky *et al.* (2022)
Usiamo/regaliamo i residui/avanzi per fare compost e fertilizzanti organici	Radwan (2010)
Formiamo il personale sulla corretta preparazione e conservazione degli alimenti	Okumus (2019) Elkhwesky *et al.* (2022)
Prestiamo attenzione a ciò che ordinano i clienti e a ciò che non viene consumato	Okumus (2019)
Educhiamo i clienti sulle corrette porzioni dei piatti e alimenti	Okumus (2019)
Scegliamo i piatti anche con l'obiettivo di utilizzare la materia prima in scadenza	Okumus (2019)
Utilizziamo tecniche di lavorazione/conservazione per "prolungare" la vita delle materie prime	Del Chiappa & Puligheddu (2023)
Usiamo piatti semilavorati/precotti per la preparazione di piatti alternativi	Del Chiappa & Puligheddu (2023)
Curiamo la fase di conservazione ed etichettatura degli alimenti	Okumus (2019)
Utilizziamo diverse tecniche di conservazione	Del Chiappa & Puligheddu (2023)
Programmiamo gli acquisti evitando di sovradimensionare gli stock di prodotti alimentari	Okumus (2019)
Abbiamo in menù opzioni vegetariane/vegane per orientare i clienti verso piatti "veg"	Okumus (2019) Elkhwesky *et al.* (2022)
Abbiamo menù interamente per vegani	Del Chiappa & Puligheddu (2023)
Abbiamo menù interamente per vegetariani	Del Chiappa & Puligheddu (2023)
Prevediamo piatti vegani nel menù per bilanciare quelli a base di carne e pesce	Elkhwesky *et al.* (2022)
Prevediamo piatti vegetariani nel menù per bilanciare quelli a base di carne e pesce	Okumus (2019) Kim & Hall (2020)

Barriere all'adozione di pratiche a favore della neutralità climatica e della sostenibilità	**Fonte**
Al personale manca la formazione per lavorare i piatti in modo da valorizzare i prodotti locali	Del Chiappa & Puligheddu (2023)
Ci vuole tempo a preparare piatti che siano più sostenibili	Del Chiappa & Puligheddu (2023)
Il nostro territorio ha una cultura/tradizione fortemente legata all'uso di pesce	Del Chiappa & Puligheddu (2023)

Ridurre il consumo di pesce metterebbe in crisi l'economia produttiva locale	Del Chiappa & Puligheddu (2023)
Il nostro territorio ha una cultura/tradizione fortemente legata all'uso di carne	Del Chiappa & Puligheddu (2023)
Ridurre il consumo di carne metterebbe in crisi l'economia produttiva locale	Del Chiappa & Puligheddu (2023)
Non sono convinto che cambiare i miei comportamenti nella gestione del ristorante possa fare la differenza nel contenimento delle emissioni	Del Chiappa & Puligheddu (2023)
Anche se ci impegnassimo per contenere la produzione di CO2, gli effetti si manifesterebbero solo nel lungo periodo	Del Chiappa & Puligheddu (2023)
Anche se ci impegnassimo a contenere la produzione di CO2, non credo che questo farebbe la differenza nel mitigare il cambiamento climatico	Del Chiappa & Puligheddu (2023)
Mancano le risorse economiche/organizzative per adottare una ristorazione orientata alla riduzione delle emissioni di CO2	Elkhwesky *et al.* (2022)
La ristorazione vegetariana/vegana non rispecchia la filosofia alimentare dello chef/proprietario del ristorante	Del Chiappa & Puligheddu (2023)
La richiesta di piatti "vegetariani/vegani" è ancora ridotta	Del Chiappa & Puligheddu (2023)
Al personale manca la formazione sui temi della cucina vegetariana/vegana	Del Chiappa & Puligheddu (2023)
In generale, manca la consapevolezza sulla rilevanza di questi temi	Elkhwesky *et al.* (2022)
C'è molta normativa/burocrazia nell'adottare un tipo di ristorazione che aiuti a contenere le emissioni di CO2	Elkhwesky *et al.* (2022)
Si riscontrano difficoltà burocratiche nel fare investimenti/scelte verso una ristorazione orientata alla riduzione delle emissioni di CO2	Elkhwesky *et al.* (2022)
Al personale manca la formazione su come la ristorazione possa contribuire a contenere le emissioni di CO2	Del Chiappa & Puligheddu (2023)
Nell'immaginario dei nostri clienti la cucina sarda è legata a piatti di carne e questo si aspettano	Del Chiappa & Puligheddu (2023)
È difficile reperire prodotti coltivati senza pesticidi	Del Chiappa & Puligheddu (2023)
È difficile reperire prodotti locali con la regolarità e gli standard di qualità che ci servono	Del Chiappa & Puligheddu (2023)

Track 15
Tertiarization & Sustainability. new challenges for management in the Digital Era

Conflicting narratives in car pathways: a case study of Italian stakeholders' framings of the automotive low-carbon transition

FEDERICA GASBARRO[1]

Abstract

Frame of the research. *The pathways of low-carbon automotive transition are still uncertain. Different stakeholders' framing influences the success of the solutions identified by regime or niche actors.*

Purpose of the paper. *This study aims to uncover stakeholders' framing of the low-carbon transition in the automotive sector, with specific attention to servitization alternatives.*

Methodology. *We carried out a content analysis of the news articles published between 2020 and 2024 in major Italian newspapers: Corriere della Sera, ANSA financial news, ANSA business, and Milano Finanza.*

Results. *We found two broad narratives, one about the mobility transition within the urban areas and another about the automotive perspective. Depending on the actor and time, stakeholders' views can differ. Even though electric car sales dominate the public discourse, other narratives emerged: a discourse surrounding car rental and electric scooter sharing.*

Research limitations. *The analysis is limited to a specific case study and should be extended to a broader context. In addition, the analysis is limited to national newspapers included in the Nexis Uni database.*

Managerial implications. *These results suggest that mobility servitization is gaining legitimacy in public discourse and that if automotive incumbent firms continue delaying the transition, the regime might be destabilized and transformed by other actors.*

Originality of the paper. *While previous research mainly analyses the narratives about technical solutions of automotive low-carbon transition, we broaden the focus to alternative business models.*

Key words: *Low-carbon transition; Multi-Level Perspective (MLP); automotive regime; stakeholders' narratives; niche innovations.*

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1. Introduction

Decarbonizing transportation is a top global priority for mitigating the effects of climate change. With the ratification of the Paris Agreement, 191 of the 197 UN parties put decarbonization on their agenda. Transportation is one of the key sectors in this process. In fact, according to the IEA, CO2 emissions in the transport sector accounted for 27% of the global emissions in 2019. This represents more than a quarter of the total GHG emissions (IEA, 2021)-half of which is generated by passenger vehicles. Globally, passenger transport is going to increase nearly threefold between 2015 and 2050. Previous data suggest that, despite some technological improvements in energy efficiency, the transportation sector's global greenhouse gas emissions rose from 4.8 to 8.5 Gt CO2eq between 1990 and 2018, of which road transport, comprising both passenger and freight modes, accounted for 73% (Lamb *et al.*, 2021). The increase in passenger vehicles has been driven, on the one hand, by growing demand for private transport, and on the other, by changes in vehicle characteristics (increased weight and size of passenger cars) (Dargay *et al.*, 2007). Some progress has been made towards the transition: for instance, the IEA's World Energy Outlook (202) reported that in 2023, over one in five new car registrations was electric in Europe, one in ten in the United States, and more than one in three in China. However, further progress is still necessary to meet the targets set by the Net Zero Emissions by 2050 (NZE) scenario.

Transportation accounts for over one-quarter of all greenhouse gas (GHG) emissions in the EU, causing air pollution, noise pollution, and habitat fragmentation (*Transport and Mobility*, 2024). Road passenger transport in the EU is expected to grow by approximately 21%, and freight transport by 45% by 2050. In response, a strong political commitment to decarbonization has emerged in Europe. The EU has set a binding target of achieving climate neutrality by 2050 and to cut emissions by at least 55% by 2030. This requires a substantial decline in current GHG emission levels over the next decades.

As part of this effort, the EU is revising its climate, energy, and transport-related legislation under the 'Fit for 55 package', which includes a proposed target of 100% emissions reduction by 2035 (CE, 2021). This implies that from 2035, it will no longer be possible to place cars or vans with an internal combustion engine on the market in the EU. Phasing out the combustion engine will require a fundamental transformation of the automotive industry, with significant effects on automotive manufacturers and indirect effects on supply chains and logistics systems.

However, improvements in fuel efficiency (e.g., phasing out the internal combustion engine with electric and hydrogen vehicles) seem not to be sufficient to decrease impacts from transportation and need to be coupled with a reduction in the transport demand and new ways of providing transportation services (Arbeláez Vélez *et al.*, 2023; Montoya-Torres *et al.*, 2023), including car sharing, ride-hailing, micro-mobility, and active mobility. This implies a profound transformation of the transport system. Therefore, the automotive transition is often depicted as a socio-technical transition, which is a transformation of a system resulting from a co-evolution of structures, technologies, and behaviors, at three levels: niche or micro level, regime or meso level, and landscape or macro level (Geels, 2002). At the niche level, innovations take place. At the regime level, various actors (e.g., incumbents, consumers, policymakers, and other stakeholders) as well as established rules, processes, technology, and culture that support the dominant order operate. At the landscape level, macro-economic and social trends, which are beyond the control of individual actors, pose pressures to the regime and niche levels, unfold (Geels, 2012).

In the case of mobility transition, the automotive regime suffers several pressures at the landscape level, not only related to the introduction of restriction of GHGs emissions, but also by the development of digitalization, and at niche level by innovations such as biofuels, electric vehicles, and smart cards (Geels, 2018). However, the pathways of automotive transition are still open. The success of the solutions identified by regime or niche actors will depend not only on their sustainability degree and economic viability but also on the level of consumers' and stakeholders' acceptance (Dessi *et al.*, 2022; Spandagos *et al.*, 2022; van Vliet *et al.*, 2020). The level of acceptance

is then influenced by different actors' narratives. In fact, within a socio-technical transition, how actors frame the different transformative pathways might influence the evolution of transition by either supporting or opposing the regime or niche innovations (Hermwille, 2016; Roberts, 2017). Therefore, to grasp socio-technical transition outcomes, it is important to analyze stakeholders' narratives. If the previous research mainly analyses technical solutions, we broaden the focus to alternative business models. Therefore, this study aims to shed light on the stakeholders' narratives about the automotive transition, with specific attention to servitization alternatives.

With a case study on the Italian automotive low-carbon transition through a content analysis of the news published by Italian newspapers from 2020 to 2024, we discovered two overarching narratives: one concerning the mobility transition in urban areas and the other from the automotive perspective. Stakeholders' frames can vary based on the actor and timing. Although the public discourse is dominated by electric car sales, our analysis revealed other narratives. For example, the discussion about rental business models centers on innovative forms of renting, including individual long-term car rentals and corporate fleet rentals. Furthermore, another narrative is developing around scooters, particularly electric ones. However, Italian stakeholders frequently characterize this option as a hazardous form of mobility.

The structure of this paper is as follows: in the next section, an overview of the pressures for a low-carbon transition and the role of the stakeholders' narratives toward its transformation are presented. Then, a description of the method and data for the analysis is provided. The findings section covers the main narratives in car services pathways and the contrasting discourses by stakeholders. Finally, we proceed with the discussion and conclusion.

2. The automotive regime and the pressures for a low-carbon transition

Within the Multi-Level Perspective (MLP), a regime is a set of established rules and actors that co-evolve and adapt to the environment (Geels, 2012). It encompasses networks of social groups and actors (e.g., firms, engineers, users, policymakers, stakeholders), a set of formal and informal rules for the socio-technical system, and the technical elements and materials. Innovation is often gradual under established regimes due to several lock-ins and path dependencies. As highlighted by Geels (2012), in the transport sector, there are several regimes, e.g., automotive, tram, train, cycling, and so on. However, the importance of the automotive industry for the actual economic system makes the transport sector dependent on car ownership (Mattioli *et al.*, 2020). The lock-ins of the automotive regime are well summarized by Mattioli *et al.* (2020), who identified the key characteristics of the automotive industry that contribute to car dependence as follows: 1) It is a major industrial sector of the world economy, playing a fundamental role for the economic development by introducing technological innovations and improvement in labor organizations imitated by other industries, and having significant economic ties to other sectors, both upstream and downstream supply; 2) The products characteristics required high capital investments in big volume plants which only few companies could afford. As a consequence, this led to a political conflict; in other words, the governments tend to support this industry with public funds because the automotive factories are too big to fail. This created a political lock-in both for this industry and to a specific configuration of production; 3) The dominating technical regime of vehicle manufacturing provides for economies of scale but demands high production and sales volumes relative to capacity. Additionally, the size and expense of new car plants make it challenging to adjust output to demand. In saturated car markets in developed countries, car makers compete through product differentiation, with a proliferation of models, which makes it more difficult to achieve the break-even point.

Beyond the automotive industry characteristics, according to these scholars, transport system car dependence is also due to: 4) the provision of car infrastructure such as publicly funded paved roads, parking, and enforcement of driving regulations; 5) the political economy of urban sprawl: low population density, limited roadway connection, and monofunctional land use contribute to increased

automobile usage; 6) the provision of public transport: where the public transport is limited there is an increase of car ownership; 7) cultures of car consumption: Institutions encourage people to travel by car even if other options are more cost-effective, convenient, or have a better societal and environmental impact. In the case of cars, these are considered not just as a means of transportation, but also as symbols of 'freedom', independence, class differentiation, personal space, offering protection from the outside world (e.g., crime, weather, road-traffic safety, encounters with strangers, and air pollution), as well as 'cocooning' through insulation and in-car entertainment systems (Mattioli *et al.*, 2020).

The automotive regime is receiving several pressures not only related to the introduction of restriction of GHGs emissions, but also to the introduction of some measures by local authorities such as parking limitations, traffic calming, traffic-free pedestrian zones, bus use promotion, and road pricing, or reduce the prevalence of vehicles in some urban areas (Geels, 2012). In addition, the diffusion of Intelligent Transportation Systems (ITS), which integrates Information and Communication Technologies (ICT) devices into transport and highway systems to collect information on traffic and accidents helping the management of traffic flows, and that of ICT in everyday life, giving rise to an information society with new practices such as teleworking, teleshopping, and teleconferencing, challenge the automobility regime (Geels, 2012). Finally, ICT development enables widespread mobility services and new business models, threatening the automotive regime. Further threats to the automotive regime come from the niche level. As an example, in the UK passenger transport transition, five niche-innovation trajectories have been identified: biofuels, electric vehicles, smart cards, compact cities, and home working (Geels, 2018).

According to the previous research, to face the pressures deriving from the changes in the socio-technical landscape and from niche innovations, the automotive industry can adopt different measures, both in terms of fuel and powertrain technology substitution and in terms of business model changes towards servitization. When considering innovations for the carbon transition, the automotive industry has several options. On the one hand, several alternative fuels can be considered as a substitution for conventional fuels, such as natural gas, electric power, hydrogen, biofuels, and renewable fuels, on the other hand, there are three primary options for powertrain substitutions: producing hybrid, battery electric, fuel cell electric vehicles (FCEVs) (Shahzad & Iqbal Cheema, 2024). Hybrid vehicles combine an Internal Combustion Engine (ICE) with an electric motor and can be considered a temporary step toward full decarbonization thanks to their improved fuel efficiency and reduced emissions compared to traditional ICE fueled only with gasoline or diesel (Shahzad & Iqbal Cheema, 2024). Battery electric vehicles (BEVs) have an electric motor powered by batteries that are charged on the electric grid and do not emit either greenhouse gas (GHG) emissions or other air pollution (De Stefano *et al.*, 2016). Fuel cell vehicles rely on an electrochemical process within a fuel cell for converting fuel energy into electric energy. This system can be powered with diverse fuels, even gasoline, but the most suitable alternative for carbon transition is clean fuel such as hydrogen derived from renewable energy (De Stefano *et al.*, 2016). The use of biofuels, such as ethanol and biodiesel, is controversial because of the implications in terms of land use (e.g., deforestation), water consumption, and food production, therefore, electricity and hydrogen are usually considered more sustainable options as fuels for transportation. However, BEVs and FCEVs also face several challenges, the former in terms of duration and distance covered, availability of charging stations, and affordability, while the latter in terms of hydrogen production and storage, charging stations, and higher costs (Shahzad & Iqbal Cheema, 2024). Regarding business model changes, these range from the main traditional business models of selling a product (Pure product) to providing a mobility service (Pure service) (Gaiardelli *et al.*, 2014; Genzlinger *et al.*, 2020; Tukker, 2004).

3. Framing the Automotive Regime Transformation

If a transition is conceived as a result of interactions and co-evolution of niche, regime, and landscape levels in a socio-technical system according to the multi-level perspective (Geels, 2002), it has been shown that how the pressures and innovations to the regimes are narrated by different actors can influence the transition direction (Hermwille, 2016). Narratives, therefore, on the one hand, can be considered the way stakeholders make sense of transformative options, and on the other (Upham & Gathen, 2021), a way stakeholders communicate their interpretation (Drexler *et al.*, 2022). This may result in an attempt to create or erode the legitimacy of socio-technical transformations (Rosenbloom *et al.*, 2016). Actors choose topics and language to shape recipients' comprehension of the facts they are narrating; in this way, they represent a system of framing (Hermwille, 2016). A frame usually outlines the problem and its characteristics, discusses the reasons behind the particular issue, and offers potential answers (Drexler *et al.*, 2022; Entman, 1993). These narratives can be formulated by regime actors, to legitimize and defend the socio-technical regime (Roberts, 2017) by niche actors to legitimize their innovations (Rosenbloom *et al.*, 2016), and also by underrepresented groups that present the same issues in different, perhaps even conflicting, manner (Hermwille, 2016). Each group of stakeholders proposes its narrative of the socio-technical transition, contributing to creating a discourse coalition of actors sharing the same narrative and conflicting coalitions proposing different narratives (Roberts, 2017).

These narrative coalitions influence the evolution of transition by either supporting or opposing the regime or niche innovations (Roberts, 2017) and help define what is politically possible (Hermwille, 2016). Then, the success of the solutions identified by the firms will depend not only on their sustainability degree and economic viability but also on the level of consumers' and stakeholders' acceptance (Dessi *et al.*, 2022; Spandagos *et al.*, 2022; van Vliet *et al.*, 2020). For instance, BEVs and FCEVs require changes in the vehicle structures and in the driving patterns, which implies from the producer side a change in the manufacturing process and relationship with the suppliers (e.g., chemical and energy industries) and from the consumer side a change of mind (De Stefano *et al.*, 2016). The level of acceptance is then influenced by narrative coalitions. For example, in the public discourse about the mobility transition, the German representatives of industry, science, policy, and media frame a transition as a necessity, but they propose different solutions, especially in terms of technical innovations for cars (Drexler *et al.*, 2022). Moreover, narratives change over time (Roberts, 2017) and vary by context (Hermwille, 2016). Therefore, to understand the pathways of mobility transition, it is necessary to carry out further analyses of actors' narratives in different contexts and times.

4. Method

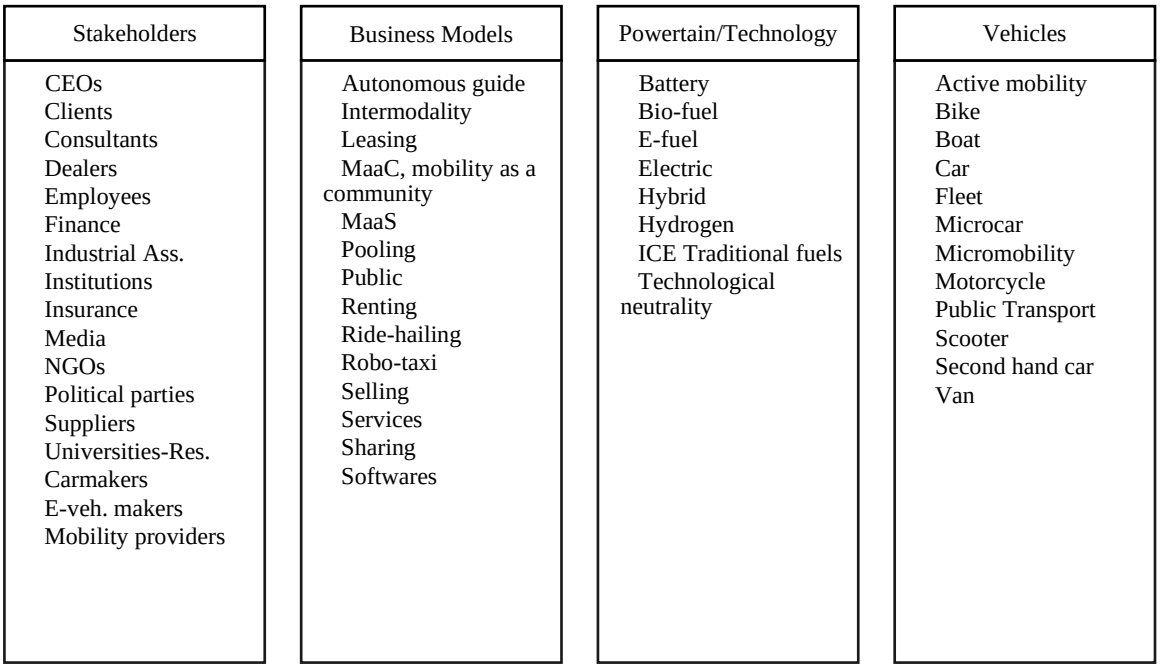
While the scientific literature on green technologies for the automotive transition is mainly focused on American, British, and German case studies (Fava & Favero, 2023), we chose the Italian case study because the country is currently engaged in a significant debate on the future of its automotive industry. Italy has a long-standing tradition in this sector, which represents a fundamental pillar for the nation's economic and social development. However, since the downsizing of Fiat-now a Stellantis bone-and the divestment of its plants and research centers, the sector is experiencing a decline (Lanzini, 2024). Despite this downturn, the automotive sector still retains an important role in the Italian economy, generating approximately 54 billion euros in turnover and employing around 170,000 workers (Moretti & Zirpoli, 2021). As a result, the transition of this socio-technological regime occupies a prominent place in national debates. Various solutions are portrayed either as potential threats, capable of deepening the industry's crisis with repercussions on employment, or as an extraordinary opportunity to revitalize the entire economic system.

To catch stakeholders' narratives on the automotive transition towards net-zero emissions, we conducted a qualitative analysis using data from Italian newspapers. Specifically, we carried out a content analysis of news published by *Corriere della Sera, ANSA financial news, ANSA business*, and *Milano Finanza* between 2020 to 2024. Relevant articles were retrieved from the Nexis Uni database using the following keywords: "automotiv* AND maas OR sharing OR renting OR leasing OR mobility services OR pooling". Nexus Uni is a comprehensive online database that offers access to news, business, and legal information.

We retrieved 64 articles in 2020, 55 in 2021, 82 in 2022, 52 in 2023, and 65 in 2024, for a total of 318 articles. All articles analyzed were written in Italian. This method allowed us to address the limitations of previous research by encompassing a broader range of automotive innovative solutions, including business model transformation, and reflecting the perceptions of multiple stakeholders such as the national governments, the research community, non-governmental organizations (NGOs), labor and trade unions and associations, representatives from other relevant institutions, and civil society.

The data has been coded and analyzed using NVivo software. The content analysis followed a step-by-step approach. The first step involved first-order manual coding to identify the main topics and actors discussed in the articles. These initial codes were then grouped into higher-level categories representing the broader narrative themes and actor groups (see Figure 1). Cross-tabulation among the codes and word frequency was used to support the interpretation of the data.

Fig. 1 - Second-order codes and aggregate dimensions



Source: our elaboration

5. Results

5.1. The main narratives in the car services pathways

The word frequency cluster analysis provided a broad picture of the main narratives in the newspapers analyzed: on the one hand, the mobility transition within the urban areas, and on the other, the automotive perspective. In the first narrative, several topics are discussed, such as car sharing, scooter sharing, public transport, long-term rental, and company fleets. In the second

narrative, other topics are discussed: services for clients, car sale trends, European car transition and the role of electric cars, the car crisis, electric car sales, the incentives for car sales, and the long-term rental to private clients and company fleets.

Even though mobility by electric scooter seems to be a promising solution for sustainable mobility, gaining popularity among citizens and showing growth in both sales and sharing solutions, it is also portrayed as a risky alternative for urban mobility, frequently discussed in terms of accidents and insurance issues:

> *There are 2,000 scooters [in Milan]. In the usage ranking, scooters come first with 9,053 daily rentals and an average duration of 16 minutes. "We are at a crossroads, and we have to decide what to do about these vehicles - said the mayor. We have not pushed for the spread of scooters either. We are aware that they are seen by some citizens in a not-so-positive light, but we have to balance, on the one hand, the risks related to the service, and on the other, the fact that they are ecological vehicles"* (Corriere della Sera, April 4, 2024).

Between 2020 and 2021, public transport was often associated with higher health risks due to COVID, while riding a private car was portrayed as a safer mode of transportation:

> *Forty percent of the academic community of the University of Turin plans to change the way they travel to reach the university campuses. Students, professors, and employees, with a higher incidence than the Italian average, are ready to revolutionize what experts call modal choices. Public transport will pay the price. Buses will lose 20 percent of the "university travelers" from the pre-COVID period. A predictable figure due to the contagion nightmare that goes hand in hand with another less predictable one. Half of these former GTT users will replace the bus and tram with a car or a scooter. The remainder, fortunately, have chosen a bicycle, a scooter, or a shared vehicle as an alternative* (Corriere della Sera, October 9, 2020).

Car sales trends, especially those of electric cars, are portrayed positively at the beginning of the period considered, but negatively towards the end. These narratives are often associated with requests for incentives*:*

> *In Italy, the share of electric vehicles was low until the latest incentives came into force (June 3), but with the incentives in June, it doubled from 4.4% in June 2023 to 8.4%. The problem is what will happen when the effects of the incentives end. Furthermore, doubts are starting to creep in - says President Gian Primo Quagliano* [Centro Studi Promotor] *- about the future of the electric car and it therefore appears necessary and urgent that the European Union, with its new institutional bodies, say a clear and definitive word on the policy it intends to conduct in terms of sustainable mobility (*ANSA Financial News, July 18 2024).

The car crisis and the decline in sales are sometimes mentioned alongside rising car prices:

> *Car purchase incentives are an important factor in enabling the renewal and growth of registrations: recently, prices have increased significantly, alienating the lower-income segment of customers," says the president of Areté* [Massimo Ghenzer]. *"Furthermore, in this delicate transition phase, incentives should be provided for both traditional cars (petrol and diesel, ed.) and hybrid and electric cars. Also, because, for the moment, the prices of electric cars are still high and therefore their purchase is mainly linked to high spenders, who need incentives less, it is better to allocate resources to those with a medium and low income." The increase in car prices is also reflected in the corporate fleet sector, which has changed profoundly in recent years. "In the past, companies had their cars in their fleets. Today, however, they mostly take them with long-term rental contracts, to pay only a monthly fee and delegate the other costs to the rental company:*

> *a solution that also appeals to private individuals, since it allows them to use a car without the commitments that ownership requires", he concludes* (Corriere della Sera, March 4, 2024).

Company fleets are depicted as an opportunity for a low-carbon transition:

> *The main way is electrification: many new cars are hybrid or electric. The offer is complete, but people can't get a clear idea, and there is some push to back the expected objectives. Mario Draghi wrote in his latest report: we must first convert the cars of company fleets that are 60% of the circulating fleet while postponing 2035 would lead to a further delay compared to China, the leader in this market"* [Michele Crisci's declaration, Volvo Italia CEO and Unrae's president] (Corriere della Sera, October 6, 2024).

Car long-term rental is also depicted as an opportunity for the transition towards low-carbon mobility:

> *Rental confirms its centrality in policies aimed at accelerating the ecological transition of the Italian circulating fleet, among the oldest in Europe, explains Alberto Viano, president of Aniasa. Not only because it registers more green cars, but also because company fleets use cars of the latest generation, economically accessible and less polluting* (Corriere della Sera, March 4, 2024).

5.2. Contrasting discourses by stakeholders

The narratives expressed by different actors are far from homogeneous. Regarding technology, stakeholders often express their views on electric vehicles, sometimes coupled with discourse about battery and hybrid solutions. The view of stakeholders varies depending on the actor and the time. For example, in 2020, a car industry association 2020 argued that the transition through electric vehicle adoption, particularly when driven by public incentives, was proceeding too rapidly. They claimed this pace of change limited the free choice of consumers and caused distortion in the market:

> *By remodulating the second round of eco-bonuses, the government has strongly favored electric or, in any case, low environmental impact vehicles. A choice not entirely shared by the Union of Foreign Manufacturers (Unrae): "The division of financing into three ceilings is disconnected from real market segmentations and risks slowing down the free choices of consumers", said the president of the association, Michele Crisci. Who added: "It is plausible to think that the ceiling of one hundred million euros destined for vehicles that emit from 91 to 110 g/km of CO2 will run out prematurely, creating inevitable market distortions"* (Corriere della Sera, September 14, 2020).

In 2024, the same car industry association declared that electrification is the main pathway to a low-carbon mobility transition, and that the market is ready to adopt needed incentives, as quoted in the previous section. In the narrative of other stakeholders, such as researchers, electric car makers, and finance companies, the transition to electric cars is too slow. In the words of an asset management company:

> *The legacy of pollution left by those who do not go in the right direction will be significant because cars sold today will be on the road for an average of 12 years, if not 20. For Federated Hermes, it is therefore necessary to accelerate the process of adoption of battery electric vehicles (BEV). "With the reskilling of the workforce," the report concludes, "it is therefore the key to achieving the 100% penetration of these vehicles required ideally by 2030 or 2035 at the latest."* (Milano Finanza, March 9, 2021).

Some suppliers call for technological neutrality:

> *It is wrong to see electricity as the only solution for the future of the automobile," says Paolo Scudieri, number one of Adler Group (plastics processing) and former president of the National Association of the Automotive Industry Supply Chain. "The energy transition process desired by the EU, he explains, limits our freedom when the market is experiencing uncertainty; on the contrary, we must be able to attack it. We need clarity, technological neutrality gives more space to the entire automotive sector, including components."* (Corriere della Sera, September 24, 2024).

Media journalists provided a more analytical view of electric car diffusion:

> *Almost careless of what was considered an accident along the way, it was thought that the combustion engine could dictate the rules for a long time. To the point of believing that it would be enough to postpone the deadline indicated by Europe in 2035, when thermal engines were to cease being sold, to think of continuing "business as usual". And yet, there was the example of a Tesla. The markets gave the American company the same value as all the major global car manufacturers. Certainly not, or better, not only for the electric engines that powered them. It was not a question of replacing an engine with a different one, and not necessarily an electric one, but also of having different technologies and methods of use on board, as demonstrated by the acceleration of rental* (Corriere della Sera, December 3, 2024).

The narratives regarding other technological options are limited in the news analyzed. They refer especially to some experiments and pilot projects, such as the first service station in Venice for hydrogen refueling in an urban area, developed by Eni in collaboration with Toyota.

The discourse about alternative business models to pure products is broader. The narrative about sharing is more frequent than that related to selling, and the renting business model narrative closely follows that of the selling business model. The narrative regarding rental is strongly supported by thematic industry associations and mobility service providers:

> *Mobility requires structural measures for achieving the objectives of containing emissions decided at the European level, starting with legislative interventions to lighten the tax burden, explains Alberto Viano, president of Aniasa. Spreading the use of rental, especially among private individuals, can only guarantee immediate advantages in support of the automotive market, the replacement of the circulating fleet, the ecological transition, and also the fiscal emergence* (Corriere della Sera, June 12, 2023).

However, the news reports a positive trend in the car renting and leasing market, which attracts several players from the bank sector and traditional car makers:

> *The Italian car market has become populated by specialized players. Among the largest, there are Sicily By Car, expected to be listed on the stock exchange soon, and Leasys, a company of the Stellantis group that will now be divided 50% with Credit Agricole. Still half Italian, of the Fca Bank group, is Drivalia, a company mostly focused on long-term rental and on the new subscription formula: monthly car subscription formulas that can also be purchased on Amazon. Focused mainly on leasing, in Italy, the subsidiaries of the various credit institutions stand out. Credemleasing recently signed a partnership with Avvera (both of the Credem group) with the aim for the latter to reach 30 million in financing in the automotive and capital goods leasing sector by 2025. Among the Italian names is UnipolRental, which combines in the car rental all the mobility services of the Unipol group in a single monthly payment. In Italy, however, a large slice of the market belongs to foreign names such as the French Arval Service Lease, the American Avis Budget Group, Hertz, or Ald Automotive, a majority-owned subsidiary of Société Générale. Whether they are foreign or Italian, companies are understanding the need for a change in the offer of the automotive world. Manufacturers are also doing so, such as*

> *Citroen (part of the Stellantis conglomerate), which is evaluating a leasing period of 15 years. The era of car ownership has ended, and the era of sharing seems to have begun."* (Milano Finanza, October 22, 2022).

Another sign of this important innovation in the automotive industry is the fact that there is a dealer transformation from car sellers to car service providers:

> *"Our goal, in addition to creating critical mass, is to transform our points of sale into real mobility centers. So we intend to grow and hire, explains Marco Utili, CEO of Biauto, with 430 million in revenue. Within our shops, we include bodywork, short and long-term rental services, and financing. This is how we address the transformations of the sector and aim for relaunch"*. (Corriere della Sera, December 31, 2024, TORINO Edition).

As pointed out before, the narrative about renting business models covers especially new forms of renting, such as long-term car renting for private citizens, while usually this service was aimed at companies, and company fleet renting, while in the past, private companies mostly preferred to own their car fleets. In addition, the discourse about renting business models covers the opportunity related to changing the company fleets with electric vehicles.

The narrative about sharing business models is mainly proposed by public institutions, such as municipalities, mobility providers, NGOs, and research institutions, to switch to sustainable mobility. As an example:

> *The urban planner and architecture theorist Ratti provides useful elements for the direction to take: "Today we have a lot of data to understand how to improve urban mobility. In New York, many vehicles repeat the same routes in the same period. A car-sharing operation would be enough to reduce the vehicles on the road by 40%", explained the expert. "For 90% of the time, the vehicles in the city are not used, but occupy public land, stopping in a parking lot. Thanks to technology, we can therefore reverse the trend and make improvements with new services"* (Corriere della Sera, June 28, 2023).

Interestingly, sharing business models are not related only to cars and bike vehicles anymore, but also to scooters, especially electric scooters, as recalled in the previous section.

6. Discussion and conclusion

The objective of this research was to shed light on the stakeholders' narrative about the low-carbon automotive transition, with specific attention to alternative business models beyond the traditional product-sale approach. Our analysis of Italian newspapers from 2020 to 2024 provides a broad picture of the different actors' discourse about the alternative pathways for the transition. We found two broad narratives, one about the mobility transition within the urban areas and another on the automotive perspective. In the first narrative, several topics are discussed such as car sharing, scooter sharing, public transport, long-term rental, and company fleets; while in the second narrative, services for clients, car sales trends, European car transition, and the role of electric cars, the car crisis, electric car sales, the incentives for car sales, and the long-term rental to private clients and company fleet are the major topics.

While our analysis especially targeted business model alternatives for the low-carbon transition, the dominant discourse largely focused on the electric car market. Stakeholders' views vary over time and across actor types. For instance, carmakers and their associations, and supply chain members, frame electric car adoption either as too fast, not accepted by the market, or not supported by government incentives. On the other hand, journalists, finance companies, researchers, and electric carmakers frame the transition through electric car adoption as too slow and advocate for

acceleration. Even though electric car sales dominate the public discourse, other narratives emerged from our analysis. In particular, the discourse surrounding rental business models focuses particularly on novel types of renting, such as long-term car rentals for individuals, while traditionally rental was targeted at businesses, and corporate fleet rentals, whereas private companies used to prefer owning their car fleets. Moreover, the discussion regarding rental business models encompasses the perspective of transforming corporate vehicle fleets into electric ones. This narrative is supported by several stakeholder groups such as dealers, banks, industry associations, and mobility service providers. In addition, there is an emerging narrative related to scooters, especially electric scooters. This technological niche innovation has gained market share in recent years, but the Italian stakeholders often depicted this solution as a risky alternative for mobility. This can be interpreted as an attempt to delegitimize this niche innovation in the eyes of the citizens who are adopting it as a sustainable alternative for urban mobility.

Therefore, our analysis showed that if the automotive regime suffers several pressures at the landscape level, not only related to the introduction of restriction of GHGs emissions, but also by the development of digitalization, and at the niche level by innovations such as biofuels, electric vehicles, and smart cards (Geels, 2018). It is suffering pressures also within the regimes with the development of alternative business models such as car sharing, renting and leasing, offered by client companies, or new players belonging to other regimes, attracted by positive market trends. This represents an additional threat to the market share of car sales to the final customers, which is traditionally dominated by carmakers. Our analysis highlighted that new niches are emerging, such as electric scooters. This and private long-term car rental and company fleet service innovations are supported by several stakeholders with alternative framing for the automotive transition.

Our study has important implications for the automotive regime. It shows that within the regime, several actors already embraced the low-carbon transition and are framing the public discourse to accelerate the adoption not only of electric vehicles but also of more sustainable business models beyond car selling, such as vehicle sharing, renting, and leasing. Our analysis indicates that sustained pressures on automotive regimes from all three system levels are being translated into supporting narratives echoed in national newspapers. Hence, if the automotive incumbent firms continue to delay the transition, delay in adapting both technological innovations and strategic business model remodulation, the regime will be destabilized and transformed by all the agile actors operating across all levels: niche, regime, and landscape. With such a shift, traditional car makers are likely to lose their leading role.

This study is not without limitations. It is limited to a specific case study, and the analysis should be extended to a broader context. In addition, the analysis is limited to national newspapers included in the Nexis Uni database. Further analyses could be carried out on the news published in other newspapers and specialized magazines.

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