

Automation and the impact on workers by gender: what is the influence of institutional context?

1. Introduction

Automation technologies can potentially replace workers in a growing number of occupations (e.g., Frey and Osborne 2017).

Much research has been done concerning the consequences of automation technologies (e.g., Nedelkoska and Quintini 2018; Pouliakas 2018), but limited attention is paid to how they differ between women and men. The few existing studies have yielded conflicting results, suggesting the influence of the context. However, these analyses do not investigate how the institutional context considered in light of the level of gender equality is determinant in explaining the difference in the risk of substitution faced by men and women.

Our research addresses this gap by analysing how the institutional context affects the risk of substitution faced by men and women.

2. Literature review

The estimate of the probability of automation of occupations is based on the occupation-based (whole occupations can be automated) or the task-based approach (work activities can be automated).

Moreover, it takes into account the existence of some technical limitations that prevent the automation of some non-routine tasks (Frey and Osborne 2017). These limitations are linked to three capabilities: perception and manipulation, creative intelligence, and social intelligence (e.g., Frey and Osborne 2017).

Based on the probability of automation, some studies have analysed how it is influenced by socio-demographic characteristics of the worker (including gender) and job-specific factors (Nedelkoska and Quintini 2018; Pouliakas 2018). Regarding gender, conflicting results have emerged suggesting the influence of the institutional context: in Europe, women face a lower risk of substitution (Pouliakas 2018); in OECD countries, the opposite is true (Nedelkoska and Quintini 2018). Women will be less affected by automation because they are not present in science and technology sectors, perform routine tasks, and are not much present in technology sectors and STEM education programs (e.g., Delgado Cadena 2020; Pampliega 2019).

We argue that the different impact of automation technologies on women could be explained considering gender gaps and segregation regarding the tasks and occupation performed (Piasna and Drahokoupil 2017).

3. Research design

The database used in this study is the European Skills and Jobs Survey (ESJS) for 2014. It contains information regarding the socio-demographic characteristics of the worker and job characteristics for about 49,000 adult workers of the 27 European countries and the United Kingdom.

For estimating the probability of automation of European occupations, the task-based approach is applied based on Frey and Osborne (2017) and by Nedelkoska and Quintini (2018).

In the first phase, the probability of automation is estimated. A training set is built by assigning to some occupations a dummy variable equal to 1 if it can be automated (e.g., sales workers, drivers, clerks) and 0 otherwise (e.g., managers, doctors, cleaners) based on Frey and Osborne (2017). Then, the variables of the database that describe the capabilities that cannot be automated – i.e., perception and manipulation, creative intelligence and social intelligence – are selected based on Pouliakas (2018). Finally, the probability of automation of occupations is estimated using a Gaussian process classifier: a model is built based on the training set and is then applied to estimate the probability of automation of all European occupations.

In the second phase, a logistic regression is run to examine the relationship between the probability of automation and gender, controlling some worker and job characteristics:

$$\begin{aligned} \text{Probability of automation} = f(\text{gender, gender*institutional context,} \\ \text{socio-demographic characteristics, job-specific factors,} \\ \text{occupational and industry-specific variables}) \end{aligned}$$

The institutional context is measured with the Gender Equality Index for 2017 (European Institute for Gender Equality), which measures gender equality taking into account also aspects such as work and education.

4 Findings

We found that the interaction effects of *Gender* and *Institutional context* has a negative and significant coefficient: in contexts where gender equality is higher, female workers face a lower risk compared to contexts with lower gender equality. The protection enjoyed by female workers is reduced in less egalitarian contexts because due to barriers regarding the participation in education

and training, women are not able to acquire the necessary skills to protect themselves from the risk of substitution. As a consequence, women are segregated into occupations with a higher probability of automation or perform more routine tasks than in more egalitarian contexts.

5 Discussion and implications

Society must respond to changes due to automation by designing targeted policies that minimize the negative consequences on workers.

To guide future labour policies the differential impacts of automation for women and men must be assessed. Action should be taken to prevent automation from worsening existing gender inequalities in the labor market. The employability and career advancement of women in occupations with a low probability of automation must be promoted. To this aim, supporting programs aimed at female workers must be designed, flexible work arrangements should be offered, and effective labour protection frameworks must be set up.

References

- Delgado Cadena, M.V. (2020), “Gender job gaps and challenges in the digital economy: findings from global governance entities”, *Cuadernos de Administración*, Vol. 36 No. 67, pp. 158–171.
- Frey, C.B. and Osborne, M. (2017), “The future of employment: How susceptible are jobs to computerisation?”, *Technological Forecasting and Social Change*, Vol. 114, pp. 254–280.
- Nedelkoska, L. and Quintini, G. (2018), *Automation, Skills Use and Training*, OECD Social, Employment and Migration Working Papers No. 202, Vol. 202, OECD Publishing, Paris, available at:<https://doi.org/10.1787/2e2f4eea-en>.
- Pampliega, G. (2019), *Brecha de Género y Automatización. Efectos de La Revolución Digital En El Mercado Laboral Español, Un mundo complejo*, available at: <https://epampliega.com/blog/index.php/2019/07/17/brecha-de-genero-y-automatizacion/>.
- Piasna, A. and Drahokoupil, J. (2017), “Gender inequalities in the new world of work”, *Transfer: European Review of Labour and Research*, Vol. 23 No. 3, pp. 313–332.
- Pouliakas, K. (2018), *Determinants of Automation Risk in the EU Labour Market: A Skills-Needs Approach*, Discussion Paper No. 11829, IZA Institute of Labor Economics, Bonn.