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Economic and financial integration, capital controls, and risk sharing

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Abstract

We analyse economic (EI) and financial (FI) integration, and their effects on international consumption risk sharing (RS) across 40 countries, including 21 developed (DEV) and 19 emerging (EM) markets, from 1995 to 2019. Utilizing the metric for EI and FI of Akbari *et al*. (2020, *Journal of Financial and Quantitative Analysis*, **55**, 2270–303), and various RS proxies, we find that increasing EI reduces RS in EM, while FI enhances it. Conversely, there is no evidence that EI or FI influences RS in DEV, contradicting theoretical predictions from international business cycle models. These results remain robust when controlling for trade and financial openness and capital flow restrictions. Additionally, we investigate the direct influence of capital controls on market integration. Relaxing equity inflow controls significantly enhances market integration, specifically boosting EI in DEV, and FI in EM. In contrast, equity outflow restrictions and controls on other asset categories do not significantly impact market integration. Our findings challenge the idea that simply removing legal restrictions on international capital flows is sufficient or necessary to achieve greater market integration and improved RS. This underscores the perspective that adjustments in capital controls alone may not ensure macro-financial stability.

1 | INTRODUCTION

Over recent decades, the international finance literature has provided an abundance of evidence confirming a substantial rise in the degree of trade openness (TO) and financial openness (FO), as well as in the level of global market integration. With the ultimate goal of capturing the actual evolution of the financial integration (FI) process, much effort has been devoted to developing reliable FI measures. In this respect, the large variety of quantity- and priced-based measures proposed by the international finance literature points to the common conclusion that global capital markets have become more integrated over the last three decades (see, among others, Pukthuanthong and Roll 2009; Volosovych 2011; Billio *et al.* 2017). However, less has been said about the benefits (or costs) in terms of international consumption risk sharing (RS) opportunities induced by rising FI. As predicted by international business cycle (IBC) models, in the presence of highly or perfectly integrated capital markets, one should observe an unambiguous improvement in RS. Empirically, however, a general consensus on whether higher FI levels correspond to better RS has not been reached yet. In fact, several empirical works observe that consumption risk is not shared as much as predicted by textbook IBC theories.

Existing empirical studies provide mixed evidence of improved RS due to rising levels of TO, FO or FI (see, among others, Kose *et al.* 2003, 2009; Kalemli-Ozcan *et al.* 2014; Suzuki 2004; Sørensen *et al.* 2007). For instance, Kose *et al.* (2009) and Suzuki (2004) observe the presence of marginal benefits in terms of macroeconomic stability and RS from rising FI. Other empirical works find instead that consumption and output volatility, as well as the correlation between domestic consumption and domestic output, increase for higher levels of FO, thus resulting in reduced RS (Kose *et al.* 2003, 2009; Bai and Zhang 2012; Kalemli-Ozcan *et al.* 2014). Billio *et al.* (2017) build a battery of different price-based measures of FI for a set of both advanced and emerging markets, and test them against international diversification benefits. They find that diversification benefits decline following a rise in the degree of FI, thus indicating a negative link between RS and FI.

However, all these studies have focused on one single aspect of market integration, namely FI, thus ignoring the role that could have been played by another key aspect of market integration, namely economic integration (EI). Here, a natural question arises: does EI improve RS? And, more importantly, is RS driven by EI or FI? Or both? Due to the absence of a proper dynamic measure of EI, this question is still unanswered. This paper aims to address this unanswered question by providing fresh empirical evidence on the effects of changes in the degree of EI and FI on RS. Moreover, we add novel empirical insights on the role played by legal restrictions on cross-border capital flows in driving the dynamics of both aspects of market integration and in turn RS. To do so, we first build two novel measures of EI and FI. As indicated by Akbari *et al.* (2020), disentangling EI from FI is possible thanks to the asset returns decomposition in revisions into cash-flow expectations and revisions into risk-pricing components. In the spirit of Akbari *et al.* (2020), we then use the dynamic cross-country average comovement in cash-flow revisions (risk-pricing adjustments) as proxy for EI (FI). Both metrics are obtained by employing firm-level quarterly data spanning the period 1995:Q4–2019:Q4 for 40 countries belonging to two different country groups: (i) 21 developed economies (DEV), and (ii) 19 emerging economies (EM).

To study the EI/FI–RS nexus, we employ a variety of RS proxies. These rely on established IBC theoretical findings predicting that full RS (i.e. market completeness) in equilibrium should be associated with (i) a relatively low consumption-to-output volatility ratio, (ii) a relatively high real exchange rate (RER) volatility, and (iii) a perfect positive correlation between consumption differentials and RER (see, among others, Backus and Smith 1993; Bodenstein 2008; Trezzi 2013). Thus for each country, we compute (i) the ratio between consumption growth volatility and output growth volatility, (ii) RER volatility, and (iii) Backus–Smith correlation, as potential indicators of RS.[1] Each of the above indicators of RS is then regressed against the two novel indicators of EI and FI, and several controls.

Finally, we add novel empirical evidence on the role played by cross-border capital controls in driving market integration and RS. To do so, we first control for two distinct and newly proposed indicators of equity inflow and outflow controls while examining the EI/FI–RS nexus, and then explicitly regress EI and FI on capital controls. The newly proposed indicators of equity inflow and outflow controls are based on the dataset proposed by Fernández *et al.* (2016), which allows us to construct distinct indicators of legal restrictions (for different asset categories) on either capital market inflows or capital market outflows.[2] This peculiarity allows us to construct a new indicator of equity inflow controls where each country i is exposed to the average restrictions on equity inflows imposed by all other countries j in the sample ($j \neq i$). Our empirical approach thus allows us to understand which types of controls, both in terms of asset classes and in terms of inflows and outflows, are most effective for market integration and RS.

Our key empirical findings are as follows. As observed by existing studies, we find that the degree of EI and FI has increased over the last three decades among both DEV and EM. Notably, we observe a rapid increase in the level of EI during the pre Global Financial Crisis (GFC) period. A flattening in integration levels is instead found in the aftermath of the GFC, especially among EM.[3] However, despite several global trade and capital market liberalizations, the degree of EI and FI in EM is lower than in DEV.[4] Turning to the market-integration–RS nexus, we find that FI improves RS, as indicated by its negative (positive) impact on the consumption-to-output volatility ratio (Backus–Smith correlation). However, such benefits seem to be partially offset by rising EI. In fact, a rise in the level of EI is found to increase (decrease) the consumption-to-output volatility ratio (Backus–Smith correlation). Importantly, these findings hold for EM only, whereas there is weak evidence of changes in EI and FI levels influencing RS among more advanced economies.

Taken together, our novel empirical findings suggest that in the presence of more synchronized business cycles—as captured by a stronger cross-country convergence in cash-flow news (i.e. higher EI)—RS opportunities drop. Instead, a stronger cross-country convergence in risk-pricing adjustments facilitates RS. Therefore in the data, EI seems to offset the RS-benefits-induced higher FI. However, such costs (benefits) from a stronger EI (FI) materialize only in less economically and financially integrated economies. These findings are robust to the use of different econometric specifications and controls. In particular, controlling for indicators of equity inflow and outflow controls does not alter our main evidence on the EI/FI–RS nexus. And, even more importantly, equity inflow and outflow restrictions are found to have no significant impact on any of the indicators of RS.

In the last part of the analysis, we observe that changes in capital inflow and outflow controls are not consistently correlated with market integration. In particular, our results suggest that only changes in equity inflow controls have a significant impact on FI (EI) in EM (DEV). Other types of capital flow controls, such as controls of equity outflows and on other asset categories, do not appear to have a significant impact on either FI or EI, and in turn on RS. Broadly, our results indicate that the application and removal or intensification and relaxation of capital controls by governments do not have the potential to facilitate better RS outcomes through their positive impact on FI. It seems that only the removal of controls on equity inflows by foreign countries (on average) is related to changes in integration levels.

The remainder of the paper is organized as follows. Section 2 provides a brief review of the literature focusing on the evolution of EI and FI, and its implications for RS as well as on the interplay between cross-border capital flow controls and market integration. Section 3 presents the construction of the EI and FI measures, the RS proxies, and the indicators of capital inflow and outflow controls. Section 4 first studies the evolution of both EI and FI, and their effect on RS, and then examines whether changes in capital controls represent significant determinants of either EI or FI. Section 5 concludes.

2 | RELATED LITERATURE AND MOTIVATION

The ultimate goal of this paper is twofold: (1) to provide fresh evidence on the interplay between market integration and RS; and (2) to understand whether policymakers play any role in influencing the degree of market integration, and in turn RS, by imposing (or removing) restrictions on international capital flows.

With respect to goal (1), our paper is closely related to the work of Rangvid *et al.* (2016), who first capture the dynamics of FI and RS, and subsequently examine whether higher FI levels are consistently correlated with better RS outcomes. Since measuring FI and RS is a critical element of our study, we are also close to all those empirical studies aimed at (i) measuring FI over time by means of quantity- and price-based indicators (see, among others, Pukthuanthong and Roll 2009; Volosovych 2011; Billio *et al.* 2017; Akbari *et al.* 2020; Zaremba *et al.* 2019), and (ii) estimating the impact of variations in the degree of TO, FO and FI on consumption smoothing (see, among others, Kose *et al.* 2003, 2009; Sørensen *et al.* 2007; Jappelli and Pistaferri 2011; Trezzi 2013; Suzuki 2004). We differ from all these studies in that we measure *de facto* integration using the firm-level price-based approach of Akbari *et al.* (2020). In our analysis, *de facto* quantity-based and *de jure* indicators of FI are used exclusively as controls. Moreover, we are the first to explicitly focus on another aspect of market integration, namely EI.

Our choice is motivated by several facts. First, and most importantly, the price-based approach proposed by Akbari *et al.* (2020) is the only one that allows us to disentangle EI from FI, thereby letting us explore the implications of both dimensions of market integration for RS. Second, it is largely accepted that *de jure* and quantity-based *de facto* indicators are not always suitable for capturing the actual evolution of the FI process. There is a large consensus in the international finance literature indicating that having free access to global capital markets for international investors does not guarantee full market integration (see, among others, Bekaert *et al.* 2003; Pukthuanthong and Roll 2009; Lehkonen 2015; Billio *et al.* 2017; Donadelli *et al.* 2024). In this respect, *de jure* indicators of FI (e.g. indicators of intensity of legal restrictions on international capital flows) do not necessarily capture actual FI levels. Note also that *de jure* measures such as controls on the international flow of financial capital are highly durable, and for this reason, they cannot reflect any real business cycle (RBC) related phenomena, including consumption and exchange rate dynamics. For instance, it seems rather implausible that relaxing capital controls induces investors to automatically (or immediately) diversify their portfolios. Consider also that generally, capital controls remain in place for decades, but over such a long period there might occur global shocks (of any type) forcing investors to re-allocate resources in places where the marginal utility is relatively high for consumption smoothing purposes. *De facto* quantity-based indicators are instead represented by aggregated cross-country capital flows (e.g. foreign direct investment (FDI), aid, and portfolio inflows and outflows) and fail to capture bilateral relationships, as opposed to price-based measures. In fact, recent empirical evidence indicates that most types of capital flow are not consistently correlated with better RS outcomes (Islamaj and Kose 2022). In addition, data on capital flows are rarely available at the same frequency for which data are available on asset prices and macroeconomic variables.

Using annual data for 16 countries from 1875 to 2012, Rangvid *et al.* (2016) provide evidence of a strong time-varying component in the degree of FI and RS. Moreover, they show that higher capital market integration forecasts more RS in the future. We differ from Rangvid *et al.* (2016) in several respects. First, Rangvid *et al.* (2016) focus only on the impact of FI dynamics, whereas we explicitly study the effects of changes in the levels of two different aspects of market integration, that is, EI and FI. In this respect, we depart also from previous studies on market integration, which rely exclusively on FO and FI, and their implications for macro-financial stability, but ignore completely any aspect of EI. To the best of our knowledge, we are the first to examine the implications of EI dynamics for consumption RS. To do so, we follow Akbari *et al.* (2020) and use firm-level data to decompose asset returns into revisions in cash-flow expectations and revisions in risk-pricing adjustments, allowing us to capture both EI and FI. Our measure of EI (FI) integration is then defined by the cross-country average correlation of pairwise cash-flow news (risk-pricing adjustments).[5] Second, in the spirit of existing studies (Asdrubali *et al.* 1996; Sørensen *et al.* 2007; Artis and Hoffmann 2008), Rangvid *et al.* (2016) captures the degree of RS by using the beta estimated from a regression of deviations of own-country consumption growth from world consumption growth on deviations of own-country income growth from world income growth. We differ from Rangvid *et al.* (2016)—as well as from the other existing empirical studies—in that we employ a variety of international consumption RS proxies, and do not rely on a unique regression-based measure.[6] In particular, we rely on a standard consumption-based measure (i.e. volatility of consumption conditional on output) and two additional measures found by the most recent IBC literature to be associated with full FI regimes, that is, (i) RER volatility, and (ii) Backus–Smith correlation (correlation between consumption differentials and RERs).[7] Third, Rangvid *et al.* (2016) focus on the very-long-run implications of capital market integration. To do so, they retrieve annual data for 16 developed economies. Their work is thus limited to a sample of advanced economies only. Our study, instead, relies on a shorter time period (i.e. 1989–2019) and uses quarterly firm-level data for 21 (19) DEV (EM). This allows us to study the implications of rising EI and FI for RS among both DEV and EM.

With respect to goal (2), we are instead most broadly connected to those studies investigating the determinants of market integration and in particular to those exploring the role of financial market liberalizations (Lane and Milesi-Ferretti 2003; Carrieri *et al.* 2007; Lehkonen 2015; Akbari *et al.* 2021). Actually, we differ from previous works in that we are interested in examining the determinants of both aspects of market integration. In this respect, the only work close to ours is Akbari *et al.* (2021). They observe that *de jure* indicators such as measures of capital account openness do not represent important drivers of market integration. Instead, stock market capitalization and GDP per capita are found to play a significant role in driving FI and EI, respectively.[8] Lane and Milesi-Ferretti (2003) relate *de jure* measures of FI to *de facto* quantity-based FI, finding that financial liberalization policies improved FI. Similarly, Carrieri *et al.* (2007) and Lehkonen (2015) confirm the role of financial liberalization in explaining the degree of FI. Differently from them, we do not consider financial liberalization as an isolated and broad phenomenon, but decompose it into changes in capital inflow restrictions and changes in capital outflow restrictions, as suggested by Fernández *et al.* (2016). This empirical strategy permits us to investigate which type of policy aimed at controlling capital flows matters most for either EI or FI. Remarkably, this question is still unanswered.

3 | MEASURING MARKET INTEGRATION, RS AND CAPITAL CONTROLS: METHODOLOGY AND DATA

Our main interest lies in the development of EI and FI processes in the equity markets, and in the investigation of their implications for RS. For this reason, we collect firm-level and macroeconomic data from 21 DEV and 19 EM. Since we are also interested in the role played by capital controls in driving market integration, and in turn RS, indicators of capital inflow and outflow restrictions for different asset categories are employed as well. The following subsections provide a description of the novel measures of EI and FI (Subsection 3), RS proxies (Subsection 3) and indicators of capital controls (Subsection 3) employed in our empirical analysis.

3.1 | Economic and financial integration

To capture the evolution of the two main aspects of market integration, namely EI and FI, we follow the methodology proposed by Akbari *et al.* (2020). The main technical details of this novel approach are reported in what follows. Akbari *et al.* (2020) rely on the well-known fact that the price of an asset can be decomposed into two components (Cochrane 2009), that is,

$$P_t = \underbrace{\sum_{j=1}^{\infty} \frac{\mathbb{E}(d_{t+j})}{(1+r_{f,t+j})^j}}_{\text{Present value of future expected cash flows}} + \underbrace{\sum_{j=1}^{\infty} Cov_t(m_{t+j}, d_{t+j})}_{\text{Risk-pricing adjustments}}, \tag{1}$$

where $\mathbb{E}(d_{t+j})$ is the expected future dividend at time $t+j$, m_{t+j} is the stochastic discount factor (SDF), and $r_{f,t+j}$ denotes the discount rate. The last term of equation (1) captures the covariance between expected dividends and SDF, that is, risk-premium adjustments. It follows that the return of an asset can be defined as the sum of cash-flow revisions (CF_t) and risk-pricing adjustments (RP_t). Hence

$$R_t = \frac{PV_t}{P_{t-1}} - 1 + \frac{RP_t}{P_{t-1}} - 1 = \underbrace{CF_t}_{\text{Cash-flow revisions}} + \underbrace{RP_t}_{\text{Risk-pricing adjustments}}. \tag{2}$$

Notably, revisions in the CF_t component are driven by changes in the economic fundamentals of the underlying asset, and the remaining return variation can be attributed to SDF fluctuations. In practice, we observe only the return of a stock and not the cash flow or the risk-pricing components. In the spirit of Akbari *et al.* (2020), we estimate CF_t using the methodology of Chen *et al.* (2013), and obtain RP_t as the residual part of returns that is not explained by cash-flow news. We relegate details on the estimation of CF_t to Appendix B.

The cross-country average degree of comovement of cash-flow revisions then represents our novel EI indicator (see also Phylaktis and Ravazzolo 2002). In a similar fashion, we shape FI by estimating the degree of comovement between countries' risk-pricing adjustments. Let us stress that our novel indicators of EI and FI are built by employing countries' bilateral correlations.[9] In this respect, we differ from Akbari *et al.* (2020), who rely on the average correlation of countries vis-à-vis a world aggregate. From an economic point of view, the two empirical approaches could give rise to some conceptual differences. Intuitively, a small economy can be strongly integrated with several economies around the world but weakly integrated with the largest ones. Since the world aggregate is defined as a value-weighted average of either CF_t or RP_t, larger economies account for most of the variations in the aggregate CF_t or RP_t. This might induce a low level of integration between small economies and the world aggregate, neglecting the fact that a small economy can be strongly integrated with other small economies and thus share risk also with them (and not necessarily only with a large economy).[10] In the end, we proxy EI (FI) integration by means of countries' average bilateral conditional correlation of cash-flow revisions (risk-pricing adjustments). In other words, EI (FI) in country i is given by the average conditional correlation of CF_i (RP_i) against all other countries' $CF_{i\neq j}$ ($RP_{i\neq j}$). Formally, for each country i we have

$$EI_i = \frac{1}{N}\sum_{j\neq i} corr(CF_i, CF_j), \tag{3}$$

$$FI_i = \frac{1}{N}\sum_{j\neq i} corr(RP_i, RP_j). \tag{4}$$

Dynamic bilateral correlation coefficients are then estimated via a standard `DCC-GARCH(1,1)`. Let us stress that the use of such a model allows us to account for volatility, avoid the subjective choice of a window size, and, most importantly, have more point estimates in our hands, as opposed to standard rolling/sliding window approaches.

As in Akbari *et al.* (2020, 2021), we use data at firm level retrieved from Thomson Reuters to build our EI and FI measures. In particular, we retrieve earnings per share for the next three years, payout ratios and long-term firm growth rates from the Institutional Brokers' Estimate System (I/B/E/S). Information on price and return as well as on industry classification are instead collected from Datastream. All variables are expressed in US\$.[11] Since the presence of possible data errors may lead to measurement errors in the estimation of the present value, filters are applied as indicated by Ince and Porter (2006). Additionally, we winsorize earnings per share as well as firm-level cash flow and risk-pricing before aggregating at country level. Cash-flow and risk-pricing revision components are computed for a total of 17,561 firms belonging to two different country groups: (i) DEV (12,483 firms), and (ii) EM (5078 firms).[12] Finally, we use as proxy for the risk-free rate at different maturities (1–15 years) the US T-bills retrieved from Bloomberg. To ensure consistency with macroeconomic data, all financial data have been retrieved on a quarterly basis for the period 1989:Q4–2020:Q4. However, our analysis will focus on the benchmark period 1995:Q4–2019:Q4. This time frame is chosen to align with the availability of international capital flow controls data, which start in 1995, and to exclude the period affected by COVID-19. Details on financial and macroeconomic data are summarized in Appendix A (see Table A1).

Descriptive statistics (i.e. mean values) for returns (R), cash-flow expectations (CF) and risk-pricing adjustments (RP) for the whole sample of 40 countries (ALL), DEV and EM are reported in Table C1. Entries in Appendix Table C1 display also mean levels of EI and FI. As in Akbari *et al.* (2020), the static level of EI (R^2_{CF}) is captured by the R^2 obtained from regressing a country's cash-flow news (CF_c) on world cash-flow news (CF_w). Similarly, static FI (R^2_{RP}) is measured by the R^2 obtained from regressing a country's risk-pricing adjustments (RP_c) on world risk-pricing adjustments (RP_w). These measures indicate that DEV (on average) exhibit higher levels of EI and FI compared to EM. A larger gap is found in the degree of FI, confirming the catching up in the level of EI between the two country groups (see also Akbari *et al.* 2020). The estimated slope coefficients—denoted by β_{CF} and β_{RP}—from these regressions are also reported. Finally, Appendix Table C1 presents the variance decomposition of returns (i.e. $\sigma_{CF,R}$ and $\sigma_{RP,R}$). Overall, cash-flow revisions are as important as risk-pricing adjustments in explaining stock returns, especially in EM, where 48.5% (51.5%) of returns variation is due to CF (RP).

The EI and FI dynamics for the three different country groups are depicted in Figure 1. In line with several international finance literature contributions aimed at examining FI dynamics, we observe an increasing path in the degree of FI over the last three decades. FI has increased substantially in both country groups. EI is also found to be increasing over time. Note that EI appears to be higher than FI in all country groups, especially in DEV. In the aftermath of the GFC, EI slows down, following an almost stable path in both DEV and EM. In other words, FI keeps rising, even if at a slower pace, in DEV. In EM, though, EI stops rising, influencing in turn the path of global economic integration (see the blue line in Figure 1(b)). This is also clear from entries in Appendix Table C2, which reports the cross-country average levels of EI and FI for three different periods: (i) full sample, (ii) pre-GFC, and (iii) post-GFC. A big jump in integration levels is observed during the 2008–9 subprime crisis where the global demand collapse induced (i) an unprecedented synchronized drop in aggregate cash flows, that is, a jump in the degree of EI, and (ii) a severe positive comovement in countries' risk premium, that is, a jump in the degree of FI. Dynamics in Figure 1 corroborate existing theoretical evidence indicating that in the presence of global shocks, cross-country balance sheet linkages strengthen, thus generating a much stronger comovement between both firms' cash flows and firms' prices (see, for instance, Devereux and Yetman 2010).[13]

3.2 | Proxies of international consumption RS

In an influential theoretical work, Backus and Smith (1993) show that in the presence of market completeness, symmetric preferences and standard constant relative risk aversion utility,

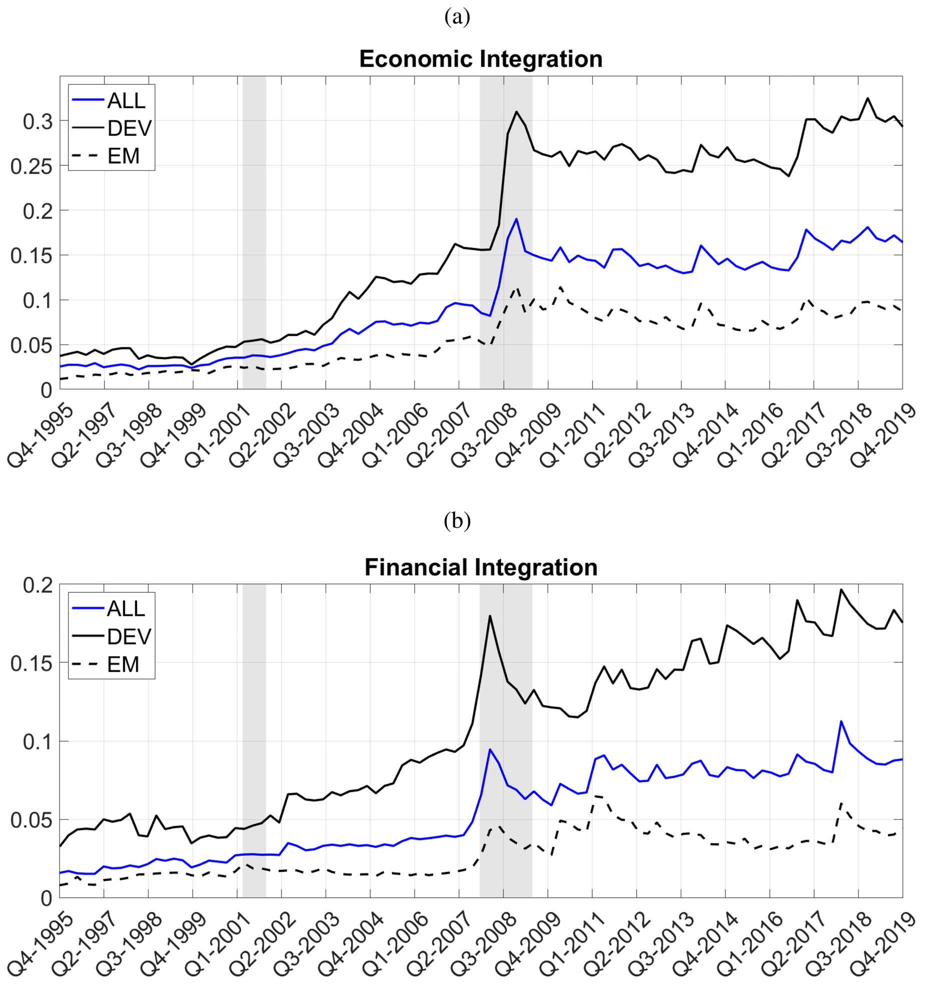

FIGURE 1 Economic versus financial integration. *Notes*: This figure shows the evolution of aggregate (a) EI and (b) FI for three different country groups: ALL (blue line), DEV (solid black line) and EM (dashed black line). EI (FI) is proxied by the average correlation of cash-flow revisions (risk-pricing adjustments) of country *i* versus all other countries (see equations (3) and (4)). Correlation values are estimated using a `DCC-GARCH(1,1)`. For each country group, the aggregate EI (FI) is computed as the equal-weighted average of country-level EI (FI). Sample period: 1995:Q4–2019:Q4.

the perfect RS condition leads to a correlation between the RER and consumption growth differentials (i.e. the Backus–Smith correlation) equal to 1 (see Trezzi 2013). More recent IBC studies provide further theoretical and empirical evidence indicating that better cross-country RS opportunities—as induced by higher levels of FO, TO and FI—should correspond to (i) a relatively low consumption-to-output volatility ratio, and (ii) a relatively high RER volatility. We reconcile to this IBC literature, and in addition to one of the canonical consumption-based measures of RS (i.e. volatility of consumption conditional on output) usually employed to study the FI–RS nexus, we use the following two IBC-related international RS proxies: (i) RER volatility, and (ii) Backus–Smith correlation. In what follows, we report details on how these measures have been constructed.[14] The intuition is rather simple and reads as follows: if—as indicated by theories—higher levels of RER volatility and Backus–Smith correlation represent symptoms of higher degrees of market integration, then in the data, a significant correlation between those proxies of RS and indicators of either FI or EI should be observed.

3.2.1 | Consumption-to-output volatility

IBC studies indicate that under full FI, shocks to income should not influence consumption choices. If a country is highly integrated, then one should observe a low consumption-to-output volatility ratio. Thus, in line with existing studies on the FI–RS nexus, we use the ratio between consumption growth volatility and output growth volatility as a first indicator of RS. The growth rate of consumption (output) is computed using OECD data on real private final consumption expenditure (real gross domestic output). Consumption and output volatilities are estimated using a `GARCH(p,q)`. The evolution of the consumption-to-output volatility ratio for the three different country groups is depicted in Figure 2(a). Not surprisingly, the consumption-to-output volatility ratio across EM is higher than across DEV. This indicates the presence of better RS conditions among richer economies. Interestingly, for most DEV, the degree of RS implied by this measure is rather stable over the whole time period. In other words, the pattern of consumption-to-output volatility ratio for EM reveals a significant variability in the degree of RS.

3.2.2 | RER volatility

As predicted by a variety of IBC theoretical models (see, among others, Bodenstein 2008; Colacito and Croce 2013; Tretvoll 2018; Itskhoki and Mukhin 2021), the presence of less segmented international capital markets allows investors to exploit more RS opportunities. In other words, the presence of more complete markets gives investors the incentive to trade securities internationally for the purpose of improving consumption smoothing over time. This generates a substantial amount of pressure on international currencies, making them more volatile. Therefore as markets become more integrated, exchange rates should exhibit higher variability. We follow this theoretical prediction and use as an additional indicator of RS the RER volatility. Data on the RER have been retrieved from the IMF, and their volatility has been computed using a `GARCH(p,q)`. The RER volatility dynamics for the three country groups are illustrated in Figure 2(b).

3.2.3 | Backus–Smith correlation

According to long-standing IBC theories, the presence of complete international financial markets implies a perfect correlation between relative marginal utility across borders and the RER (Backus and Smith 1993). Formally, the perfect RS condition derived by Backus and Smith (1993) implies a correlation between RER and consumption differentials equal to 1.[15] The IBC literature refers to this correlation as the Backus–Smith correlation. As in Trezzi (2013), we thus use the Backus–Smith correlation as a further indicator of RS. For the sake of simplicity, we assume the USA to be our foreign benchmark economy. Data on consumption and RERs have been retrieved from the OECD and IMF, respectively. For each country, the Backus–Smith correlation is estimated using a `DCC-GARCH(p,q)`. The patterns illustrated in Figure 2(c) confirm existing studies pointing to a low or negative correlation between consumption differentials and the RER (Corsetti *et al.* 2012; Colacito and Croce 2013; Itskhoki and Mukhin 2021). Figure 2 thus confirms the existence of the Backus–Smith anomaly. However, what matters for our investigation is whether a rise in either EI or FI brings the Backus–Smith correlation closer or farther from its perfect RS condition value.

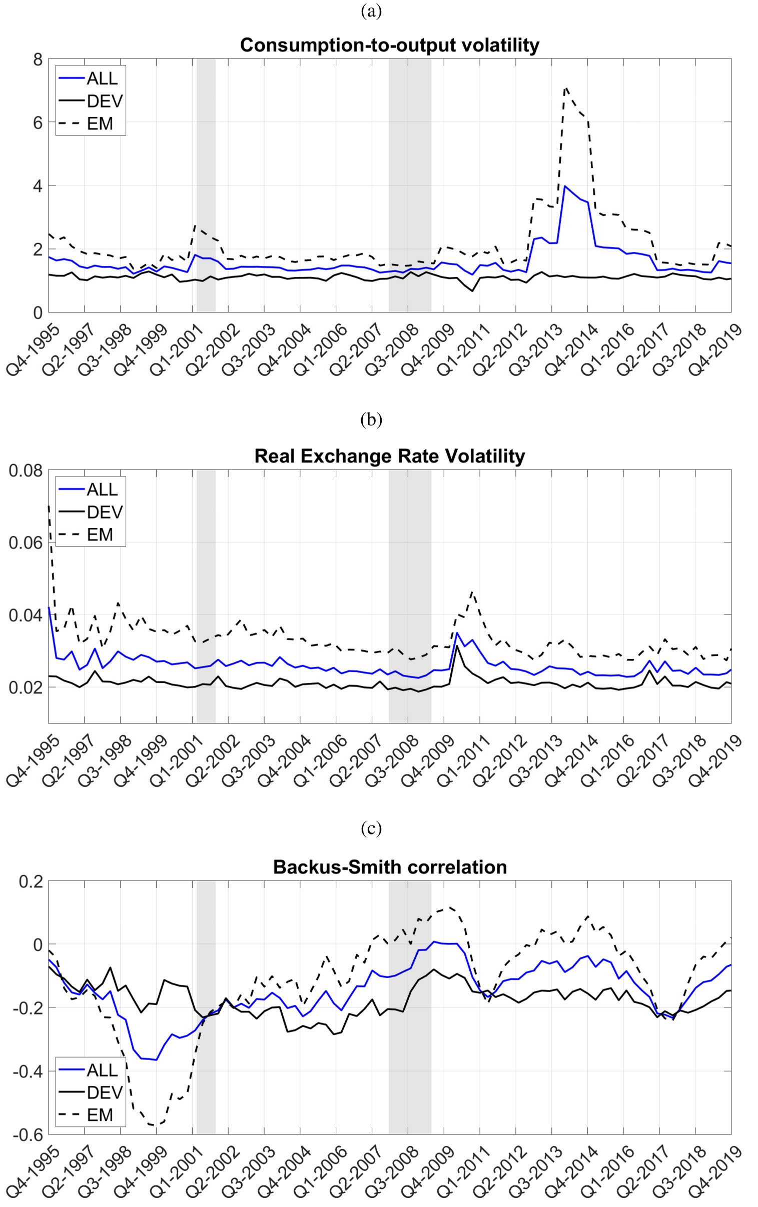

FIGURE 2 Risk-sharing proxies over time. *Notes*: This figure depicts the dynamics of (a) aggregate consumption-to-output volatility ratio $\sigma(\Delta c)/\sigma(\Delta y)$, (b) aggregate RER volatility ($\sigma(rx)$), and (c) aggregate Backus–Smith correlation $\rho(\Delta rx, \Delta c - \Delta c^*)$, for the country groups ALL (blue line), DEV (solid black line) and EM (dashed black line). Consumption-to-output volatility is constructed as the ratio between consumption growth volatility and output growth volatility. Volatilities are computed using a `GARCH(p,q)`, with `p` and `q` being chosen optimally according to the Bayesian information criterion (BIC). Aggregate consumption-to-output volatility ratio is computed as the equal-weighted average of country-level consumption-to-output volatility ratio across ALL, DEV and EM. RER volatility is constructed using a `GARCH(p,q)`, with `p` and `q` being chosen optimally according to the BIC. Aggregate RER volatility is computed as the equal-weighted average of country-level RER volatility across ALL, DEV and EM. The Backus and Smith (1993) correlation is constructed as the correlation of consumption growth differentials between two countries (home and foreign) and the RER. The USA is assumed to be the major trading foreign partner for all countries in our sample, i.e. the US$ is used as benchmark foreign currency. Correlation coefficients are estimated using a `DCC-GARCH(p,q)`, with `p` and `q` being chosen optimally according to the BIC. Aggregate Backus–Smith correlation is computed as the equal-weighted average of country-level Backus–Smith correlation across ALL, DEV and EM. Sample period: 1995:Q4–2019:Q4.

3.3 | Capital control indicators

To study ultimately the role of governments in driving market integration, we build a set of novel indicators of capital controls based on the work of Fernández *et al.* (2016). In the spirit of the existing literature aimed at capturing changes in the degree of FI (or FO) (see, among others, Kose *et al.* 2003, 2009), we use as proxies for capital mobility restrictions the so-called *de jure* FI measures.[16]

Existing empirical studies, however, do not make any distinction between newly implemented government restrictions on capital inflows and newly implemented government restrictions (or liberalizations) on capital outflows. To account for the two different dimensions of cross-border capital mobility, we use the Fernández *et al.* (2016) dataset for capital controls, which allows us to construct distinct indicators of intensity of legal restrictions on either capital market inflows or capital market outflows. To be consistent with the newly developed equity-market-based measures of EI and FI, our main analysis on the effects of international capital flow controls on market integration focuses primarily on one asset category, namely equity.

Let us stress that the idea of disentangling capital outflow restrictions from capital inflow restrictions is rather intuitive and works as follows. On the one hand, an international investor living in country i and willing to build a well-diversified portfolio with the purpose of smoothing consumption faces all the equity outflow restrictions imposed by his own country i. On the other hand, the same international investor living in the domestic country i is also subject to all equity inflow restrictions imposed by all foreign countries $j \neq i$. Thus to capture the intensity of legal restrictions on equity outflows, we use the equity outflow controls (EQO) variable provided by Fernández *et al.* (2016). This variable ranges between 0 and 1, where values closer to 1 indicate strong restrictions. To account instead for all the inflow restrictions imposed by foreign countries, we construct a measure of cross-border (average) inflow restrictions following the strategy used to build the FI and EI indicators in Section 3. Formally, we have

$$EQI_{i,t} = \frac{1}{N-1}\sum_{j\neq i} EQI_{j,t}. \tag{5}$$

In other words, inflow restrictions (EQI) for country i depend also on the average restrictions imposed by all countries $j \neq i$. Let us stress once again that distinguishing between inflow and outflow capital controls is consistent with the idea that an international investor or consumer willing to internationally diversify his portfolio faces two restrictions: (i) his domestic country might preclude or limit foreign (equity) investments, and (ii) destination countries could restrain inflow of capital for non-residents.

Cross-country average EQI and EQO restrictions are depicted in Figure 3. The following facts are noteworthy. First, over the analysed sample, the average level of outflow restrictions is higher than the average level of inflow restrictions. This holds for all country groups. Second, capital flow controls are persistent and not frequently adjusted. For this reason, as argued by Eichengreen and Rose (2014), such policies cannot be used to capture business-cycle-related phenomena. Third, DEV have already removed most of their restrictions on equity inflows and outflows. In fact, the indicators of EQI and EQO range from a minimum 0.02 to a maximum 0.23 (i.e. weak restrictions).

4 | EMPIRICAL ANALYSIS

In this section, we test whether a rise in the level of FI or EI improves RS. Further, we check whether measures of market openness and capital controls influence the transmission channel between FI and RS. Then to gain a better perspective on the determinants of market integration,

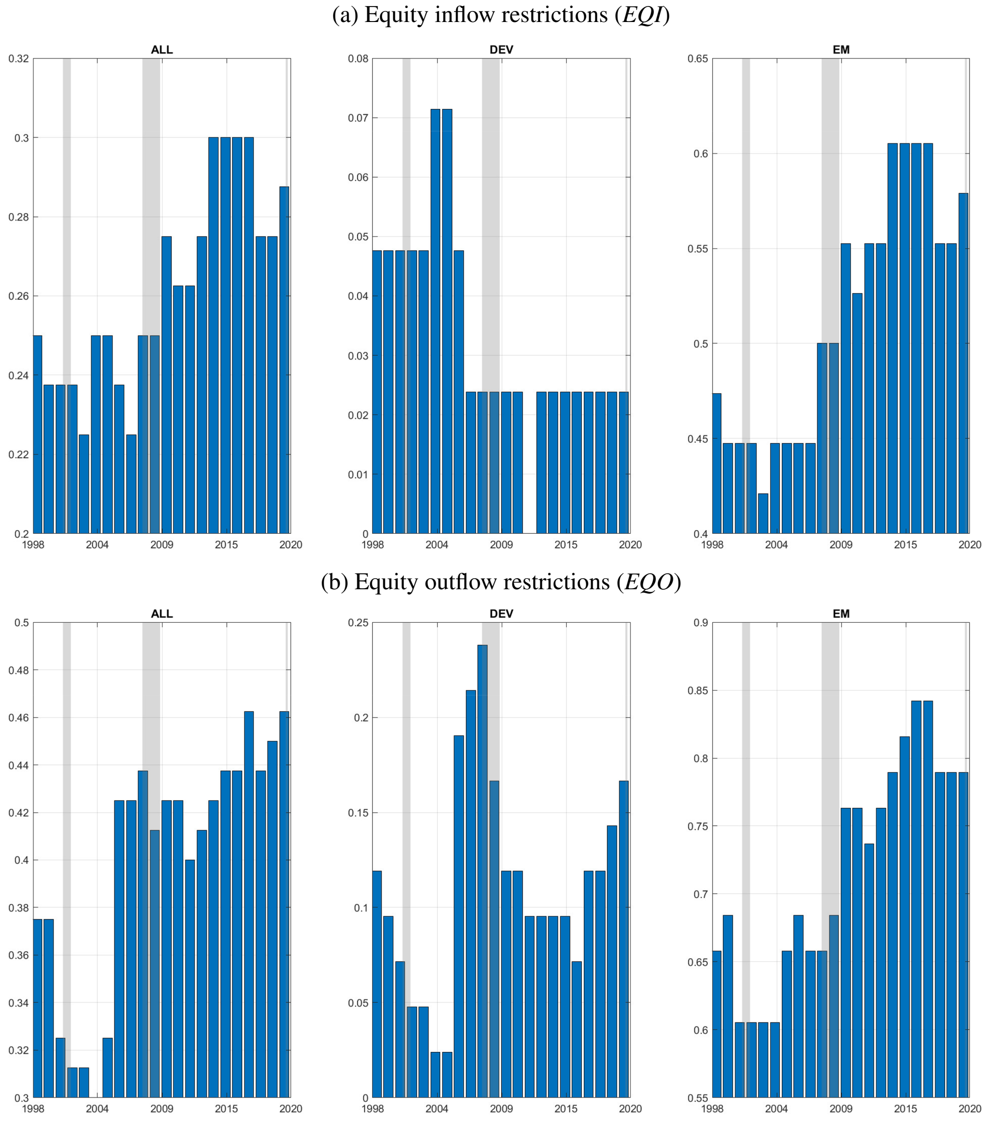

FIGURE 3 The evolution of restrictions on equity inflows and outflows. *Notes*: This figure shows the evolution of average equity (a) inflow and (b) outflow restrictions for ALL, DEV and EM. Data on equity flow restrictions are from Fernández *et al.* (2016). Sample period: 1995–2019.

we reverse the direction of our analysis by investigating the role of governments' interventions on capital controls in influencing either EI or FI.

4.1 | Market integration and consumption RS

To examine the implications of changes in the levels of EI and FI for RS, we estimate the panel regression model

$$y_{i,t} = \gamma\ FI_{i,t} + \delta\ EI_{i,t} + \beta_{FO}\ FO_{i,t} + \beta_{TO}\ TO_{i,t} + \beta_{GDP}\ GDP_{i,t} + \lambda_i + \tau_t + \varepsilon_{i,t}, \quad (6)$$

where the dependent variable $y_{i,t}$ denotes—alternatively—one of the following RS proxies: (i) consumption-to-output volatility ratio $\sigma(\Delta c)/\sigma(\Delta y)$, (ii) RER volatility $\sigma(\Delta rx)$, and (iii) Backus–Smith correlation $\rho(\Delta rx, \Delta c - \Delta c^{*})$ in country i at time t. Here, $EI_{i,t}$ and $FI_{i,t}$ refer to country-level EI and FI, respectively. Country's trade openness ($TO_{i,t}$), financial openness ($FO_{i,t}$) and output ($GDP_{i,t}$) levels serve as controls.[17] Finally, λ_i and τ_t denote country and year fixed effects, respectively. In this way, we ensure that our results are not influenced by quantity-based measures of integration, but are exclusively driven by cross-country convergence in cash-flow news (i.e. EI) and risk-pricing adjustments (i.e. FI).

Results from model (6) are shown in Table 1. When the whole sample of countries is considered (i.e. ALL), we find no significant effects of changes in FI levels on RS (panel A, ALL). Instead, we find significant effects from changes in the level of EI. Precisely, EI is found to have a significant positive (negative) impact on the consumption-to-output volatility ratio (Backus–Smith correlation). In other words, rising EI seems to be detrimental for RS. On the one hand, it undermines macroeconomic stability, and on the other hand, it brings the Backus–Smith correlation farther from its perfect RS condition established by IBC theories (see Trezzi 2013). When looking at DEV, neither FI nor EI has a significant impact on RS (see panel A, DEV).

Rising FI is instead found to generate RS benefits among EM. In fact, a positive change in the level of FI generates a drop in the consumption-to-output volatility ratio, as indicated by the negative and statistically significant coefficient for $\sigma(\Delta c)/\sigma(\Delta y)$. This indicates an improvement in macroeconomic stability due to better RS opportunities, consistent with what predicted by both RBC and IBC theories. In contrast, a rise in the level of EI undermines consumption smoothing in EM (Table 1, panel A, EM), as suggested by the statistically significant positive (negative) impact that a positive change in the level of EI has on the consumption-to-output volatility ratio (Backus–Smith correlation). Similar results are obtained when the whole sample is considered (panel A, ALL). Therefore the benefits coming from higher FI levels seem to be partially offset by the higher degree of EI. It is also worth noting that there is no evidence of a statistically significant impact of increasing both EI and FI on the RER volatility. Notice that even if not significant, the sign of the coefficient attached to $\sigma(\Delta RER)$ confirms that FI (EI) improves (undermines) RS among EM. In other words, as predicted by IBC models, higher FI levels put pressure on exchange rates, making them more volatile.[18]

Broadly speaking, our novel estimates are inconsistent with IBC theoretical predictions indicating that higher FI levels should come with better RS opportunities and as a consequence help to fix well-known international macroeconomic puzzles like the RER volatility puzzle and the Backus–Smith anomaly. In fact, among both EM and DEV, we do not observe that a higher degree of FI helps to fix those two puzzles (i.e. the impact of a rise in FI on $\sigma(\Delta RER)$ and $\rho(\Delta rx, \Delta c - \Delta c^{*})$ is not significant). We find only that higher FI significantly decreases the ratio of consumption growth volatility to income growth volatility, as predicted by the standard RBC theory. Empirically, we also find that the higher cross-country convergence in cash-flow news (i.e. higher EI) neither helps to fix the two international macroeconomic puzzles nor reflects one key RBC feature. *Reductio ad absurdum*, higher EI levels lead to opposite evidence with respect to what is predicted by IBC models. Solving international macroeconomic puzzles thus seems to be a theoretical rather than empirical success.

To gain novel insights into the role played by governments in driving RS, we examine whether changes in the intensity of capital controls (i) have a direct effect on RS, and (ii) influence the transmission channel between market integration and RS. To do so, we follow existing empirical studies and re-estimate model (6) by adding a couple of *de jure* measures of FI (see, among others, Kose *et al.* 2003, 2009; Prasad *et al.* 2003; Islamaj and Kose 2022). In practice, we add to the set of controls employed in model (6) country-level indicators of legal restrictions on equity inflows

TABLE 1 EI and FI, controls on equity inflows and outflows, and RS.

	ALL			DEV			EM		
	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$
Panel A									
FI	−0.00902	−0.00198	0.00016	−0.0359	−0.02537**	0.0031	−0.00778*	0.0006	−0.00309
	(0.00525)	(0.00385)	(0.00171)	(0.03367)	(0.0084)	(0.00793)	(0.00318)	(0.00155)	(0.00196)
EI	0.00013***	0.00003*	−0.00019***	0.01935	0.00925	0.00186	0.00015***	−0.00001	−0.00022***
	(0.00003)	(0.00001)	(0.00003)	(0.01929)	(0.0085)	(0.00526)	(0.00003)	(0.00002)	(0.00004)
FO	0.00008	0	0.00018	0.00008	0	0.00012	0.00437	−0.00033	−0.0115
	(0.00015)	(0.00003)	(0.00013)	(0.00015)	(0.00003)	(0.00011)	(0.00504)	(0.00298)	(0.02251)
TO	0.61928	−0.35179*	−0.32572	0.93302	−0.57462**	−0.02753	0.34059	−0.09602	−0.49888
	(0.32323)	(0.16959)	(0.19)	(0.95132)	(0.19414)	(0.13771)	(0.25679)	(0.26226)	(0.2793)
GDP	0.23265	−0.6875	1.85229*	−0.85479	−0.96238	0.06094	1.31543	−0.00877	2.13671
	(1.16448)	(0.37314)	(0.73955)	(1.59661)	(0.57503)	(0.46361)	(1.14625)	(0.3672)	(1.01805)
Constant	0.03277	−0.00742	−0.14813**	0.02935	−0.0041	−0.16221**	0.0433	−0.02221	−0.13522
	(0.02528)	(0.01554)	(0.04332)	(0.03201)	(0.00724)	(0.04524)	(0.04357)	(0.05114)	(0.09149)
R^2	0.01015	0.01602	0.04381	0.01572	0.0257	0.02352	0.01889	0.02436	0.07896
Observations	3722	3001	3613	1990	1798	1885	1732	1203	1728
Panel B									
FI	−0.00947	−0.00133	0.00006	−0.04606	−0.02165	0.01050	−0.00762*	0.00097	−0.00360
	(0.00515)	(0.00340)	(0.00190)	(0.02284)	(0.01228)	(0.01128)	(0.00309)	(0.00111)	(0.00231)
EI	0.00014***	0.00003*	−0.00019***	0.02062	0.00826	0.00236	0.00015***	−0.00001	−0.00022***
	(0.00003)	(0.00001)	(0.00004)	(0.01962)	(0.00783)	(0.00599)	(0.00003)	(0.00002)	(0.00004)
EQI	1.25854	0.06176	−1.18806	1.27907	−0.22299	−4.24738	1.29585	−0.15808	0.70463
	(1.23420)	(0.26461)	(2.56344)	(1.42805)	(0.63108)	(2.17630)	(1.50125)	(0.36394)	(3.68254)
EQO	0.00355	−0.01522*	0.02422	0.00686	−0.00266	−0.07241	−0.00203	−0.02381*	0.10808
	(0.01916)	(0.00708)	(0.06602)	(0.03067)	(0.00570)	(0.13187)	(0.02644)	(0.01027)	(0.06575)
FO	0.00008	0.00000	0.00018	0.00008	−0.00000	0.00016	0.00439	−0.00013	−0.01131
	(0.00015)	(0.00003)	(0.00013)	(0.00015)	(0.00003)	(0.00013)	(0.00516)	(0.00292)	(0.02242)

TABLE 1 (Continued)

	ALL			DEV			EM		
	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$
TO	0.59686	−0.32218	−0.30430	0.95153	−0.54186**	−0.02026	0.30631	−0.06855	−0.49285
	(0.33328)	(0.17243)	(0.18910)	(0.98128)	(0.17952)	(0.11902)	(0.26184)	(0.28395)	(0.29190)
GDP	0.26307	−0.71730	1.90357*	−0.75029	−1.02356	0.03350	1.27166	0.01847	2.12806
	(1.14635)	(0.39865)	(0.74289)	(1.59538)	(0.61678)	(0.45597)	(1.13913)	(0.40177)	(1.06176)
Constant	−0.45466	−0.06505	0.15956	−0.50825	0.02964	1.06223	−0.38479	−0.02214	−0.41613
	(0.36398)	(0.07616)	(0.72957)	(0.44167)	(0.17931)	(0.61028)	(0.43608)	(0.10787)	(1.01398)
R^2	0.01233	0.01360	0.05922	0.01793	0.02632	0.00055	0.02107	0.02264	0.08713
Observations	3635	2927	3531	1932	1746	1833	1703	1181	1698

Notes: This table reports the panel regression results of international RS indicators on EI and FI for three different country groups: ALL, DEV and EM. The volatility of consumption, output and RER growth is estimated using a GARCH(p, q). The Backus–Smith correlation is obtained from estimating a DCC-GARCH(p, q), where p and q are chosen optimally according to the BIC. EI (FI) is proxied by the average correlation of cash-flow revisions (risk-pricing adjustments) of country i versus all other countries (see equations (3) and (4)). Correlations are estimated using a DCC-GARCH(1, 1). Control variables: FO := FDI outflow as % of GDP; TO := (IMP + EXP)/GDP (where IMP is imports, and EXP is exports); GDP := GDP per capita. EQI := equity inflow restrictions for country i is given by the average inflow restrictions imposed by all other countries $j \neq i$; EQO := equity outflow restrictions. Country-level EQI and EQO are from Fernández *et al.* (2016). EQI and EQO are one-year lagged. All variables are expressed in growth rates, except for the Backus–Smith correlation, EQI and EQO, which are expressed in levels. EQI and EQO are at annual frequency. R^2 refers to the overall R-squared. Country and year fixed effects are included. Robust standard errors clustered by country are reported in parentheses. Sample period: 1995:Q4–2019:Q4.

*, **, *** denote significance at 10%, 5%, 1%, respectively.

($EQI_{i,t}$) and outflows ($EQO_{i,t}$). Thus we estimate the model

$$y_{i,t} = \gamma\, FI_{i,t} + \delta\, EI_{i,t} + \beta_{EQI}\, EQI_{i,t-4} + \beta_{EQO}\, EQO_{i,t-4} + \beta_{FO}\, FO_{i,t} + \beta_{TO}\, TO_{i,t} + \beta_{GDP}\, GDP_{i,t} + \lambda_i + \tau_t + \varepsilon_{i,t}. \tag{7}$$

The results of the regression model (7) are presented in panel B of Table 1. Let us stress once again that differently from previous works, we account for two different dimensions of capital controls on equity, that is, restrictions on equity inflow and outflow. Neither *EQI* nor *EQO* is found to exert a significant impact on RS. More importantly, the inclusion of these two *de jure* indicators does not alter results obtained from model (6). Thus entries in panel B confirm that rising FI improves RS among EM via its negative impact on $\sigma(\Delta c)/\sigma(\Delta y)$. However, the improvements in RS are partially offset by higher EI, which is found to be responsible for (i) a rise in the consumption-to-output volatility ratio, and (ii) bringing the Backus–Smith correlation farther from its perfect RS condition. In other words, our main results on the EI/FI–RS nexus are robust to the inclusion of equity inflow and outflow restrictions. This evidence should not come as a surprise. In fact, the literature focusing on the interplay between the removal of barriers to international capital flows, FI and RS has observed that relaxing/removing capital controls does not necessarily imply higher levels of *de facto* market integration. In other words, loosening controls on capital does not always allow us to build more diversified portfolios and thus have better consumption smoothing (see, among others, Bekaert *et al.* 2003; Billio *et al.* 2017; Islamaj and Kose 2022).[19]

Most broadly, our results confirm existing theoretical and empirical contributions indicating that a higher degree of FI provides more RS opportunities, especially among partially segmented markets (i.e. EM). However, all these existing contributions neglect what could be the impact of a rise in the degree of EI, which in our novel empirical evidence comes with bad news for consumption smoothing in EM. Intuitively, higher EI levels make business cycles more synchronized by reducing the opportunity to re-allocate resources internationally for the purpose of smoothing consumption. In EM, we thus observe a trade-off between the benefits induced by the higher FI, and the costs generated by increasing convergence in cash-flow revisions. Finally, our novel empirical evidence indicates that changes in the intensity of controls on equity inflows and outflows (i.e. *EQO* and *EQI*) do not play any role in determining a higher or lower degree of cross-country RS. In addition, and most importantly, controlling for changes in capital flow restrictions does not influence the channel between FI (or EI) and RS.

Taken together, our fresh empirical evidence indicates the presence of benefits from rising FI only among EM. One can thus argue that in countries where the average degree of integration is relatively low, there are still marginal benefits from exploiting additional RS opportunities due to rising FI. In other words, a higher cross-country comovement in risk-pricing adjustments is found to have no significant impact on consumption smoothing among more financially integrated economies. More synchronized business cycles (i.e. stronger convergence in cash-flow news) are instead responsible for higher macroeconomic instability and worse consumption smoothing, especially in less economically integrated economies.[20]

But why do rising integration levels lead to controversial RS implications? Actually, higher levels of FI and EI may intensify the international propagation of shocks. In particular, this is due to the presence of stronger cross-country balance sheet linkages. On the one hand, a higher level of global market integration may reduce the severity of crises due to better diversification opportunities. On the other hand, however, higher integration levels increase contagion risk and ultimately crisis frequency (Billio *et al.* 2017; Devereux and Yu 2020). It is thus reasonable to find conflicting results on the true benefits of rising market integration where the overall degree of risk may rise or fall relative to a situation of financial autarky. It is also important to stress that the two different aspects of FI have different impacts on RS.

4.2 | Capital controls and market integration

As the last contribution of this study, we examine whether changes in the intensity of legal restrictions on cross-border capital flows serve as possible channels of increased or decreased market integration. In other words, rather than exploring to what degree EI and FI have an impact on RS, we ask what is the role of policymakers in influencing the level of either aspect of *de facto* market integration.[21] On the one hand, this empirical exercise contributes to gain a better perspective on the determinants of the two main aspects of market integration. On the other hand, even if indirectly, it sheds light on the impact of imposed or removed capital controls on RS. To be consistent with our equity-price-based measures of EI and FI, we have decided to rely on equity inflow and outflow restrictions as main policy instruments, and then investigate how changes in these translate into EI and FI variations.

To do this, we regress the yearly growth rate of either EI or FI on the two novel indicators of equity inflow and outflow restriction, and controls. The following equation forms the basis of our analysis:

$$y_{i,t} = \beta_{EQI}\ EQI_{i,t-1} + \beta_{EQO}\ EQO_{i,t-1} + \beta_{FO}\ FO_{i,t} + \beta_{TO}\ TO_{i,t-1} + \beta_{GDP}\ GDP_{i,t} + \beta_{FX}\ FX_{i,t} + \lambda_i + \varepsilon_{i,t}, \tag{8}$$

where $y_{i,t}$ is alternatively economic ($EI_{i,t}$) or financial ($FI_{i,t}$) integration, and $EQI_{i,t-1}$ and $EQO_{i,t-1}$ are one-year lagged equity inflow and outflow controls, respectively. For the sake of robustness, we include as controls a measure of financial openness ($FO_{i,t}$), trade openness ($TO_{i,t}$), output ($GDP_{i,t}$) and the real foreign exchange rate to US\$ ($FX_{i,t}$). Finally, λ_i denotes the country fixed effect.

Results from model (8) for the three different country groups are presented in Table 2. Entries in panel A present estimated coefficients for the whole sample. We find that equity inflow controls enter with a negative sign, indicating that government interventions aimed at relaxing/removing restrictions on equity inflows generate an increase in market integration levels. However, the coefficient is statistically significant only for FI. All the other controls—including measures of financial and trade openness and restrictions on equity outflows—are found to exert no significant effects on either measure of integration.

Estimates for the country group DEV (EM) are reported in panel B (panel C) of Table 2. Despite the coefficient on equity inflow controls entering consistently with a negative sign, the effect is not always significant. This type of policy instrument appears to be more effective in influencing the degree of EI among DEV, while in EM, reducing inflow controls generates a significant increase in the degree of FI. Importantly, among both EM and DEV, changes in equity outflow restrictions are found to have no significant impact on EI and FI.[22]

Overall, our empirical findings suggest that there is little space for government interventions aimed at boosting or limiting market integration levels. According to our estimates, governments can only rely on relaxing controls on equity inflows. By doing so, they can generate a significant rise in the level of FI (EI) in EM (DEV). It turns out that loosening equity inflow restrictions can improve RS outcomes among EM via its positive impact on FI. Loosening or tightening equity outflow restrictions is instead found to have no effect on EI or FI. These latter empirical findings indicate that foreign policies (e.g., removal of barriers to equity inflows imposed by all foreign countries) on capital controls matter most for changes in the degree of integration in the home country.[23] Broadly, our evidence corroborates existing studies arguing that countries' *de jure* restrictions on capital flows do not necessarily map into higher *de facto* FI levels (see Bekaert *et al.* 2003).

Policymakers can certainly find ways to limit—with the ultimate goal of reducing contagion risk—or boost—with the ultimate goal of improving consumption smoothing via the presence of more complete markets—integration, but relaxing capital controls seems to represent a necessary

TABLE 2 Capital flow controls and EI and FI.

	Panel A: ALL		*Panel B: DEV*		*Panel C: EM*	
	FI	EI	FI	EI	FI	EI
EQI	−2.397*	−46.876	−2.696	−1.633***	−2.122*	−86.985
	(0.988)	(49.072)	(1.629)	(0.369)	(0.940)	(100.389)
EQO	0.046	−7.648	−0.006	−0.066	0.075	−13.828
	(0.044)	(7.962)	(0.039)	(0.069)	(0.084)	(13.706)
FO	0.002	0.025	0.003	−0.000	−0.002	−0.001
	(0.002)	(0.036)	(0.002)	(0.001)	(0.001)	(0.073)
TO	−0.259	142.077	−0.623	0.632	−0.169	178.190
	(0.351)	(115.596)	(0.963)	(0.352)	(0.377)	(139.495)
GDP	0.297	−122.708	1.012	−1.489**	−0.142	−160.178
	(0.731)	(109.272)	(1.664)	(0.451)	(0.825)	(146.538)
FX	−0.000*	0.002	0.011*	0.003**	−0.000	0.004
	(0.000)	(0.002)	(0.005)	(0.001)	(0.000)	(0.003)
Constant	0.669**	10.474	0.723	0.497***	0.535*	22.102
	(0.242)	(14.155)	(0.402)	(0.102)	(0.197)	(31.482)
R^2	0.001	0.003	0.001	0.01	0.001	0.003
Observations	925	925	496	496	429	429

Notes: This table reports the panel regression results of EI and FI on equity inflow and outflow controls for three different country groups: ALL, DEV and EM. Equity inflow controls (EQI) for country i are given by the average inflow restrictions imposed by all other countries $j \neq i$. EQO denotes country-level equity outflow restrictions. Country-level EQI and EQO have been retrieved from Fernández *et al.* (2016). EQI and EQO are one-year lagged. EI (FI) is proxied by the average correlation of cash-flow revisions (risk-pricing adjustments) of country i versus all other countries (see equations (3) and (4)). Correlation values are estimated using a `DCC-GARCH(1,1)`. Control variables: FO := FDI outflow as % of GDP; TO := (IMP + EXP)/GDP; GDP := GDP per capita; FX := exchange rate to US$. All variables are expressed in growth rates, except for EQI, EQO and FX, which are expressed in levels. R^2 refers to the overall R-squared. Country and year fixed effects are included. Robust standard errors clustered by country are reported in parentheses. Sample period: 1995–2019.
*, **, *** denote significance at 10%, 5%, 1%, respectively.

and not sufficient condition to influence FI and eventually EI. In reality, as discussed by Eichengreen and Rose (2014), capital controls are rarely employed as instruments to cushion against financial instability. This is because the presence (or absence) of legal restrictions on capital flows is rather persistent and thus unable to respond to business cycle frequency-related phenomena. Since capital controls (on average) remain in place for decades, it is unlikely that they can help international investors to re-allocate resources—following either bad or good domestic/global news—to 'places' where the marginal utility is higher, with the ultimate goal of smoothing consumption. It is thus not surprising to observe no links between capital flow restrictions and the RER volatility or the Backus–Smith correlation (see Table 1). Notice also that governments have little experience in using capital controls at a relatively high frequency. In addition, reimposing some controls that were previously removed may undermine governments' credibility. Fiscal or monetary policies must thus be preferred by policymakers to limit the adverse consequences of bad or good macroeconomic and financial news.

4.3 | Robustness checks and additional results

In this subsection, we run several robustness checks on earlier results, and present additional novel empirical evidence on the interplay between market integration and RS as well on the capital controls–market integration nexus. Our tests include the use of: (i) indicators of EI and

FI built as in Akbari *et al.* (2020); (ii) a standard regression-based measure of RS as in Rangvid *et al.* (2016); (iii) a new composite index of FI proxied by the first principal component extracted from the dataset composed by FI (i.e. price-based measure), FDI (i.e. quantity-based measures) and capital controls (i.e. two *de jure* indicators); and (iv) different types of capital controls (i.e. inflow and outflow restrictions on all assets and on FDI). Key insights from these additional empirical tests are discussed below. Additional details on the construction of alternative measures of EI/FI, RS and indicators of capital controls are relegated to Appendix D.[24]

4.3.1 | Correlation between country cash flow (or risk-pricing) and world cash flow (or risk-pricing)

This first test involves the use of the indicators of EI and FI built using the average correlation between countries' cash flow (or risk-pricing) and a world cash flow (or risk-pricing). In doing so, we strictly follow the metric proposed by Akbari *et al.* (2020). Let us remark that our EI (FI) is instead built using pairwise cross-country average correlations of cash flow (risk-pricing). Moreover, correlation coefficients in Akbari *et al.* (2020) are estimated using an `STDCC-GARCH` model, whereas we rely on a `DCC-GARCH`. Therefore we estimate model (6) using the indicator of EI and FI built following the approach of Akbari *et al.* (2020). Estimates from this test are presented in Appendix D (see Table D1) and show the absence of a significant correlation between either aspect of market integration and RS. In our humble opinion, there are two main facts motivating this evidence. First, computing the indicators of EI and FI via the use of correlation between countries' cash flow/risk-pricing and a world cash flow/risk-pricing assigns a larger importance on countries with larger size. However, this could underestimate the RS opportunities arising from strong linkages existing between smaller countries. Second, the use of an `STDCC-GARCH` model to compute correlation coefficients generates EI and FI dynamics that are too smooth (see Appendix Figure D1 versus Figure 1), which are not able to capture the frequency of consumption or RER dynamics.

4.3.2 | A regression-based measure of RS

In the second test, we follow Rangvid *et al.* (2016) and use the beta estimated from regressing consumption differentials on income differentials as an alternative measure of RS. We therefore estimate models (6) and (7) using this alternative RS measure as dependent variable. Our main results remain almost unaltered (see Table 1 versus Appendix Table D2). In particular, we still find that rising FI improves RS among EM, as indicated by the significant negative impact on the beta. Remarkably, this effect does not vanish once we account for changes in *EQI* and *EQO* (see panel B of Table D2). Entries in Table D2 further confirm the marginal role played by capital controls in driving RS.

4.3.3 | A composite index of financial integration

As a last test on the interplay between market integration and RS, we construct a novel composite index of FI that accounts for *de facto* price-based, quantity-based and *de jure* indicators of FI. This novel index is captured by the first principal component extracted from the dataset composed by all the employed FI proxies (i.e. EI, FO, *EQI* and *EQO*). Results in Appendix Table D3 suggest that accounting for different dimensions of FI does not produce any significant impact on RS. Nevertheless, the significant impact of rising EI on RS does not vanish. In fact, a rise in the degree of EI is still found to generate a significant increase (drop) in the consumption-to-output volatility ratio (Backus–Smith correlation). Evidence from this additional test confirms existing studies arguing that price-based, quantity-based and *de jure* measures do not capture identical aspects of FI.

4.3.4 | Different types of capital controls

In order to gain a better perspective on the policies that might affect market integration dynamics and that could serve as sources of macroeconomic stabilization, we examine the link between other types of capital controls and EI and FI. Panel A of Appendix Table D6 present estimates from model (8), where inflow and outflow restrictions on all asset classes are considered as potential determinants of either EI or FI. Broadly, we find no significant evidence of changes in overall inflow and outflow capital restrictions influencing market integration. Entries in panel B of Table D6 show that only loosening controls on FDI inflows generates some significant effects. In particular, relaxing FDI inflow restrictions generates a significant increase in the level of EI (FI) among DEV (ALL). Taken together, results from these additional empirical tests confirm our earlier findings, indicating that controls on cross-border capital flows do not represent significant drivers of market integration. As discussed in Subsection 4.2, the application and removal or intensification and relaxation of controls by governments is not a frequently used policy. This is further confirmed by the dynamics of inflow and outflow controls on different asset categories plotted in Appendix Figures D4 and D5.

5 | CONCLUSION

Previous research on financial integration (FI) and its implications for consumption smoothing and macro-financial stability has found incontrovertible evidence that international capital markets have become more integrated over time, but evidence on the benefits in terms of improved consumption risk sharing (RS) from higher integration levels is not so incontrovertible. Actually, existing empirical findings on the impact of FI on RS have been found to be controversial and inconclusive. This is due mainly to the use of heterogeneous empirical strategies, which make it difficult to synthesize the results. For instance, price-based, quantity-based and *de jure* indicators have often been used interchangeably to measure FI. Similarly, no common indicators of RS have been employed. However, no study has focused on a different aspect of market integration, namely, economic integration (EI). In this respect, there has been no attention to the relationship between EI and RS. In particular, this is due to the absence of a metric able to capture the evolution of the EI process.

We contribute to the vast and still growing literature on market integration in three ways. First, we employ the metric proposed by Akbari *et al.* (2020) to study the dynamics of both EI and FI in a sample of 40 countries (ALL) and two of its subsamples—21 developed (DEV) and 19 emerging (EM) markets—over the period 1989–2019. In line with existing studies, we find FI and EI to follow an increasing path until the Global Financial Crisis (GFC) in both EM and DEV. In the aftermath of the GFC, both EI and FI keep rising—even if at a lower pace—among DEV while they follow a more stable path among EM. Second, we investigate the role of both aspects of market integration in driving RS. By employing a variety of RS proxies, we find rising FI to provide better RS opportunities among EM. Unfortunately, such benefits seem to be partially offset by higher EI levels, which are found to undermine (on average) the macroeconomic stability of EM. Instead, no significant links are found between changes in EI and FI levels and RS among DEV. Further, we control for changes in legal restrictions on capital controls, and observe that governments have no role in influencing RS. Third, we broadly examine the determinants of both EI and FI. In particular, we examine whether changes in capital inflow and outflow controls implemented by governments have significant implications for market integration levels. We make use of two novel indicators of equity inflow and outflow restrictions, and find that only tightening or loosening controls on equity inflows has a direct effect on market integration. More specifically, relaxing controls on equity inflow increases EI (FI) in DEV (EM). Instead, no other policies are found to exert a significant impact on market integration levels (or RS).

Taken together, our novel empirical evidence suggests that cross-country convergence in cash-flow revisions tends to reduce RS opportunities. Instead, stronger cross-country comovement in risk-pricing adjustments is found to improve RS, consistent with theoretical predictions. However, such costs (benefits) from a stronger EI (FI) materialize only in less economically and financially integrated economies (i.e. EM). To conclude, among EM, the benefits induced by higher FI are washed away by higher EI. In other words, a stronger synchronization among EM business cycles turns out to be a foe of RS.

Our results also suggest that governments have little room to intervene in order to influence market integration levels. Broadly, we observe that loosening or tightening capital inflow and outflow controls maps into neither higher market integration nor better RS. The motivation lies in the fact that controls on capital inflows and outflows are highly durable and not suitable for matching variations in consumption and RER dynamics, which usually run at a higher frequency. This casts some doubt on the use of capital controls as policies to promote macro-financial stability. Overall, our empirical investigation highlights the marginal role played by policies aimed at controlling international capital flows in driving market integration and in turn RS.

An aspect unexplored in our analysis is related to the sectoral dimension of integration. In this respect, future research should capture the evolution of EI and FI in different sectors, and subsequently examine the interplay between changes in the degree of EI and FI in different sectors, capital controls and RS.

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ENDNOTES

1 Let us stress that we differ from existing studies examining the FI–RS nexus in that they rely on either a single regression-based measure of RS (Artis and Hoffmann 2008; Suzuki 2004; Rangvid *et al.* 2016; Islamaj and Kose 2022) or a single standard consumption-based RS measure, i.e. consumption-to-output volatility ratio (Kose *et al.* 2003; Prasad *et al.* 2003).

2 It is worth mentioning that this distinction is absent in previous empirical studies examining the impact of legal restrictions or liberalizations on capital flows on macro-financial stability and RS (see, for instance, Kose *et al.* 2003, 2009; Islamaj and Kose 2022).

3 Similar market integration dynamics can be found in Billio *et al.* (2017) and Akbari *et al.* (2020).

4 In this respect, Bekaert *et al.* (2011) find that countries' foreign capital flows restrictions and certain non-regulatory factors are responsible for a still high level of segmentation observed among EM.

5 Note that Akbari *et al.* (2020) rely on the correlation between countries' cash-flow news (risk-pricing adjustments) and the world cash-flow news (risk-pricing adjustments) to measure EI (FI). In this respect, we differ from them in that we use cross-country bilateral correlations. By doing so, we assume that countries are not exposed to a single benchmark trading partner shock (e.g. world) but can be influenced by shocks hitting all other countries. This allows countries to better share risk (see Billio *et al.* 2017).

6 In a robustness test, we also use a regression-based RS measure similar to that of Rangvid *et al.* (2016). Results from this additional empirical exercise are reported in Appendix Table D2 and discussed in Subsection 3.

7 Trezzi (2013), for instance, relies on the perfect RS condition under international financial markets of Backus and Smith (1993) that requires a perfect positive correlation between consumption differentials and the RER. Using consumption and RER data for 18 countries, Trezzi (2013) finds evidence of an increasing degree of RS (i.e. a high Backus–Smith correlation) over time only for the UK and the USA, but only at low frequencies.

[8] Focusing on the EU28 equity market, Nardo *et al.* (2022) also observe FI to be driven mainly by macroeconomic variables (e.g. GDP growth and inflation), market capitalization and financial development.
[9] This procedure is also in line with Adam *et al.* (2002), who argue that integration measures must reflect the bilateral relation of RS.
[10] Let us stress that the use of cross-country pairwise correlations represents a standard practice in the international finance literature when it comes to measuring comovement across international stock markets. The average of the correlation coefficients across all dyads in the study sample has been used as a proxy for FI by Adam *et al.* (2002), Goetzmann *et al.* (2005), Quinn and Voth (2008), and Billio *et al.* (2017).
[11] Considering the point of view of a US-based investor is an ubiquitous practice in the international finance literature (see, for instance, de Jong and de Roon 2005; Pukthuanthong and Roll 2009). The use of quantities and prices expressed in US$ only alleviates foreign exchange rate noise, retains only US inflation, and is consistent across international economies.
[12] The lower number of companies in our sample compared to Akbari *et al.* (2020, 2021) is due to restrictive access to I/B/E/S, which excludes small and minor firms. Luckily, this does not come as a bad news since the missing firms are those most responsible for measurement error (see also Ince and Porter 2006).
[13] In our empirical analysis that will be performed in Section 4, we account also for crisis periods while studying the interplay between RS and market integration, and the nexus between EI/FI and capital-flow restrictions. For instance, the inclusion of a dummy capturing the GFC is found to have no significant implications. For brevity's sake, results are not reported, but they are available on request.
[14] Descriptive statistics (at country level) on the four RS proxies are reported in Appendix C (see Table C3).
[15] This result is derived assuming symmetric preferences and standard constant relative risk aversion utility.
[16] The literature on FI is rather vast. For decades, *de jure* indicators have been used to capture changes in the degree of FI. However, the most recent international finance literature has raised several concerns about the ability of *de jure* indicators to capture the actual degree of FI of a country/region (see, among others, Bekaert *et al.* 2003; Billio *et al.* 2017; Islamaj and Kose 2022; Donadelli *et al.* 2024). Most importantly, due to their durability, the indicators of intensity of legal restrictions on cross-border capital flows cannot really shape the evolution of the FI process (Islamaj and Kose, 2022).
[17] In this respect, we differ substantially from Kose *et al.* (2003, 2009), who use FO as a proxy for FI while studying the link between FI and RS. In our empirical strategy, *FO* and *TO* are used instead as controls in order to get a net effect of *de facto* FI on RS.
[18] GMM estimates where lagged dependent variables have been used as instruments confirm our main results. For brevity's sake, results are not reported but are available on request.
[19] For instance, Islamaj and Kose (2022) find that only remittances and aid flows are associated with increased RS. They instead observe all other types of capital flows to be uncorrelated with better RS outcomes. *Reductio ad absurdum*, Billio *et al.* (2017) observe a negative link between higher levels of FI and international diversification benefits.
[20] Our results are consistent with di Giovanni and Levchenko (2009) in that we also find that economic integration increases macroeconomic instability. Furthermore, a sectoral analysis on the nexus between FI and EI and macroeconomic volatility delivers similar results. This empirical tests are not reported but are available on request.
[21] We would like to thank an anonymous referee for asking questions that elicited this additional empirical exercise.
[22] We also conducted the tests using indicators of capital inflow and outflow controls on different asset categories. In particular, we built indicators reflecting changes in inflow and outflow restrictions on (i) all asset classes, and (ii) direct investments. These results are summarized in Appendix Table D6 and discussed in Subsection 4.
[23] In Subsection 4, we test whether other types of policies aimed at changing restrictions on capital inflows and outflows are consistently correlated with changes in EI and FI levels. In particular, we account for controls in both directions of flow on other asset categories (i.e. all assets and FDI).
[24] For the sake of robustness, we have run several other tests. More specifically, we have: (i) re-estimated models (6) and (7), where the volatility of output, consumption and RER is estimated using a rolling window of 40 quarters; (ii) added a dummy capturing the GFC in models (6), (7) and (8); (iii) included an interaction variable in model (6) aimed at quantifying the interaction between EI or FI and capital controls; (iv) added lagged FI and EI values in model (6). As the results of all the tests do not bring new significant insights, for brevity's sake they are not reported.
[25] Payout ratios in the three subsequent years are assumed to remain constant and converge (linearly) to their industry median from $t+4$ to $t+15$.
[26] Bai and Zhang (2012) estimate the regression coefficient $\hat{\beta}$ using a rolling window of 9 years for (i) a panel of OECD countries, and (ii) a panel of EM. For both country groups, they also observe the absence of RS improvements in the more-integrated period. Actually, among EM, the regression coefficient is found to be increasing over time, indicating declining RS.

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APPENDIX A. DATA DESCRIPTION

This appendix lists the countries belonging to each group. Table A1 provides detailed information about all the data used in our analysis.

The countries in the dataset are as follows.

Developed (21): Austria (AT), Australia (AU), Belgium (BE), Canada (CA), Switzerland (CH), Germany (DE), Denmark (DK), Spain (ES), Finland (FI), France (FR), UK (GB), Hong Kong (HK), Ireland (IE), Italy (IT), Japan (JP), Netherlands (NL), Norway (NO), New Zealand (NZ), Sweden (SE), Singapore (SG), USA (US).

Emerging (19): Argentina (AR), Brazil (BR), Chile (CL), China (CN), Egypt (EG), Greece (GR), Indonesia (ID), Israel (IL), India (IN), Korea (KR), Mexico (MX), Malaysia (MY), Philippines (PH), Pakistan (PK), Poland (PO), Portugal (PT), Thailand (TH), Turkey (TR), South Africa (ZA).

TABLE A1 Data description and sources.

Variable	Name	Description	Source	Frequency	Sample
P	Price	TR.PriceClose	Thomson Reuters	Q	1995:Q4–2019:Q4
R	Return	TR.TotalReturnIndex	Thomson Reuters	Q	1995:Q4–2019:Q4
EPS	Earnings per share median forecast	TR.EPSMedian	I/B/E/S	Q	1995:Q4–2019:Q4
g	Long-run estimate of EPS growth	TR.F.LGTMean	I/B/E/S	Q	1995:Q4–2019:Q4
PO	Payout ratio	TR.DivPayoutRatioPct	Thomson Reuters	Q	1995:Q4–2019:Q4
MktCap	Market capitalization	TR.F.MktCap	Thomson Reuters	Q	1995:Q4–2019:Q4
C	Consumption	Real private final consumption expenditure, national currency, s.a.	OECD	Q	1995:Q4–2019:Q4
Y	Output	Real gross domestic product, national currency, s.a.	OECD	Q	1995:Q4–2019:Q4
IMP	Imports	Real imports of goods and services, national currency, s.a.	OECD	Q	1995:Q4–2019:Q4
EXP	Exports	Real exports of goods and services, national currency, s.a.	OECD	Q	1995:Q4–2019:Q4
POP	Population	Population, total	World Bank	Y	1995–2019
FDIo	FDI outflow	FDI outflow, net outflow (BoP, current US$)	World Bank	Y	1995–2019
FDIi	FDI inflow	FDI inflow, net inflow (BoP, current US$)	World Bank	Y	1995–2019
CPI	GDP deflator	GDP deflator	World Bank	Y	1995–2019
RER	Real effective exchange rate	Real effective exchange rate based on consumer price index	IMF	Q	1995:Q4–2019:Q4
Rf	Risk-free rate	US T-bills (1Y–15Y)	Bloomberg	Q	1995:Q4–2019:Q4
EQI	Equity inflow restrictions	Equity inflow restrictions	Fernández *et al.* (2016)	Y	1995– 2019
EQO	Equity outflow restrictions	Equity outflow restrictions	Fernández *et al.* (2016)	Y	1995–2019

Notes: Here, s.a. means seasonally adjusted, and BoP means balance of payments.

APPENDIX B. ESTIMATING CASH-FLOW AND RISK-ADJUSTMENT COMPONENTS FROM RETURNS

In the spirit of Akbari *et al.* (2020), we capture EI and FI by the the cross-country average degree of comovement of cash flow (CF) revisions and risk-pricing (RP) adjustments, respectively, where CF and RP are constructed at firm level and aggregate at country level. Hereafter, we provide details on the methodology to disentangle cash-flow news and risk-pricing adjustments from returns.

The starting point is

$$R_t = \frac{PV_t - PV_{t-1}}{P_{t-1}} + \frac{RP_t - RP_{t-1}}{P_{t-1}} = CF_t + RP_t. \quad \text{(B1)}$$

As in Akbari *et al.* (2020), we decide to estimate CF and obtain RP as a residual from equation (B1), that is, $RP_t = R_t - CF_t$. In the spirit of existing empirical finance contributions (see, among others, Pástor *et al.* 2008; Chen *et al.* 2013), we express the present value of a stock as

$$PV_t = \sum_{j=1}^{15} \frac{EPS_{t+j} \times PO_{t+j}}{(1 + r_{f,t+j})^j} + \frac{TV_{t+15}}{(1 + r_{f,t+15})^{15}},$$

where EPS_{t+j} is the (forecasted) earning per share at time t and j periods ahead, PO_{t+j} is the payout ratio at time t and j periods ahead,[25] TV_{t+15} is the terminal value of the stock at $t + 15$, and $r_{f,t+j}$ is the risk-free rate, proxied by the US T-bills. The terminal value TV_{t+15} is obtained as a perpetuity given the earning per share at $t + 15$. Forecasts for earning per share are obtained from I/B/E/S for years 1–3. Because earnings per share from year 4 onwards are rarely available, they are constructed as

$$EPS_{t+j} = EPS_{t+j-1} \times g_{t+j},$$

where g_{t+j} is the long-term growth rate of the firm, assumed to converge linearly to the country's average historical aggregate output growth rate. Note that our approach invokes the use of the risk-free rate instead of the implied cost of capital. This choice is driven by the assumption of the existence of a single world market in which cash flows expressed in a single currency are discounted by the same stochastic discount factor (Solnik 1974). Given the estimated PV, we compute the cash-flow component and subsequently obtain the risk-pricing component as residual. Formally,

$$RP_t = R_t - CF_t.$$

Finally, aggregate country-level cash-flow revisions and risk-pricing adjustments are obtained by aggregating value-weighted (country-level) CF_t and RF_t.

APPENDIX C. DESCRIPTIVE STATISTICS

Table C1 presents summary statistics of return components (R, CF and RP), variance decomposition of returns, and the number of firms considered within each country group. Additionally, Table C1 provides cross-country averages for the EI measure R^2_{CF}, the slope coefficient β_{CF}, the FI metric R^2_{RP}, and the slope coefficient β_{RP}, by country group.

Table C2 displays the average level of EI and FI across countries for three distinct periods, while Table C3 presents descriptive statistics of employed RS indicators.

TABLE C1 Return and variance decomposition (by country group).

Country	R (%)	CF (%)	RP (%)	β_{CF}	R^2_{CF} (%)	β_{RP}	R^2_{RP} (%)	$\sigma_{CF,R}$ (%)	$\sigma_{RP,R}$ (%)	No. of firms
DEV	10.859	6.132	4.723	0.848	39.170	0.928	29.087	54.788	45.212	12,483
EM	12.359	7.567	4.793	0.881	25.777	0.765	11.704	48.459	51.541	5078
ALL	11.534	6.778	4.757	0.863	33.143	0.855	21.264	51.940	48.060	17,561

Notes: This table reports (a) the average annual return for (i) returns (R), (ii) cash-flow news (CF), and (iii) risk-pricing adjustments (RP); (b) the slope coefficient β_{CF} (β_{RP}) obtained from regressing a country's cash flow (risk-pricing) on world cash flow (risk-pricing), and the related estimated R-squared, R^2_{CF} (R^2_{RP}); (c) the variance decomposition of returns, $\sigma_{CF,R}$ and $\sigma_{RP,R}$; (d) the number of firms included in each country group. Entries refer to equal-weighted average values for the whole sample (ALL), developed countries (DEV) and emerging (EM) countries. All entries are expressed in percentages, except β and number of firms. Sample period: 1989:Q4–2021:Q4.

TABLE C2 EI and FI (average) levels (by country).

	Economic integration			Financial integration		
	Full sample	Pre-GFC	Post-GFC	Full sample	Pre-GFC	Post-GFC
Panel A: DEV						
AT	0.308	0.232	0.413	0.253	0.213	0.308
AU	0.267	0.239	0.304	0.124	0.077	0.188
BE	0.332	0.271	0.416	0.286	0.246	0.341
CA	0.296	0.23	0.385	0.268	0.215	0.34
CH	0.358	0.25	0.505	0.328	0.275	0.399
DE	0.442	0.315	0.566	0.3	0.212	0.386
DK	0.359	0.315	0.418	0.17	0.149	0.197
ES	0.363	0.259	0.505	0.256	0.185	0.355
FI	0.364	0.264	0.5	0.335	0.262	0.434
FR	0.395	0.298	0.528	0.305	0.262	0.365
GB	0.396	0.307	0.517	0.31	0.265	0.372
HK	0.384	0.323	0.466	0.282	0.252	0.322
IE	0.241	0.208	0.286	0.262	0.224	0.312
IT	0.355	0.219	0.54	0.334	0.276	0.414
JP	0.304	0.236	0.398	0.211	0.173	0.262
NL	0.326	0.238	0.447	0.277	0.24	0.327
NO	0.15	0.064	0.246	0.21	0.154	0.272
NZ	0.269	0.231	0.322	0.083	0.061	0.114
SE	0.388	0.304	0.502	0.312	0.219	0.438
SG	0.371	0.286	0.487	0.289	0.214	0.391
US	0.388	0.291	0.521	0.298	0.226	0.396
Panel B: EM						
AR	0.113	0.063	0.181	0.115	0.096	0.141
BR	0.256	0.214	0.314	0.218	0.172	0.281
CL	0.227	0.215	0.243	0.083	0.072	0.099
CN	0.212	0.186	0.245	0.202	0.139	0.281
EG	0.158	0.114	0.198	0.233	0.2	0.263
GR	0.299	0.253	0.362	0.176	0.168	0.188
ID	0.23	0.204	0.266	0.232	0.179	0.303
IL	0.167	0.108	0.238	0.169	0.168	0.17
IN	0.3	0.261	0.353	0.195	0.15	0.258
KR	0.33	0.258	0.429	0.166	0.097	0.26
MX	0.305	0.259	0.367	0.208	0.162	0.271
MY	0.347	0.29	0.425	0.296	0.239	0.374
PH	0.105	0.042	0.182	0.2	0.19	0.212
PK	0.248	0.2	0.314	0.088	0.037	0.157
PL	0.333	0.192	0.495	0.259	0.21	0.316
PT	0.281	0.218	0.366	0.161	0.152	0.172
TH	0.281	0.211	0.377	0.189	0.14	0.255
TR	0.287	0.221	0.367	0.168	0.139	0.204
ZA	0.309	0.249	0.39	0.182	0.128	0.257

Notes: This table reports the average levels of EI and FI for the following subperiods: full sample (1995:Q4–2019:Q4), pre-GFC (1995:Q4–2009:Q3) and post-GFC (2009:Q4– 2019:Q4). For each country, EI (FI) is defined as in equation (3) (equation (4)).

TABLE C3 Proxies of RS: average values (by country).

	$\sigma(\Delta c)/\sigma(\Delta y)$			$\sigma(\Delta rx)$			$\rho(\Delta rx, \Delta c - \Delta c^{*})$		
	Full sample	Pre-GFC	Post-GFC	Full sample	Pre-GFC	Post-GFC	Full sample	Pre-GFC	Post-GFC
Panel A: DEV									
AT	1.248	1.197	1.319	0.01	0.01	0.01	−0.115	−0.138	−0.082
AU	0.858	0.993	0.674	0.037	0.037	0.036	−0.34	−0.295	−0.4
BE	0.938	0.894	1	0.012	0.012	0.012	−0.304	−0.313	−0.29
CA	1.176	1.262	1.06	0.027	0.026	0.029	−0.462	−0.308	−0.636
CH	0.593	0.583	0.607	0.02	0.02	0.021	−0.136	−0.211	−0.033
DE	0.935	0.969	0.888	0.012	0.012	0.012	−0.306	−0.233	−0.406
DK	1.02	1.094	0.918				−0.282	−0.22	−0.366
ES	1.184	1.203	1.157	0.016	0.017	0.014	−0.135	−0.261	0.036
FI	1.196	1.165	1.237	0.015	0.015	0.015	−0.26	−0.278	−0.236
FR	1.189	1.187	1.192	0.012	0.012	0.012	−0.127	−0.06	−0.22
GB	1.434	1.366	1.527	0.026	0.027	0.026	−0.318	−0.58	0.039
HK	1.596	1.443	1.805				0.127	0.137	0.112
IE	0.588	0.65	0.502	0.019	0.019	0.018	−0.344	−0.387	−0.286
IT	1.253	1.221	1.297	0.018	0.018	0.017	−0.195	−0.364	0.036
JP	1.037	1.023	1.055	0.044	0.044	0.042	−0.231	−0.239	−0.219
NL	1.706	1.613	1.834	0.013	0.013	0.013	−0.206	−0.322	−0.048
NO	1.174	1.151	1.205	0.023	0.023	0.022	−0.619	−0.489	−0.798
NZ	1.147	1.149	1.145	0.033	0.034	0.031	−0.189	−0.087	−0.327
SE	0.859	0.884	0.825	0.025	0.025	0.024	−0.206	−0.27	−0.118
SG	1.071	1.022	1.139	0.012	0.012	0.012	−0.306	0.002	−0.727
US	0.996	1.03	0.95	0.023	0.023	0.023			
Panel B: EM									
AR	1.573	1.549	1.585				−0.329	−0.214	−0.386
BR	1.187	1.214	1.153	0.075	0.075	0.075	−0.111	−0.039	−0.202
CL	1.301	1.262	1.353	0.034	0.035	0.032	−0.222	−0.108	−0.376
CN	1.353	1.224	1.53	0.031	0.036	0.025	0.246	0.484	−0.079
EG	11.413	3.914	21.655	0.013	0.013	0.013	0.32	0.161	0.432
GR	1.108	1.111	1.104	0.013	0.014	0.011	−0.263	−0.486	0.042
ID	0.978	1.093	0.821				−0.64	−0.658	−0.616
IL	1.392	1.39	1.394	0.025	0.025	0.024	−0.341	−0.455	−0.191
IN	1.248	1.256	1.238				−0.205	−0.285	−0.107
KR	1.313	1.279	1.359				−0.292	−0.42	−0.117
MX	1.205	1.205	1.206	0.057	0.06	0.053	−0.483	−0.724	−0.154
MY	2.043	2.027	2.064	0.025	0.026	0.024	−0.491	−0.497	−0.483
PH	2.458	2.981	1.743	0.03	0.037	0.02	−0.364	−0.403	−0.311
PK	5.681	6.108	5.098	0.028	0.028	0.027	−0.356	−0.306	−0.425
PL	0.844	0.937	0.717	0.034	0.04	0.027	−0.213	−0.213	−0.213
PT	1.25	1.234	1.272	0.01	0.01	0.009	−0.107	−0.369	0.251
TH	1.442	1.582	1.25				−0.187	−0.573	0.34
TR	1.182	1.176	1.189				−0.56	−0.791	−0.245
ZA	1.22	1.218	1.222	0.051	0.052	0.048	−0.688	−0.739	−0.619

Notes: This table reports country mean values for consumption-to-output volatility ($\sigma(\Delta c)/\sigma(\Delta y)$), RER volatility ($\sigma(\Delta rx)$) and Backus–Smith correlation ($\rho(\Delta rx, \Delta c - \Delta c^{*})$) for the following subperiods: full sample (1995:Q4–2019:Q4), pre-GFC (1995:Q4–2009:Q3) and post-GFC (2009:Q4–2019:Q4). The volatility of consumption, output and RER (Backus–Smith correlation) are computed using a `GARCH(p,q)` (`DCC-GARCH(p,q)`).

APPENDIX D. ADDITIONAL RESULTS

In this appendix, we run a range of robustness tests and extensions to gain better insights into (i) the effects of market integration (and capital controls) on RS, and (ii) the role of international capital flow controls in driving market integration (i.e. EI and FI).

D.1 Correlation between country cash flow (or risk-pricing) and world cash flow (or risk-pricing)

In Table D1, we replicate the analysis from Table 1, using a different empirical strategy to compute the indicators of EI and FI. In practice, we follow Akbari *et al.* (2020) and estimate correlation coefficients between countries' cash flow (or risk-pricing) and the world cash flow (or risk-pricing) via an STDCC-GARCH. The patterns of the two indicators are plotted in Figure D1. EI and FI dynamics—even if smoother—are similar to those obtained using pairwise correlations (see Figure 1). Under this specification, the beneficial effects of rising FI among EM, in terms of reduced consumption-to-output volatility, vanish. Remarkably, when EI and FI metrics are computed using a world aggregate as benchmark, weaker or no links between integration and RS are found. This has a straightforward and intuitive explanation. Since the world aggregate is constructed as a value-weighted sum of individual country cash-flow revisions and risk-pricing adjustments, it follows that economies with larger equity markets (e.g. the USA) matter most. However, as mentioned previously, RS opportunities can be also exploited among small economies, especially among those whose business cycle is less tied to global shocks. Entries in panel B of Table D1 indicate that controls on equity flows do not alter the impact of both EI and FI on RS, and most importantly, have no direct implications for RS. We argue that changes in capital flow controls do not serve as a channel for EI and FI dynamics, and in turn RS.

D.2 A regression-based measure of RS

As indicated by theoretical predictions, in the presence of complete markets (i.e. full integration), fluctuations in relative (i.e. idiosyncratic) marginal utility growth should be independent of idiosyncratic risk. In other words, if full RS is attained, then idiosyncratic shocks to consumption can be fully diversified. Therefore the correlation between income growth and consumption growth of a country should be rather low. Based on this prediction, Obstfeld (1994) proposes to measure consumption RS by regressing individual country consumption growth on world consumption growth or world income growth. More recent studies (Sørensen *et al.* 2007; Kose *et al.* 2009) have extended the approach of Obstfeld (1994) and proxied the degree of RS by using the coefficient of a (panel) regression of consumption growth differentials on output growth differentials. In this setting, an estimated coefficient close to zero would imply full RS.

We therefore re-examine the EI/FI–RS nexus using this additional regression-based RS measure. As in Rangvid *et al.* (2016), this is obtained by estimating the regression

$$\Delta c_{i,t} - \Delta\overline{c_t} = \alpha + \beta_i(\Delta y_{i,t} - \Delta\overline{y_t}) + \varepsilon_{i,t}, \tag{D1}$$

where $\Delta c_{i,t}$ and $\Delta y_{i,t}$ denote US$-based real per capita consumption growth and output growth in country i, respectively, and $\Delta\overline{c_t}$ and $\Delta\overline{y_t}$ are aggregate consumption growth and output growth of all countries included in our sample. To account for time variations in the degree of RS, equation (D1) is estimated using a rolling window of 32 quarters (i.e. 4 years). The evolution of the cross-country average regression coefficient $\widehat{\beta}$ for the three country groups is depicted in Figure D2. In all country groups, we observe a coefficient approaching 1. In other words, a decreasing path in the degree of RS over the last three decades is observed. Improvements in RS can be observed only during the period 2002–8 in DEV (see Figure D2, solid black line). On

TABLE D1 EI and FI, controls on equity inflows and outflows, and RS.

	ALL			DEV			EM		
	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^{*})$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^{*})$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^{*})$
Panel A									
FI	0.02027*	−0.00132	−0.00410	0.00903	−0.00850	0.01500	0.02293	0.00321	−0.00987
	(0.00937)	(0.00816)	(0.01461)	(0.01318)	(0.00724)	(0.00791)	(0.01205)	(0.00987)	(0.01602)
EI	0.00065	0.00395	0.00607*	0.03533	0.01813***	0.00461	−0.00062	−0.00345	0.00594**
	(0.00262)	(0.00643)	(0.00237)	(0.01771)	(0.00350)	(0.01215)	(0.00124)	(0.00389)	(0.00198)
FO	0.00008	0.00000	0.00018	0.00008	0.00000	0.00012	0.00463	−0.00032	−0.01165
	(0.00015)	(0.00003)	(0.00013)	(0.00015)	(0.00003)	(0.00011)	(0.00502)	(0.00298)	(0.02260)
TO	0.61835	−0.34887*	−0.33395	0.91177	−0.58837**	−0.02627	0.34220	−0.09996	−0.51202
	(0.32090)	(0.17020)	(0.18844)	(0.93370)	(0.19548)	(0.14070)	(0.24575)	(0.26423)	(0.27522)
GDP	0.20722	−0.68845	1.84730*	−0.88766	−0.96375	0.03921	1.29268	−0.01320	2.13586
	(1.16025)	(0.37396)	(0.74880)	(1.57396)	(0.57668)	(0.46621)	(1.14831)	(0.36665)	(1.02845)
Constant	0.03268	−0.00761	−0.14800**	0.02886	−0.00458	−0.16211**	0.04336	−0.02185	−0.13524
	(0.02528)	(0.01551)	(0.04332)	(0.03187)	(0.00716)	(0.04517)	(0.04372)	(0.05112)	(0.09155)
R^2	0.01033	0.01607	0.04454	0.01570	0.02582	0.02411	0.01941	0.02447	0.07924
Observations	3722	3001	3613	1990	1798	1885	1732	1203	1728
Panel B									
FI	0.02073*	−0.00145	−0.00430	0.00888	−0.00862	0.01440	0.02358	0.00313	−0.00867
	(0.00976)	(0.00818)	(0.01423)	(0.01283)	(0.00729)	(0.00872)	(0.01263)	(0.00996)	(0.01479)
EI	0.00072	0.00396	0.00602*	0.03551	0.01825***	0.00512	−0.00053	−0.00346	0.00594**
	(0.00258)	(0.00649)	(0.00235)	(0.01749)	(0.00345)	(0.01185)	(0.00121)	(0.00393)	(0.00195)
EQI	1.77047	−0.61544	−2.46020	−0.75674	−0.60760	−3.98046	2.19118	−0.66496	−0.11158
	(1.54327)	(0.58114)	(2.79494)	(2.88129)	(0.63049)	(2.22231)	(1.76074)	(0.84791)	(3.63101)
EQO	0.02014	0.00737	0.05382	0.00727	0.00369	−0.02679	0.03419	0.01149	0.13401
	(0.01781)	(0.00952)	(0.06523)	(0.02552)	(0.00773)	(0.10927)	(0.02290)	(0.01988)	(0.06913)
FO	0.00007	−0.00000	0.00016	0.00008	0.00000	0.00013	0.00486	−0.00025	−0.01055
	(0.00015)	(0.00003)	(0.00013)	(0.00015)	(0.00003)	(0.00012)	(0.00509)	(0.00301)	(0.02281)

TABLE D1 (Continued)

	ALL			DEV			EM		
	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$
TO	0.61383	−0.34700	−0.32174	0.91267	−0.58854**	−0.03245	0.33358	−0.09786	−0.51817
	(0.32018)	(0.17064)	(0.18305)	(0.93593)	(0.19538)	(0.11973)	(0.24455)	(0.26520)	(0.27526)
GDP	0.21355	−0.68159	1.85672*	−0.88503	−0.96374	0.03670	1.29454	0.01047	2.09848
	(1.16383)	(0.37567)	(0.74559)	(1.57820)	(0.57646)	(0.45272)	(1.14549)	(0.37274)	(1.04092)
Constant	−0.44806	0.15542	0.48899	0.23450	0.16088	0.92759	−0.54817	0.14545	−0.18714
	(0.41351)	(0.14532)	(0.73727)	(0.78723)	(0.16932)	(0.59875)	(0.46852)	(0.19870)	(0.91423)
R^2	0.01125	0.01826	0.06900	0.01559	0.02545	0.00400	0.02028	0.02698	0.09408
Observations	3722	3001	3613	1990	1798	1885	1732	1203	1728

Notes: This table reports the panel regression results of international RS indicators on EI and FI for three different country groups: ALL, DEV and EM. The volatility of consumption, output and RER growth is estimated using a `GARCH(p,q)`. The Backus–Smith correlation is obtained from estimating a `DCC-GARCH(p,q)`, where `p` and `q` are chosen optimally according to the BIC. EI (FI) is proxied by dynamic conditional correlation of countries' and world (value-weighted) aggregate cash flow revisions (risk-pricing adjustments) following Akbari *et al.* (2020). Correlations are computed using an `STDCC-GARCH(1,1)`. Control variables: FO := FDI outflow as % of GDP; TO := (IMP + EXP)/GDP (where IMP is imports, and EXP is exports); GDP := GDP per capita. EQI := equity inflow restrictions for country i is given by the average inflow restrictions imposed by all other countries $j \neq i$; EQO := equity outflow restrictions. Country-level EQI and EQO are from Fernández *et al.* (2016). All variables are expressed in growth rates, except for the Backus–Smith correlation, EQI and EQO, which are expressed in levels. EQI and EQO are at annual frequency. R^2 refers to the overall R-squared. Country and year fixed effects are included. Robust standard errors clustered by country are reported in parentheses. Sample period: 1995:Q4–2019:Q4.
*, **, *** denote significance at 10%, 5%, 1%, respectively.

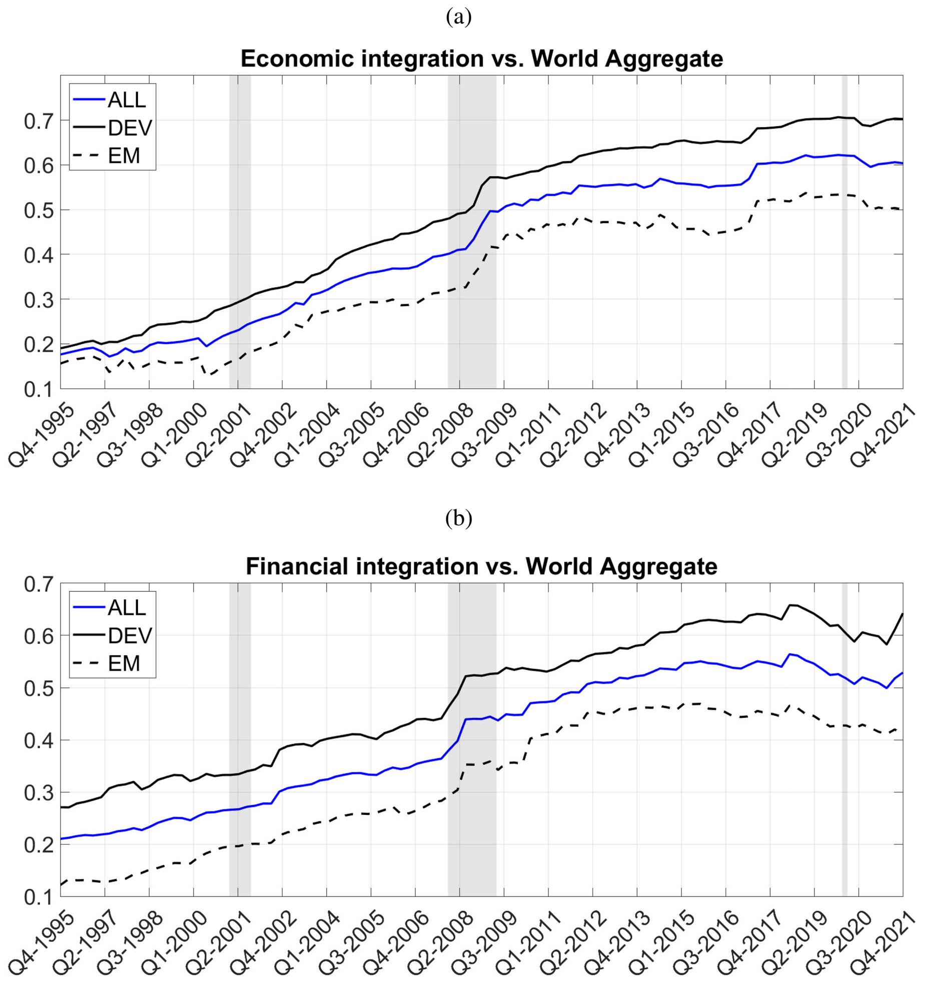


FIGURE D1 The evolution of EI and FI. *Notes*: This figure depicts the dynamics of aggregate (a) EI and (b) FI, for ALL (blue line), DEV (solid black line) and EM (dashed black line). EI (FI) is proxied by dynamic conditional correlation of countries' and world (value-weighted) aggregate cash-flow revisions (risk-pricing adjustments). Correlation is computed using an `STDCC-GARCH(1,1)`. For each country group, aggregate EI (FI) is computed as the equal-weighted average of country-level EI (FI). Sample period: 1995:Q4–2021:Q4.

the one hand, dynamics in Figure D2 confirm the consensus in the literature that RS is far from its perfect condition. On the other hand, they broadly show that financial globalization is not consistently correlated with greater RS.[26]

Results from using the β from regression (D1) as the RS measure are presented in Table D2. In line with our main results (see Table 1), FI is associated with better RS outcomes, as indicated by the negative impact on the β. However, this impact is significant only for EM. Once again, there is significant evidence of better RS from higher FI levels only among less financially integrated economies. Instead, we find no significant effects on RS due to changes in the degree of EI. The results are robust to the inclusion of equity inflow and outflow controls: the negative impact on FI remains significant for the whole sample and EM (see Table D2, panel B). This latter finding further confirms that policies aimed at controlling international capital flows (i.e. *de jure*

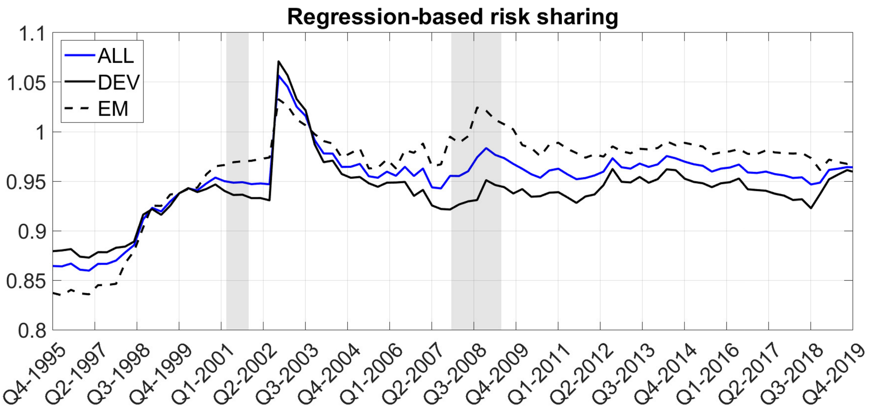


FIGURE D2 International consumption RS: a regression-based measure. *Notes*: This figure depicts the dynamics of aggregate consumption RS, as measured by the slope coefficient of the regression $\Delta c_{i,t} - \overline{\Delta c_t} = \alpha + \beta(\Delta y_{i,t} - \overline{\Delta y_t}) + \varepsilon_{i,t}$, using a rolling window of 32 quarters. Here, $\Delta c_{i,t}$ ($\Delta y_{i,t}$) is real per capita consumption (output) in US\$, and $\overline{\Delta c_t}$ ($\overline{\Delta y_t}$) is the world real per capita consumption (output) growth in US\$. Aggregate consumption RS is computed as the equal-weighted average of country-level β (within each country group). Sample period: 1995:Q4–2021:Q4.

TABLE D2 EI and FI, controls on equity inflows and outflows, and RS.

	Panel A			*Panel B*		
Dep. var. = β	ALL	DEV	EM	ALL	DEV	EM
FI	−0.00158***	−0.00269	−0.00150***	−0.00160***	−0.00283	−0.00150***
	(0.00030)	(0.00139)	(0.00031)	(0.00031)	(0.00147)	(0.00031)
EI	−0.00000	−0.00089	0.00000	−0.00000	−0.00100	0.00000
	(0.00000)	(0.00064)	(0.00000)	(0.00000)	(0.00062)	(0.00000)
EQI				0.12936	0.13711	0.01965
				(0.18850)	(0.14302)	(0.21459)
EQO				0.00166	0.00046	0.00320
				(0.00340)	(0.00479)	(0.00437)
FO	−0.00002	−0.00002	0.00031	−0.00002	−0.00002	0.00031
	(0.00001)	(0.00001)	(0.00046)	(0.00001)	(0.00001)	(0.00045)
TO	−0.03813	0.02587	−0.09940	−0.03856	0.02735	−0.10064
	(0.03522)	(0.02661)	(0.05982)	(0.03587)	(0.02541)	(0.06087)
GDP	−0.27857	−0.49426*	0.00105	−0.28207	−0.50598*	0.00340
	(0.18902)	(0.21031)	(0.09336)	(0.19215)	(0.21506)	(0.08642)
Constant	0.00138	0.00041	0.00105	−0.03562	−0.03845	−0.00855
	(0.00210)	(0.00204)	(0.00365)	(0.05563)	(0.04197)	(0.06421)
R^2	0.04527	0.09996	0.02854	0.04402	0.10012	0.02773
Observations	3500	1950	1550	3422	1895	1527

Notes: This table reports the panel regression results of a regression-based measure of RS on EI and FI for three different country groups: ALL, DEV and EM. The dependent variable is the slope coefficient of the regression $\Delta c_{i,t} - \overline{\Delta c_t} = \alpha + \beta(\Delta y_{i,t} - \overline{\Delta y_t}) + \varepsilon_{i,t}$, using a rolling window of 32 quarters. $\Delta c_{i,t}$ ($\Delta y_{i,t}$) is real per capita consumption (output) in US\$, and $\overline{\Delta c_t}$ ($\overline{\Delta y_t}$) is the world real per capita consumption (output) in US\$. EI (FI) is proxied by the average correlation of cash-flow revisions (risk-pricing adjustments) of country i versus all other countries (see equations (3) and (4)). Correlation values are estimated using a `DCC-GARCH(1,1)`. Control variables: FO := FDI outflow as % of GDP; TO := (IMP + EXP)/GDP; GDP := GDP per capita. EQI := equity inflow restrictions for country i is given by the average inflow restrictions imposed by all other countries $j \neq i$; EQO := equity outflow restrictions. Country-level EQI and EQO have been retrieved from Fernández *et al.* (2016). All variables are expressed in growth rates, except for the Backus–Smith correlation, EQI and EQO, which are expressed in levels. Equity inflow (EQI) and outflow (EQO) controls are at annual frequency. R^2 refers to the overall R-squared. Country and year fixed effects are included. Robust standard errors clustered by country are reported in parentheses. Sample period: 1995:Q4–2019:Q4.

*, **, *** denote significance at 10%, 5%, 1%, respectively.

indicators of FI) fail to embody the 'actual' degree of market integration, likely due to their persistent nature.

D.3 A composite index of FI

This robustness check examines whether the different dimensions of FI have uniform implications for RS. To do this, we construct a composite index of FI by combining *de jure* measures *EQI* and *EQO*, the *de facto* quantity-based indicator FO, and our newly built price-based measure FI. This composite index is captured by the first principal component extracted using all the information available (i.e. all measures for all countries). Its dynamics—found to explain around 35% of the variations among all countries' FI indicators—is depicted in Figure D3. It is worth noting that FI in EM (DEV) follows an increasing (decreasing) trend in the post-GFC period. In addition, the FI level in EM is higher than in DEV over the same period, indicating (broadly) that EM has opened up whereas DEV has closed up. In Table D3, we replicate our main results on the EI/FI–RS nexus by using this composite index to measures FI instead of using the four different indicators separately. This is to gain further insights into the different dimensions of FI.

According to entries in Table D3, changes in the level of our composite index of FI have no significant impact on RS. Most broadly, our estimates suggest that accounting for the different dimensions of FI/FO matters. In other words, (i) *de jure* indicators and *de facto* quantity- and price-based measures do not necessarily capture the very same aspect of the integration process, and (ii) *de facto* quantity-based and *de jure* measures of FI are not key drivers of RS (see also Bekaert *et al.* 2011; Islamaj and Kose 2022; Donadelli *et al.* 2024). Let us stress, however, that the impact of EI on RS remains unaltered, that is, rising EI reduces consumption RS among EM (see Table 1 versus Table D3). This latter evidence confirms the importance of disentangling FI from EI. In other words, one cannot exclude from consideration the real economic channel in the attempt to interpret market integration.

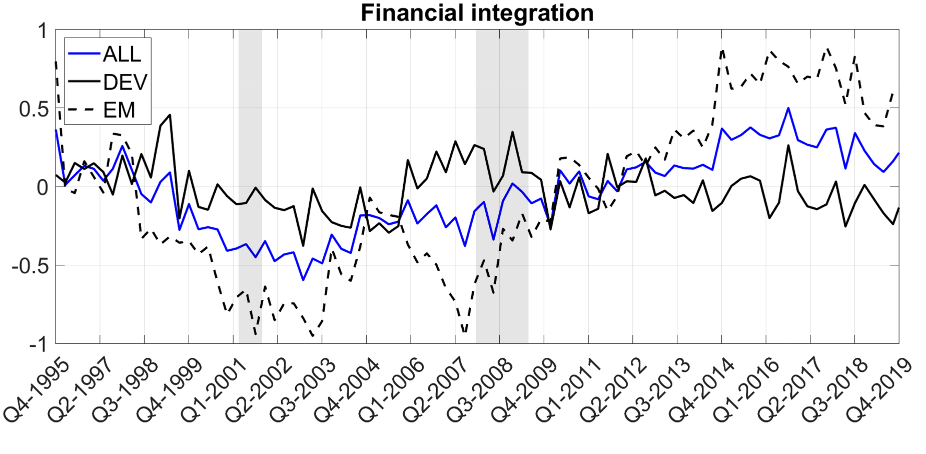


FIGURE D3 A composite index of FI. *Notes*: This figure depicts the evolution of the FI process for ALL (blue line), DEV (solid black line) and EM (dashed black line). FI is captured by the first principal component extracted from using (for all countries belonging to each group) the newly developed FI (see equation (4)), FO, and *EQI* and *EQO*. Sample period: 1995:Q4–2019:Q4.

TABLE D3 An aggregate measure of financial integration, controls on equity inflows and outflows, and RS.

	ALL			DEV			EM		
	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$	$\sigma(\Delta c)/\sigma(\Delta y)$	$\sigma(\Delta rx)$	$\rho(\Delta rx, \Delta c - \Delta c^*)$
FI	−0.00051	−0.00019	−0.00015	−0.00053	−0.00024	−0.00001	−0.00060	−0.00008	−0.00042
	(0.00042)	(0.00026)	(0.00017)	(0.00054)	(0.00042)	(0.00012)	(0.00063)	(0.00022)	(0.00029)
EI	0.00016***	0.00001	−0.00021***	0.01764	0.01313	0.00203	0.00016***	−0.00001	−0.00025***
	(0.00002)	(0.00001)	(0.00003)	(0.01827)	(0.00929)	(0.00600)	(0.00002)	(0.00002)	(0.00005)
Constant	0.03655	−0.01695	−0.13156**	0.02003	−0.01601	−0.16191**	0.07620	−0.02212	−0.10210
	(0.02102)	(0.01646)	(0.04445)	(0.02304)	(0.00846)	(0.04386)	(0.04247)	(0.05143)	(0.09531)
R^2	0.00815	0.01452	0.03160	0.01286	0.01495	0.02317	0.01705	0.02177	0.06808
Observations	3712	2993	3604	1987	1795	1882	1725	1198	1722

Notes: This table reports the panel regression results of international RS indicators on EI and FI for three different country groups: ALL, DEV and EM. The volatility of consumption, output and RER growth is estimated using a GARCH(p,q). The Backus–Smith correlation is obtained from estimating a DCC-GARCH(p,q), where p and q are chosen optimally according to the BIC. The composite index of FI is proxied by the first principal component extracted from the dataset composed by country-level FO, FI, EQI and EQO. Economic integration is proxied by the average correlation of cash-flow revisions of country i versus all other countries (see equation (3)). Correlation values are estimated using a DCC-GARCH(1,1). All variables are expressed in growth rates, except for Backus–Smith correlation, EQI and EQO, which are expressed in levels. EQI and EQO are at annual frequency. R^2 refers to the overall R-squared. Country and year fixed effects are included. Robust standard errors clustered by country are reported in parentheses. Sample period: 1995:Q4–2019:Q4.
*, **, *** denote significance at 10%, 5%, 1%, respectively.

D.4 Measurement error

Since EI and FI are constructed using quantities (e.g. expected earnings) obtained from analysts' forecasts, our estimates may be subject to measurement error. To address this issue, we follow Billio *et al.* (2017) and utilize the framework of McAvoy (1998) to model the 'true' EI and FI as latent variables. The state-space model is

$$\left.\begin{aligned} y_t = y_t^*, \qquad & y_t^* = \beta_1\, FI_t^* + \beta_2\, EI_t^* + \xi_t, \\ FI_t = FI_t^* + \eta_t, \quad & FI_t^* = \gamma_1\, FI_{t-1}^* + \nu_t, \\ EI_t = EI_t^* + \varepsilon_t, \quad & EI_t^* = \gamma_2\, EI_{t-1}^* + u_t, \end{aligned}\right\} \tag{D2}$$

where * identifies true variables, which differ from the observed ones in that they are not subject to a random Gaussian noise. We simulate the system for different signal-to-noise (StN) ratios and compare simulated and true R^2 values; the results are shown in Table D4. In the spirit of McAvoy (1998), for each country, we estimate the system using the Kalman filter. The estimated StN ratios indicate that for examined countries, the size of the measurement error is rather small. It turns out that the bias embedded in our EI and FI metrics is negligible (see Table D5).

TABLE D4 Simulated results of equations (D2).

StN	0.125	0.375	0.6250	0.800
True adjusted R^2	57.361	57.306	57.109	57.494
OLS adjusted R^2	54.715	50.046	45.923	44.12
Difference (%)	−4.613	−12.669	−19.558	−23.261

Notes: This table reports the R^2 estimates from simulated data according to equations (D2), for different signal-to-noise ratios: 0.125, 0.375, 0.6250, 0.8. True adjusted R^2 is obtained from regressing consumption volatility on the 'true' EI and FI. The OLS adjusted R^2 is obtained by estimating the previous regression with noise. Sample size: 250. Number of replications: 1000.

TABLE D5 Kalman filter estimates of signal-to-noise ratio.

	FI	EI
StN	0.23075	0.219
S.D.	0.5397	0.57126

Notes: This table reports the cross-country mean and standard deviation of the signal-to-noise (StN) estimated by applying the Kalman filter procedure discussed in McAvoy (1998) to the state-space system in equations (D2).

D.5 Different types of capital controls and EI/FI

We provide further evidence on the effects of government policies aimed at tightening (or loosening) capital controls in driving market integration. In Table D6, we replicate the analysis from Table 2, using different types of capital controls. Precisely, we rely on capital flow restrictions on (i) all asset classes (panel A), and (ii) direct investments (panel B). Overall capital restrictions represent limits to inflow or outflow on equity, bond, financial credit, derivatives, real estate transactions and direct investments, among other asset categories. The average inflow and outflow restrictions for the three country groups are shown in Figures D4 and D5 for overall and direct investment, respectively. In other words, they account for investment barriers on a variety of financial instruments.

Entries in panel A of Table D6 suggest that a broader set of capital controls has no significant effects on EI or FI. This is not surprising, as our dependent variables depict equity market

TABLE D6 Inflow and outflow controls on different asset categories versus EI and FI.

	Panel A: Overall capital restrictions						*Panel B: FDI restrictions*					
	ALL		DEV		EM		ALL		DEV		EM	
	FI	EI	FI	EI	FI	EI	FI	EI	FI	EI	FI	EI
Inflow restrictions	−1.433	19.592	0.950	−0.590	−5.054	52.058	−0.495*	30.125	−0.785	−0.564**	−0.098	67.868
	(1.761)	(22.558)	(1.066)	(0.580)	(3.625)	(60.272)	(0.233)	(26.415)	(0.381)	(0.164)	(0.179)	(55.926)
Outflow restrictions	−0.007	−15.086	−0.035	−0.118	0.064	−30.682	0.010	−0.179	−0.072	−0.142	0.059	0.965
	(0.065)	(16.022)	(0.089)	(0.125)	(0.099)	(32.351)	(0.049)	(1.052)	(0.083)	(0.100)	(0.060)	(1.880)
TO	−0.226	141.855	−0.638	0.611	−0.123	179.315	−0.330	149.077	−0.839	0.544	−0.154	190.690
	(0.338)	(114.831)	(0.976)	(0.372)	(0.356)	(139.106)	(0.367)	(119.253)	(1.102)	(0.398)	(0.357)	(144.192)
GDP	0.334	−119.161	0.736	−1.452*	−0.590	−135.636	0.253	−115.617	0.797	−1.610**	−0.056	−148.270
	(0.745)	(105.407)	(1.522)	(0.514)	(0.707)	(121.836)	(0.720)	(100.934)	(1.586)	(0.461)	(0.831)	(132.413)
FX	−0.000**	0.002	0.010*	0.004***	−0.000*	0.003	−0.000	0.001	0.010	0.003**	−0.000	0.001
	(0.000)	(0.002)	(0.004)	(0.001)	(0.000)	(0.002)	(0.000)	(0.001)	(0.005)	(0.001)	(0.000)	(0.001)
FO	0.001	0.023	0.003	−0.000	−0.002	0.004	0.001	0.002	0.003	−0.000	−0.003	−0.005
	(0.001)	(0.036)	(0.002)	(0.001)	(0.002)	(0.057)	(0.002)	(0.028)	(0.002)	(0.001)	(0.002)	(0.041)
Constant	0.469	−4.614	−0.237	0.237	1.395	−4.452	0.281**	−17.321	0.368*	0.319**	0.058	−37.899
	(0.490)	(3.705)	(0.313)	(0.162)	(0.987)	(10.589)	(0.103)	(12.585)	(0.147)	(0.083)	(0.097)	(25.921)
R^2	0.001	0.002	0.000	0.003	0.008	0.001	0.002	0.003	0.001	0.012	0.000	0.004
Observations	926	926	497	497	429	429	922	922	493	493	429	429

Notes: This table reports the panel regression results of EI and FI on overall inflow and outflow controls (panel A), and FDI inflow and outflow restrictions (panel B), for three different country groups: ALL, DEV and EM. Overall (FDI) inflow controls for country i are given by the average overall (FDI) inflow restrictions imposed by all other countries $j \neq i$. Data on overall and FDI inflow and outflow restrictions have been retrieved from Fernández *et al.* (2016). EI (FI) is proxied by the average correlation of cash-flow revisions (risk-pricing adjustments) of country i versus all other countries (see equations (3) and (4)). Correlation values are estimated using a `DCC-GARCH(1,1)`. Control variables: FO := FDI outflow as % of GDP; TO := (IMP + EXP)/GDP; GDP := GDP per capita; FX := exchange rate to US$. All variables are expressed in growth rates, except for controls on all assets and FDI, which are expressed in levels. R^2 refers to the overall R-squared. Country and year fixed effects are included. Robust standard errors clustered by country are reported in parentheses. Sample period: 1995–2019.
*, **, *** denote significance at 10%, 5%, 1%, respectively.

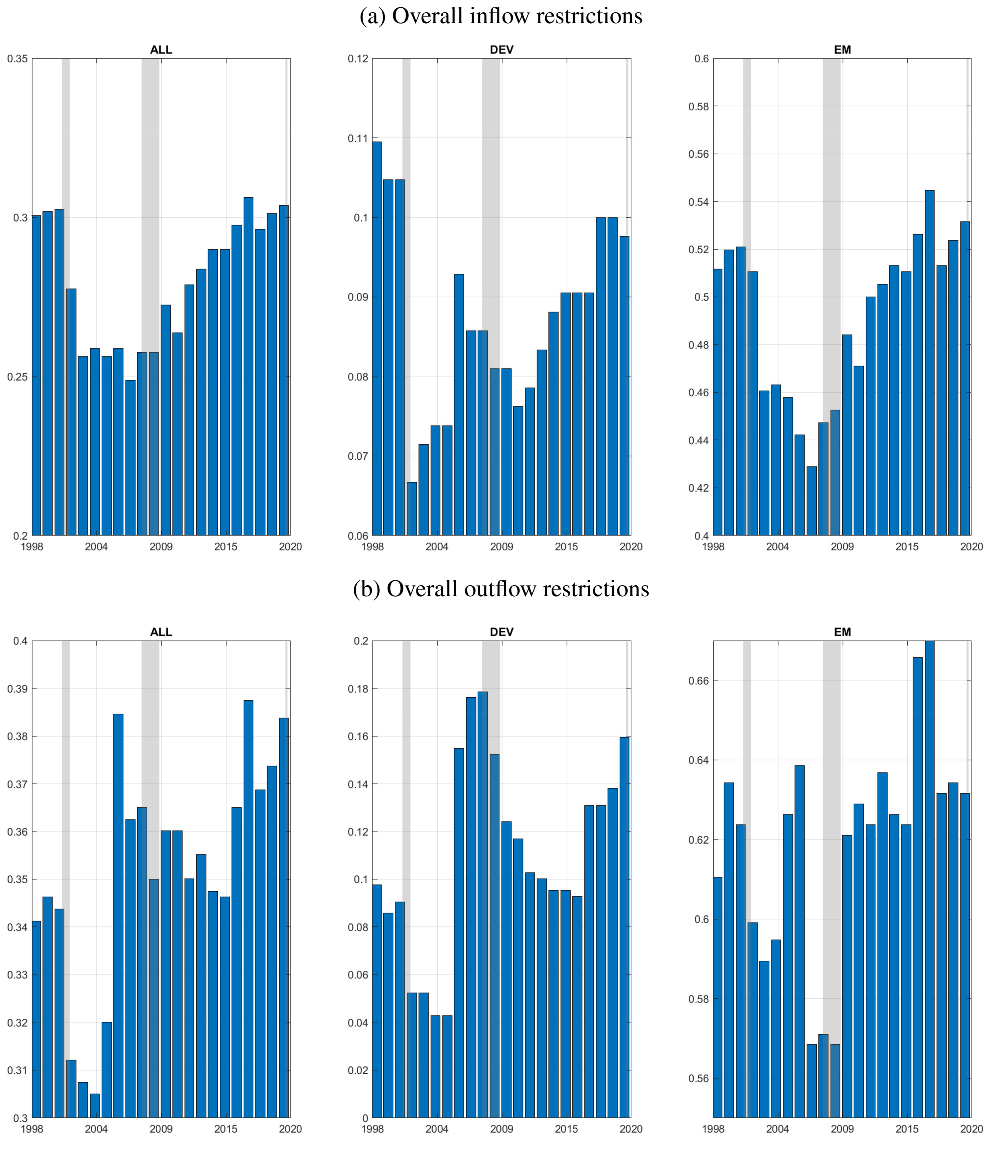
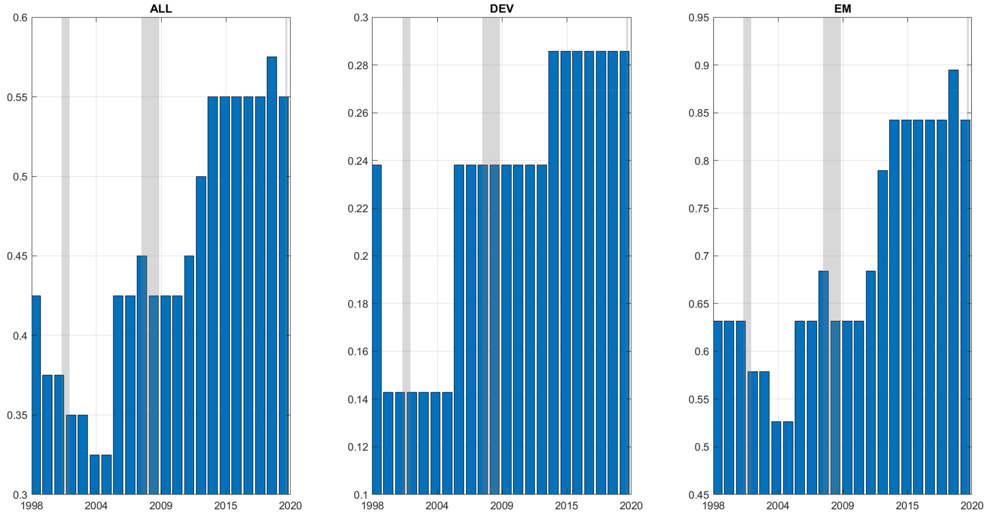


FIGURE D4 The evolution of restrictions on overall inflows and outflows. *Notes*: This figure shows the evolution of average overall (a) inflow and (b) outflow restrictions for ALL, DEV and EM. Data on overall flow restrictions are from Fernández *et al.* (2016). Sample period: 1995–2019.

integration, which does not necessarily map one-to-one with, say, bond market integration. As pointed out by Binici *et al.* (2010), the use of aggregate capital controls as potential drivers of *de facto* market integration might lead to misleading conclusions about the true degree of integration of a country, and underestimates the effectiveness of policies in the determination of integration levels. Estimates on the interplay between inflow and outflow controls on direct investments and market integration are presented in panel B of Table D6. There is weak evidence that these government interventions influence either EI or FI. We find only that loosening FDI inflow restrictions has a significant positive impact on FI (EI) in ALL (DEV). Once again, the absence of a consistent correlation between capital controls and market integration is observed.

(a) Direct investments inflow restrictions



(b) Direct investments outflow restrictions

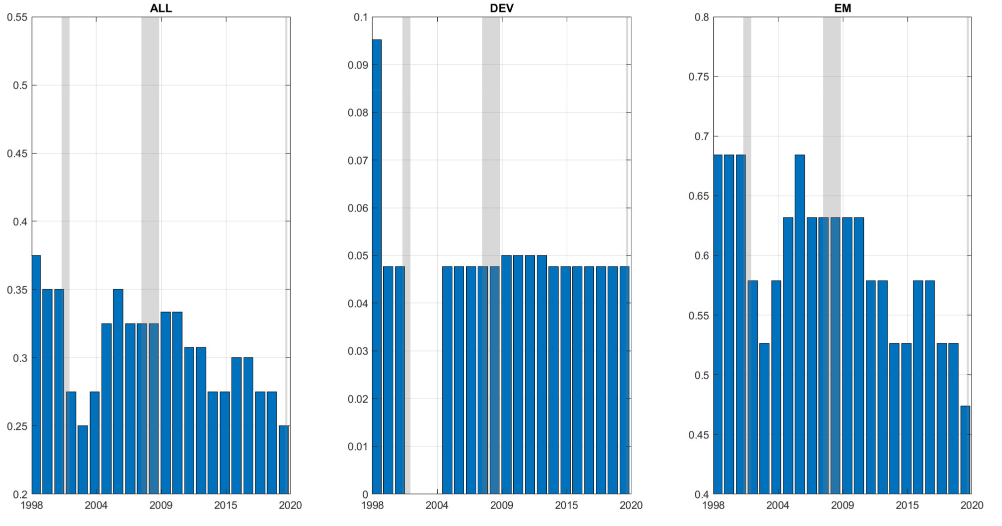


FIGURE D5 The evolution of restrictions on direct investments inflows and outflows. *Notes*: This figure shows the evolution of average direct investments (a) inflow and (b) outflow restrictions for ALL, DEV and EM. Data on direct investments flow restrictions are from Fernández *et al.* (2016). Sample period: 1995–2019.