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Review

Financial market integration: A complex and controversial journey ☆

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ABSTRACT

In this article, we develop a comprehensive review of the literature on financial integration (FI). More specifically, we focus on all those empirical and theoretical works aimed at, first, measuring FI levels overtime, and then examining the effects of rising FI on growth, macroeconomic stability, and risk sharing. Our literature review indicates the presence of clear-cut and unanimous empirical evidence that FI increased over the last 50 (30) years in advanced economies (emerging economies). Unfortunately, there are no equally clear-cut evidence on the implications of rising FI for economic growth, macroeconomic stability and risk sharing. Puzzlingly, and inconsistently with theoretical predictions, an extensive empirical literature finds weak, inconclusive and controversial evidence that rising FI levels have stimulated growth and risk-sharing. Our journey throughout the literature on FI indicates that the reason for the existence of such controversial and inconclusive empirical findings on the FI-growth and FI-risk sharing links is that the use of different FI measures, econometric techniques, and definitions of FI make it difficult to synthesize results and draw robust conclusions.

1. Introduction

Financial integration (FI) is a broad concept. Since the early 1990s, roughly corresponding to the development of Information and Communication Technologies, FI has attracted the attention of policy-makers, scholars, and practitioners, particularly for its potential benefits in terms of growth, capital allocation, macro stability, and international consumption risk sharing (hereinafter referred to as "RS"). This rising interest in FI is also clear from Fig. 1, which plots (i) the evolution of the frequency that the topic "financial integration" showed up in a corpus of books over the period 1975–2020 (Panel A) and (ii) the smoothed trend of the number of article published in each year (and stored in Scopus) reporting "financial integration" in the title (Panel B).

Greater FI is widely believed to bring numerous benefits. Among others, a higher degree of FI (i) provides lenders and borrowers a larger set of opportunities, (ii) cut the cost of financial services due to increasing competition and (iii) improves international diversification benefits. All these FI-induced benefits should then come with better RS, lower macroeconomic instability and higher growth. However, higher FI levels could also induce some costs. Specifically, highly integrated international financial markets can facilitate the cross-country transmission of shocks and generate substantial volatility in macroeconomic and asset price dynamics, undermining thus growth.

The international finance literature of the last three decades made an effort to capture the evolution of the FI process and then to investigate its effects on growth and RS. However, as of today, a general consensus on how FI should be properly measured has not been reached yet. Moreover, there are no unambiguous and clear-cut evidence on its macro- and welfare-effects. Most likely, this is due to the use of different (i) methodologies and variables employed to measure FI overtime, (ii) empirical strategies applied to estimate the impact of FI on growth and RS, (iii) samples of countries and time periods examined. With no doubts, this has led to a disconnection between international finance empirical evidence and the predictions of international business cycle (IBC) theories.

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[1] In this respect, notice that the terms financial integration (FI), financial globalization (FGLOB) and financial openness (FO) have often been used interchangeable. For instance, in the work of De Nicolò and Juvenal (2014) a price-based measure is used to capture FI whereas a quantity-based measure is used to proxy FGLOB. Several other studies instead have captured FI by focusing either on equity market and capital account liberalizations (i.e., FO) or on convergence in international equity prices (i.e., price-based FI measures).

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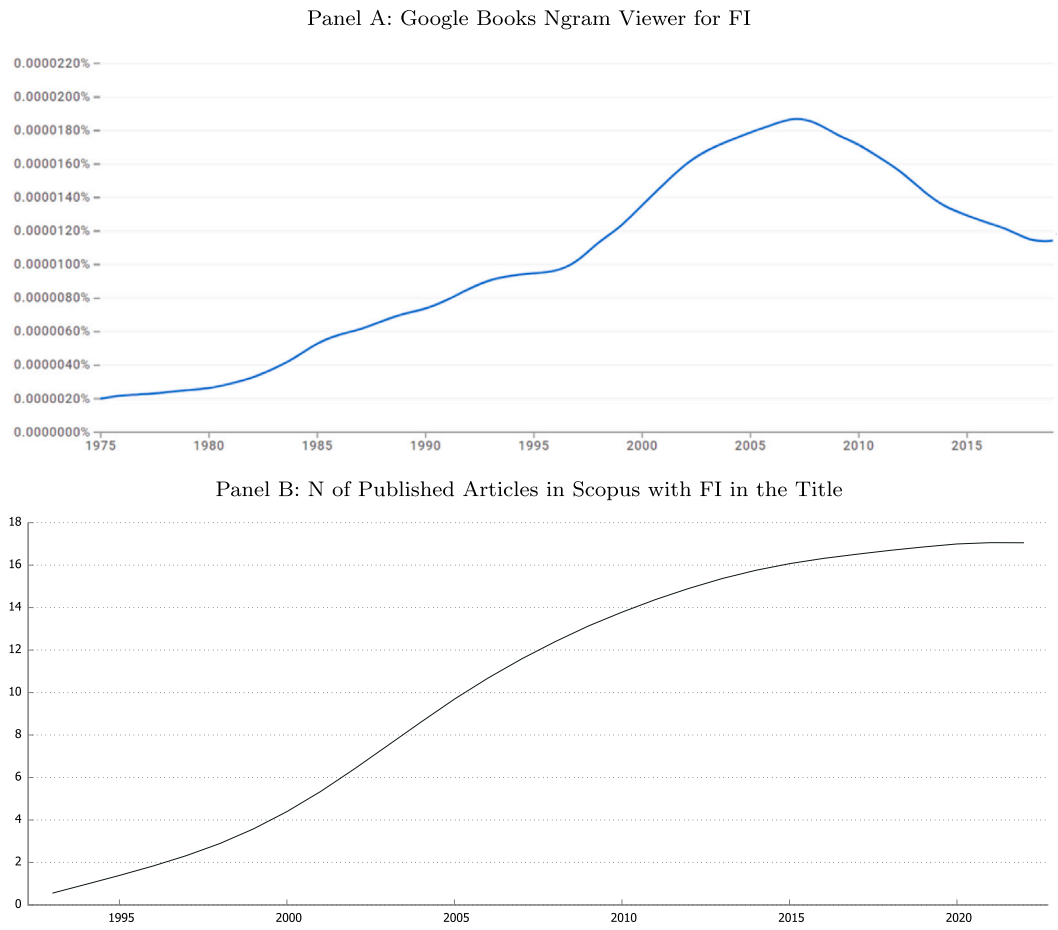

Fig. 1. The Evolution of scientific interest in financial integration. *Notes*: This figure shows the trend in the ngram from 1975 to 2015: "financial integration". The *y*-axis shows the percentage of all the bigrams contained in the sample of books written in english that are "financial integration" (Panel A). In Panel B, it is depicted the smoothed trend of the number of published articles (in each year) available in Scopus having the bigrams "financial integration" in the title.

Another important issue responsible for the ambiguous and inconclusive evidence on the effects of changes in FI levels on growth and RS is probably related to the fact that policy-makers, scholars and practitioners do not share a common view on the concept of FI. In other words, what does FI stand for? Actually, no agreed definition or generally accepted benchmark of FI has yet emerged from the international finance literature. From a theoretical perspective, FI is usually associated with the concept of market completeness. Ideally, fully integrated financial markets should facilitate economic and financial market participants to get the most efficient outcome. This because under market completeness there exists a full set of state-contingent securities in which one can perfectly hedge risks. When financial markets are complete, risk-averse agents can achieve full RS and perfect consumption smoothing. If one sticks to this definition of FI, then in the data there should be a positive significant link between FI (if properly measured) and RS. But, is it so in the data? We will see in Section 6 that this is not always the case. Market completeness, in practice, requires real access to a full set of state-contingent securities. Therefore, internationally, investors should be allowed to buy any type of securities. A natural proxy of FI can be thus represented by the degree of cross-border capital control restrictions. Intuitively, in the presence of full FI there should be no barriers that discriminate economic agents on the basis of their location in their access to funds and investment of capital. Put it differently, the more one can access to international capital markets, the larger is the set of state contingent claims and the better is RS. Other studies have instead rely on the law of one price to identify FI. Let us remind that the law of one price states that if assets have identical risks and returns, then they should be priced identically regardless of where they are transacted. Therefore under full FI international security prices should converge. To this extent, a vast empirical finance literature has attempted to capture FI using a variety of measures of convergence in cross-country asset price returns (i.e., price-based FI indicators). To conclude, there seems to be a lack of an ubiquitous and unambiguous definition of FI.[1]

In this paper, we review the large and growing literature on FI. More specifically, we aim to provide a critical survey of articles that have contributed to the following research streams over the past 20 years: (i) FI measures, (ii) FI vs. economic growth, (iii) FI vs. risk sharing, (iv) FI drivers, and (v) FI dynamics in the international business cycle (IBC) theory. To select articles we rely on an innovative process that combines quantitative (e.g., journal ranking) and qualitative (content analysis) selection criteria. Ultimately, our review attempts to provide a detailed summary of the methodologies employed and results found in each study. This with the ultimate goal of having a clear map about the divergences in the empirical findings on the implications of FI for growth and RS. We wonder then why some articles find FI to have positive influence on growth and RS and why some others find the opposite. What explains this discrepancy? Let us stress that this approach could be useful for those willing to keep contributing to this topic, as it allows to identify the most controversial points to address in order to improve the overall understanding of the phenomenon of FI.

To the best of our knowledge, there are no study providing such a type of survey. We believe that our work can help scholars to better understand (i) the range of choices they have in measuring FI, (ii) the pros and cons associated with each FI indicator, (iii) some of the reasons behind the divergence in the existing empirical findings on the

effects of FI on growth and RS and (iv) why there is no a clear-cut mapping between the IBC theoretical predictions and empirical findings on FI.

The remainder of the article is structured as follows. Section 2 introduces the main goals and objectives of this survey on FI. Section 3 outlines the criteria we used to select the papers to be considered in our literature review. Section 4 reviews the literature on FI measures and provides some updated empirical evidence on the dynamics of FI – computed using a variety of existing indicators of FI – around the globe. Section 5 (6) reviews the literature aimed at capturing the effects of FI on economic growth (RS). Section 7 discusses empirical works aimed at finding potential drivers of FI. Section 8 explores the role of FI within the IBC literature. Section 9 concludes.

2. Survey goals and objectives

The acceleration in the production of scientific works on FI over the last two decades, as illustrated in Fig. 1, can be attributed to the evolving orientation of economic systems toward global finance. This shift has captured researchers' attention, prompting a closer examination of the synchronization levels among various financial markets and their implication for the real economy.

Our survey places particular emphasis on the post-2000 literature on FI for several reasons. First, many existing surveys predominantly rely on papers from the '90s and early '00s, and there is a need to explore recent advancements. Second, the post-2000 era has witnessed notable progress in measuring FI and estimating its impact, driven by the changing nature of global economies' interconnectedness. Understanding the influence of FI on recent economic growth and its impact on the decision-making of market participants is crucial, especially considering the evolving nature of this phenomenon and its ambiguous response to underlying factors.

For years, the majority of attention on the FI process has been centered around its construction and measurement. However, our survey diverges from existing ones by not only focusing on FI measures but also delving into its macro-effects. This shift is essential because, in the context of fast globalization, the macroeconomic effects of FI have changed over time. In this respect, our survey aims to not only present evidence of changes in FI levels but also to shed light on its macroeconomic implications. This departure from conventional works focusing solely on FI measures allows for a more comprehensive exploration of the impact of FI on economic growth and RS.

Therefore, in light of the aforementioned arguments, it is of interest to delve into the research conducted over the past 23 years pertaining to the following five research streams: (i) the construction of FI indicators and their evolution over time; (ii) the effects of FI on economic growth; (iii) the relationship between FI and risk-sharing; (iv) the key factors influencing FI; (iv) the effects of FI on the macroeconomy according to the theory.

Admittedly, some surveys on FI have been already proposed (see, for instance, Akbari & Ng, 2020; Furstenberg, 1998; Kearney & Lucey, 2004; Patel et al., 2022; Quinn et al., 2011). However, we departure from these under several dimensions. Among the existing surveys on FI, the most closely related to ours is probably the one of Patel et al. (2022). In their paper, Patel et al. (2022) conduct a meta-literature review on FI, encompassing 260 articles published in top journals from 1981 to 2021. Nevertheless, we differ from Patel et al. (2022) in several respects. First, we focus on a different set of FI-related research topics. Patel et al. (2022) aim to explore general issues related to FI, including factors influencing integration and new approaches to measuring it, effects of FI on portfolio diversification, links between FI and adverse events (especially crises), and co-movements between FI and other asset prices. Differently from Patel et al. (2022) (and other existing studies), we do not exclusively review articles focusing on measuring FI but also on empirical works examining the effects of FI on economic growth, macroeconomic stability and RS. In addition, we account also for empirical works examining the potential drivers of FI and theoretical IBC studies attempting to fix international macro-finance anomalies by means of different international capital market structures. Second, Patel et al. (2022) strive to build co-authorship, co-citation, and cartographic analysis indicators to create visual maps illustrating relationships between articles in the FI literature. Our effort, instead, is devoted to provide a detailed description of the main contributions of all the selected articles as well as ascertain whether the empirical findings obtained by the different articles are consistent and unanimous. Third, we apply a different criterion to select articles to be included in the review of the FI literature. In the spirit of Patel et al. (2022), we also use both quantitative (i.e., articles selected based on journal ranking) and qualitative (i.e., articles selected by focusing on keywords in the title and content analysis) techniques. However, our selection process is overall more stringent than theirs.[2]

Let us further clarify that our survey approaches the aforementioned five research streams differently compared to previous literature. As opposed to existing surveys, we are not only interested in providing a general overview of what existing research has focused on. In particular, these surveys merely aggregate various studies based on salient factors such as the countries examined or the results yielded, without delving into the underlying reasons for any discrepancies in the findings. Instead, we aim to identify and discuss potential inconsistencies and differences among the abundance of empirical evidence on FI dynamics and its macro-effects proposed by the literature over the last two decades. To do this, one needs to perform a meticulous analysis of each article considered in the survey, evaluating its methodological approach, the empirical strategy employed, and the distinct groups of countries under scrutiny. We believe that this critical assessment and discussion of the results in the context of the five identified research streams can reveal unexplored research areas, which can represent an avenue for future research on FI.

3. Paper selection process

In what follows, we briefly describe the qualitative and quantitative steps employed to select the papers included in our novel survey. The selection process consists of various steps. As discussed in the previous section, we rely only on articles published from 2000s on. We then apply a qualitative screening by selecting papers that include the terms "*Financial Integration*", "*Financial Globalization*", or "*Market Integration*" in the title, as indicated by searches in `Google Scholar` (step 1). A quantitative filter is subsequently applied by removing papers that have a ranking below 2* according to the ABS Journal Ranking Guide (step 2). We then implement a thoughtful text analysis in order to select articles that directly focus on the five pre-identified research streams. As in Patel et al. (2022), this "ensures that any article we engage with, discuss, examine, or analyze has FI as its direct content". Since it is possible that some articles excluded from our selection could still strictly focus on issues that are closely related to our main research streams, we conduct an in-depth analysis of the text and references of the selected articles in order to "retrieve" works that otherwise could have been excluded. Let us stress that this qualitative analysis of articles ensures that we do not miss influential papers focusing on FI. These additional qualitative-based filtering steps reduce the number of articles to approximately 100. Out of these 100 articles, we select only 69. The decision to further reduce the number of papers is primarily driven by space constraint. Of course, this additional filter has led to the exclusion of papers meeting our criteria. However, a deeper content

[2] A detailed description of the selection process is provided in Section 3.

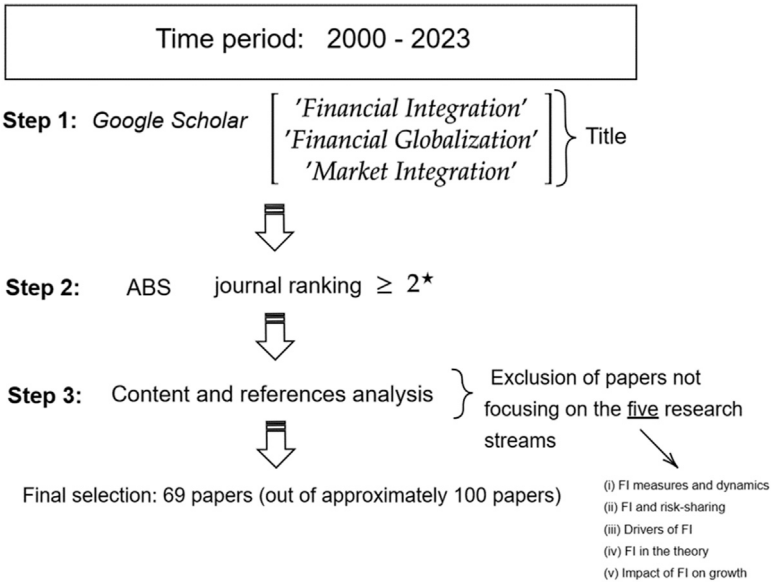

Fig. 2. Selection process outline.

analysis reveals that the excluded papers are less closely related to our five research streams.[3]

An outline of the above selection process is presented in Fig. 2 whereas the list of selected papers is reported in Table 1. Out of the 69 papers, 64 have been identified through the criteria defined in steps 1 and 2, while 5 have been included via qualitative text analyses (step 3). The so-called "rescued" papers are: Goetzmann et al. (2005), published in the highly-rated journal, the *Journal of Business*, which ceased publication in 2006 and, therefore, is not listed in the ABS ranking; Chinn and Ito (2008), a highly-cited paper published in the policy-oriented *Journal of Comparative Policy Analysis: Research and Practice*, which is not included in any classification of economic scientific articles; Bekaert et al. (2003, 2005, 2011), which do not satisfy the criterion in step 1 but are nevertheless highly-cited as well as discussed in the selected papers that meet all our criteria.

4. Financial integration measures

FI measures can be grouped into two broad categories: (i) *de jure* measures and (ii) *de facto* measures. *De facto* FI measures can be further classified into two different groups: (a) quantity-based measures and (b) price-based measures. In what follows, we survey studies focusing on *de jure* measures in Section 4.1 and discuss existing empirical works employing quantity-based (price-based) *de facto* measures of FI in Section 4.2.1 (4.2.2).

4.1. De jure measures

The *de jure* measures of FI refer to legal and regulatory changes that are implemented by governments to promote FI. When implemented by governments, such measures are designed to facilitate the flow of capital, goods, and services across borders. De *jure* measures may include changes to laws and regulations that affect the operations of a variety of financial institutions. Examples of *de jure* indicators include changes to laws and regulations that affect cross-border investment, the operation of foreign financial institutions in a given country, and the liberalization of capital controls.

Generally, the sources used to build these measures are:

- Government reports and announcements. National governments often issue reports or make announcements about changes to financial policies and regulations, which can provide information on the *de jure* status of FI.
- International organizations, such as the International Monetary Fund (IMF) and the World Bank, often track and report changes to financial policies and regulations across countries, including information on *de jure* FI.
- Legal and regulatory databases. For example:
  - IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). This report provides information on the exchange rate and capital account policies of countries, including data on restrictions on capital flows and foreign exchange transactions.
  - Central bank regulations and guidelines. Many central banks publish regulations and guidelines that govern the financial sector in their countries, including information on restrictions on capital flows, currency convertibility, and other measures of FI.
  - Financial market regulatory bodies. For example, the Securities and Exchange Commission (SEC) in the United States publishes rules and regulations that govern financial markets, including restrictions on capital flows and foreign investment.
  - International financial organizations. For example, the International Organization of Securities Commissions (IOSCO) can provide information on global regulatory standards for the financial sector, including measures of FI.

The final FI indicator relying on newly-implemented regulations can be built using two distinct approaches. First, the indicator can be represented by a standard "on/off measure" that takes the value of 1 if

[3] Among the excluded papers, it is worth mentioning Dias et al. (2019), Pyun and An (2016), and Stoupos and Kiohos (2022). Dias et al. (2019) observe that the level of FI in the seven EM of Latin America decreased following the crises of 2001 and 2008. Pyun and An (2016) provide instead evidence of a positive relationship between FI and GDP synchronization among a group of 58 countries. Stoupos and Kiohos (2022) focus mainly on FI dynamics. They observe stronger post-2010 integration among the stock markets of core countries in the Euro area and weaker integration among the stock markets of peripheral countries in the Euro area.

Table 1
List of papers surveyed on FI and its implications.

Paper	Terms in Papers' Title			ABS*	GS [Scopus]
	"Financial Integration"	*"Financial Globalization"*	*"Market Integration"*		
A: FI measures					
Ayuso and Blanco (2001)	✓		✓	3	146 [37]
Phylaktis and Ravazzolo (2002)	✓			3	254 [114]
Bekaert et al. (2003)°				3	382 [111]
Baele et al. (2004)	✓			2	936 [na]
Edison and Warnock (2003)				3	653 [195]
Kose et al. (2003)^{A,C}	✓			3	849 [na]
Goetzmann et al. (2005)				na$^{\mp}$	989 [302]
Carrieri et al. (2007)^{A,D}			✓	4	615 [252]
Kose et al. (2006)	✓			3	490 [122]
Chinn and Ito (2008)				na$^{\pm}$	2780 [na]
Kaminsky and Schmukler (2008)				4	342 [126]
Quinn and Voth (2008)				4	162 [71]
Schindler (2009)	✓			3	552 [172]
Pukthuanthong and Roll (2009)			✓	4	626 [306]
Yu et al. (2010)	✓		✓	3	294 [143]
Lucey and Zhang (2011)	✓			3	92 [37]
Volosovych (2011)^{A,D}	✓		✓	3	104 [39]
Volosovych (2013)	✓		✓	2	31 [20]
Bekaert et al. (2011)°				4	587 [231]
Bekaert et al. (2013)			✓	4	237 [85]
Furceri and Zdzienicka (2012)	✓			2	24 [9]
Donadelli and Paradiso (2014)	✓			3	51 [32]
Lehkonen (2015)^{A,D}			✓	4	149 [75]
Boubakri et al. (2016)	✓			3	18 [10]
Billio et al. (2017)			✓	3	83 [48]
Lane and Milesi-Ferretti (2018)	✓			3	646 [125]
Zaremba et al. (2019)	✓		✓	3	15 [10]
Akbari et al. (2020)	✓			4	31 [16]
B: FI vs. growth					
Prasad et al. (2003)		✓		3	33 [na]
Edison et al. (2002)	✓			3	1100 [291]
Bekaert et al. (2005)°				4	3016 [895]
Collins (2004)	✓			2	24 [9]
Quinn and Toyoda (2008)				4	678 [215]
Bonfiglioli (2008)	✓			3	406 [133]
Schularick and Steger (2010)	✓	✓		4	162 [55]
Quinn et al. (2011)	✓			3	348 [127]
Masten et al. (2008)	✓			3	283 [112]
Kose, Prasad, Rogoff et al. (2009)		✓		3	2451 [409]
Aizenman et al. (2013)	✓			2	287 [85]
Ahmed (2016)	✓			3	94 [35]
Hoffmann et al. (2020)	✓			3	34 [8]
C: FI vs. RS					
Kose, Prasad, Terrones (2009)		✓		3	333 [133]
Jappelli and Pistaferri (2011)	✓			4	102 [29]
De Nicolò and Juvenal (2014)	✓			3	76 [35]
Kalemli-Ozcan et al. (2014)	✓			4	87 [11]
Suzuki (2014)	✓			2	25 [9]
Malik (2015)	✓			2	10 [9]
Mimir (2016)	✓			2	9 [7]
Rangvid et al. (2016)	✓			3	54 [16]
Donadelli and Gufler (2021)	✓			2	2 [1]
Tang and Yao (2022)	✓			3	3 [2]
Ferrari and Picco (2023)				3	2 [0]
D: FI drivers					
Lane and Milesi-Ferretti (2003)	✓			3	718 [na]
Vo and Daly (2007)	✓			2	114 [51]
Chambet and Gibson (2008)	✓			3	219 [99]
Alotaibi and Mishra (2017)	✓			2	44 [19]
Akbari et al. (2021)	✓			3	15 [7]
Nardo et al. (2022)	✓			3	16 [5]
E: FI in the theory					
Backus and Smith (1993)				3	936 [268]
Evans and Hnatkovska (2007)	✓			4	53 [17]
Colacito and Croce (2010)	✓			4	58 [24]
Devereux and Sutherland (2011)	✓			3	70 [29]
Bai and Zhang (2012)	✓			3	216 [70]

(*continued on next page*)

Table 1 (*continued*).

Colacito and Croce (2013)		4	216 [70]
Dedola and Lombardo (2014)	✓	3	196 [60]
Evans and Hnatkovska (2014)	✓	3	195 [32]
Yu (2015)	✓	3	25 [10]
Tretvoll (2018)		3	13 [2]
Devereux and Yu (2020)	✓	4	73 [13]

Notes: ABS := ABS Journal List Ranking 2018. GS := number of Google Scholar citations, as of May 2023. [Scopus] := number of citations in Scopus, as of May 2023. na := information not available. $(\cdot)^{A,D}$ the paper falls into category A and D. $(\cdot)^{A,C}$ the paper falls into category A and C. $^{\mp}$:= paper published in *The Journal of Business* (n.b. the journal closed in 2006 and since then not rated in the ABS). $^{\pm}$:= highly cited paper published in the *Journal of Comparative Policy Analysis: Research and Practice* (i.e., journal not included in the ABS but since highly influential we have decided to include it in our survey $^{\circ}$:= papers not meeting our selection criteria (i.e., no terms "*Financial Integration*", "*Financial Globalization*", or "*Market Integration*" in the title) but included anyway for having FI as its main content of analysis (for more details, please refer to Section 3).

the regulation is in place, and 0 otherwise, or viceversa. Intuitively, this approach identifies only the presence or the absence of capital controls. Second, one can build a continuous measure aimed at capturing the intensity of regulations through a careful interpretation of the information reported in the reports.

Related literature. Bekaert et al. (2003) develop a dichotomous measure of *de jure* FI, assigning the value of one when the liberalization takes place. They examine the economic effects of official liberalization dates on market integration (measured as US holdings in percentage of market capitalization) in 30 emerging/developing economies (hereinafter EM) from 1980 to 2000 (annual frequency). Their findings indicate that equity market liberalizations led to increased market integration, which in turn had a number of positive effects on investment and economic growth.

Edison and Warnock (2003) build a monthly measure of the intensity of capital controls for a group of 29 EM from the late-80s until the early-00s. Their measure (called FOR) is represented by the portion of the domestic shares that foreigner investors may own. This ranges from a value of 0 (completely open market) to a value of 1 (completely closed market).[4] Overall, they find that EM became more open over the period 1980–2000. However, the observed degree of openness is not homogeneous across EM. For instance, some countries (i.e., Philippines, Sri Lanka, Argentina and Perù) are found to be relatively open with, however, very little variation over time in the intensity of capital controls. In other countries instead a rise in the degree of capital control is observed, leading thus to a drop in FI. Via standard regressions, the authors further find that a wider liberalization process leads to a reduction in the cost of capital, an appreciation of the exchange rate, and an increase in net capital inflows.

Kose et al. (2003) use both a *de jure* and a *de facto* indicator of FI to investigate the impact of FI on macroeconomic volatility over the period 1960–1999. They focus on a panel of 76 countries, i.e., 55 EM and 21 advanced/developed/industrialized economies (hereinafter ADV). As a *de jure* metric, they employ a binary 0–1 index of current account transaction restrictions where 1 indicates full restriction. They find no role of current account restrictions on volatility of output, consumption and income.

Chinn and Ito (2008) introduce an intensity index of capital controls called KAOPEN for 181 countries for the period 1970–2005 (annual frequency). The KAOPEN index is obtained by taking the first standardized principal component of the four major categories related to the level of capital controls and restrictions in a country's financial system available in the AREAER issues. The resulting index ranges from 0 to 1, with higher values indicating a higher degree of financial openness (FO). By using this index, they observe that ADV become more open starting from the 1970s, while EM show a strong acceleration of the financial opening process only after the 1990s.

Quinn and Toyoda (2008) develop a *de jure* measure of capital account and financial current account openness for 94 countries over a period of 50 years (i.e., from 1950 to 1999). These intensity-based measures are built starting from two indicators reported in the annual AREAER documents which offer a measure of the magnitude of the capital restrictions also distinguishing between residents and non-residents. FO follows a stable path from the post-war until the mid-70s and starts increasing rather rapidly from the mid-70s (see Fig. 1 at pag. 1410).

Schindler (2009) combines the binary information of the sub-components of each asset category reported in the AREAER issues in order to build an intensity *de jure* measure for a group of 91 countries (35 high income economies, 42 middle income economies, 14 low income economies) for the period 1995–2005 (annual frequency). Since the index was created from finely disaggregated data, the author shows how it is possible to precisely identify the source (asset category) of each variation of the regime. Taken together, the newly developed empirical strategy of Schindler (2009) indicates that *de jure* liberalization boosts *de facto* FI. This evidence holds across asset categories.

Kaminsky and Schmukler (2008) construct an intensity *de jure* measure of financial liberalization using different sources – provided by international and national institutions – for a group of 28 countries (14 ADV and 14 EM) over the period 1973–2005 (annual frequency). Their proposed index jointly evaluates the liberalization of the capital account, the domestic financial sector, and the stock market. It takes values ranging from one to three, with one (three) indicating fully liberalized (repressed) international capital markets. In line with other studies, they find ADV to be less regulated than EM. More importantly, their intensity *de jure* measure shows the presence of a gradual lifting of restriction starting from the '70s ('90s) in ADV (EM). Therefore, as indicated by other types of measures, EM started the process of FI from the early-90s. Instead, ADV became almost fully liberalized in the early-90s (see Fig. 1 at pag. 263).

Kose et al. (2006) investigate the effects of trade openness (hereinafter TO) and FI on the relationship between output growth and volatility for a group of 85 countries (21 industrial and 64 developing) over the period 1960–2000 (annual frequency). To capture FI, the authors rely on a binary *de jure* measure as well as on a *de facto* measure (i.e., the ratio of gross capital flows to GDP). The authors find that TO has contributed to weakening the negative relationship between growth and volatility. Both *de jure* and *de facto* FI measures are found to have no statistically significant implications.

Kose, Prasad, Terrones (2009) examine the pattern of international RS, measured as the difference between the consumption growth rates of a generic country and the world consumption growth, over the period 1960–2004 (annual data) among different groups of countries, i.e., 21 ADV and 48 EM. Empirically, they then check whether either *de jure* or *de facto* FI has contributed to improve RS. As a *de jure* measure of FI, the authors use both a binary and a continuous measure. The *de jure* measures are not associated with significant changes in the extent of RS. The results are robust to different group of countries and sample selection.

Lucey and Zhang (2011) study the effect of FI on corporate leverage and debt maturity in 24 EM by using a micro dataset composed by 4477 firms for the period 1995–2007 (annual data). To proxy equity market integration (STKOPEN), they rely on the *de jure* measure proposed by

[4] Quinn et al. (2011) define their index as a "hybrid" measure since it combines data on legal restrictions with quantitative market data.

Table 2
List of papers: FI → *De jure* measures.

Paper	Data/Methodology	Countries	Period (Frequency)	Main results
Bekaert et al. (2003)	FI := intensity index	30 EM	1980–2000 (A)	$FI \nearrow$
Edison and Warnock (2003)	FI := intensity index	29 EM	1988–2000 (M)	$FI \nleftrightarrow$
Kose et al. (2003)	FI := binary index	21 ADV + 55 EM	1960–1999 (A)	na
Chinn and Ito (2008)	FI := intensity index	31 ADV + 150 EM	1970–2005 (A)	$FI \nearrow$
Quinn and Toyoda (2008)	FI := intensity index	24 ADV + 70 EM	1950–1999 (A)	$FI \nearrow$
Schindler (2009)	FI := intensity index	35 HI + 42 MI + 14 LI	1995–2005 (A)	$FI \nearrow$
Kaminsky and Schmukler (2008)	FI := intensity index	14 ADV + 14 EM	1973–2005 (A)	$FI^{\nearrow}_{[ADV,1973-2005]}$ $FI^{\nearrow}_{[EM,1989-2005]}$
Kose et al. (2006)	FI := binary index	21 ADV + 64 EM	1960–2000 (A)	na
Kose, Prasad, Terrones (2009)	FI := binary & intensity index	21 ADV + 48 EM	1960–2004 (A)	na
Lucey and Zhang (2011)	FI := intensity index	24 EM	1995–2007 (A)	$FI \nearrow$
Furceri and Zdzienicka (2012)	FI := intensity index	31 ADV	1970–2009 (A)	$FI \nearrow$

Notes: In Schindler (2009): HI = high income economies, MI = middle income economies and LI = low income economies. A = annual frequency. M = monthly frequency. FI trend: $\nleftrightarrow$:= mixed evidence; $\leftrightarrow$:= stable FI trend; $\nearrow$:= increasing FI trend; $\searrow$:= decreasing FI trend; na := info on FI trend not available.

Edison and Warnock (2003).[5] Equity market integration (STKOPEN) presents an increasing trend over the period 1995–2007 (see Fig. 1 at pag. 1232). The authors find that increased equity market integration leads to greater use of debt and equity financing. The results reflect the economic benefits produced by FI: increased financing options and decreased costs of capital.

Furceri and Zdzienicka (2012), examine the effect of FI on fiscal policy using an unbalanced panel of 31 OECD countries from 1970 to 2009 (annual data). In the analysis, the authors consider as *de jure* measure the KAOPEN index introduced by Chinn and Ito (2008). *De jure* FI is found to be increasing overtime. Their empirical evidence indicate also that the *de jure* measure reduces the budget deficit and also contributes in reducing government spending volatility.

A summary reporting the main insights on data, methodologies and results of the surveyed studies on *de jure* FI measures is provided in Table 2.

Pros and cons. Unfortunately, *de jure* measures do not necessarily reflect the true degree of FI of a country or region. In fact, we still have countries with relatively close capital accounts or severe stock market participation restrictions that became substantially more financially integrated over the past decades. In this respect, as noted by Bekaert et al. (2003) legislative liberalization is not synonymous with actual integration. For example, regulatory changes might not always translate into effective integration due to pre-existing access methods or persisting market imperfections. In general, it can be observed that although foreigners now have relatively free access to capital markets thanks to financial liberalizations, such access does not guarantee full FI. To unveil the dynamic nature of integration, FI measures should have a strong time-varying component. This aspect is absent in the *de jure* measures and for this reason they are not suitable to track the evolution of the true FI process.

4.2. De facto measures

De facto measures of FI are typically built by analyzing actual market behavior and market access, rather than legal or regulatory policies. It is a reflection of the actual state of FI and the degree to which capital and investment flows freely across borders. The measure can be built by using various data sources such as market data, transaction data, portfolio flows, etc. The specific method of building a *de facto* measure of FI can vary depending on the data sources used and the research question being addressed. In general, *de facto* measures can be divided into the following two broad categories: (*i*) quantity-based measures and (*ii*) price-based measures.

[5] The measure captures the proportion of domestic equity market that is available to foreign investors.

4.2.1. Quantity-based measures

Quantity-based metrics are type of FI measures that assess the amount or size of financial transactions, such as the value of foreign investment, trade of securities, and cross-border banking transactions. These measures are considered as a proxy of financial linkages between countries and they show the magnitude of cross-border financial flows. Quantity-based measures can be used to track the development of financial systems, and the evolution of financial globalization over time.

Related literature. Lane and Milesi-Ferretti (2003) rely on two volume-based measures of FI/FO: (*i*) the aggregate sum of external asset and liabilities over aggregate GDP and (*ii*) the aggregate sum of foreign direct investment (FDI) and portfolio equity assets and liabilities over aggregate GDP. Using annual data for a group of 14 ADV, they find a massive increase (i.e., around 200%) in the level of FO/FI over the period 1983–2001 (see Fig. 1 and Fig. 3 in Lane and Milesi-Ferretti 2003).

Kose et al. (2003), in addition to a *de jure* measure (see Section 4.1), employ a quantity-based FO/FI indicator. This is defined by the gross capital flows (as a % of GDP). Using data for a group of both ADV and EM spanning the period 1960–1999, they find that FO contributes to increase the volatility of consumption growth relative to that of income, inconsistent with IBC theoretical predictions on the benefits of FI for RS.

Albuquerque et al. (2005) focus on a large group of ADV (20) and EM (74) over the period 1970–1999 (annual data) to study the dependence of FDI on global factors – i.e, factors driving FDI across several countries. They construct a globalization measure corresponding to the share of explained variation in direct investment attributable to global factors. The authors show that the globalization measure starting from the mid-1980s has increased steadily for both country groups.

As mentioned in our previous section, Kose et al. (2006) employ also a *de facto* measure to investigate the FI-growth nexus. This is built as capital flows in percentage of GDP. The authors, however, do not report evidence on the evolution of the FI process. Kose, Prasad, Terrones (2009) (see also discussion in Section 4.1) use two different measures of *de facto* FI (i.e., gross stocks of assets and liabilities, both scaled by GDP) to verify their effects on RS. Unfortunately, the paper does not show the dynamics of these measures and cannot tell us much about the FI process.

Lucey and Zhang (2011) (see also Section 4.1) adopt a variety of quantity-based measures of FI. First, to proxy credit market integration (CRTINTI), they use (i) the annual arithmetic average of outstanding international debt securities over GDP (INTLDEB) and (ii) outstanding loans from non-resident banks over GDP (NRBLOA). Data are retrieved from the World Bank (Financial Structure Database). Lucey and Zhang (2011) states that CRTINTI gauges the actual use of international credit

Table 3
List of papers: FI → Quantity-based measures.

Paper	Data/Methodology	Countries	Period (Frequency)	Main results
Lane and Milesi-Ferretti (2003)	External assets and liabilities (% of GDP): FDI, Portfolio Equity and Debts Other Investment	14 ADV	1983–2001 (A)	$FI^{\nearrow}$
Kose et al. (2003)	FI: = Capital flows (% GDP)	21 ADV + 55 EM	1960–1999 (A)	na
Albuquerque et al. (2005)	FI := SHARE	20 ADV + 74 EM	1970–1999 (A)	$FI \nearrow$
Kose et al. (2006)	Capital flows (% GDP)	21 ADV + 64 EM	1960–2000 (A)	na
Kose, Prasad, Terrones (2009)	FI := foreign assets (% GDP) & foreign liabilities (% GDP)	21 ADV + 48 EM	1960–2004 (A)	na
Lucey and Zhang (2011)	FI := CRTINTI & NTLDEBT & RBLOAN	24 EM	1995–2007 (A)	$FI \nleftrightarrow$
Furceri and Zdzienicka (2012)	FI := FI1 & FI2	31 ADV	1970–2009 (A)	$FI \nearrow$
Lane and Milesi-Ferretti (2018)	FI := net foreign assets (% GDP)	31 ADV + 181 EM	1970–2015 (A)	$FI \nearrow$

Notes: Trend effects: $\nleftrightarrow$:= mixed evidence; $\leftrightarrow$:= stable FI trend; $\nearrow$:= increasing FI trend; $\searrow$:= decreasing FI trend; na := information not available. A = annual frequency.
In Albuquerque et al. (2005): SHARE := share of explained variation in direct investment attributable to global factors.
In Lucey and Zhang (2011): CRTINTI := outstanding loans from non-resident banks over GDP; NTLDEBT := international debt securities (outstanding) as % of GDP; RBLOAN := loans from non-resident banks (outstanding) as % of GDP.
In Furceri and Zdzienicka (2012): FI1 := total stocks of external assets and liabilities as % of GDP; FI2 := sum of the total stocks of portfolio assets and liabilities and the stocks of direct investment assets and liabilities as % of GDP.

markets by country. Moreover, they observe that the degree of credit market integration increased until 1998 and then slowed down and declined during the rest of sample period (see Fig. 1 at pag. 1232 in Lucey and Zhang 2011).

Furceri and Zdzienicka (2012) (see also Section 4.1) employ the two volume-based measures of FI proposed by Lane and Milesi-Ferretti (2003), i.e., (i) share of the total stock of external assets and liabilities to GDP and (ii) share of the total stock of portfolio and foreign direct investment assets and liabilities to GDP. Both measures are found to follow an increasing trend over the analyzed period (see Fig. 1 in Furceri and Zdzienicka 2012). The authors find also that (*i*) a rise in FI increases the government budget balance; (*ii*) an increase in FI reduces government spending volatility; (*iii*) FI increases the share of debt held by foreign residents.

Lane and Milesi-Ferretti (2018) employ data on external assets and liabilities to shape the evolution of FI across countries. Data are retrieved for 212 economies over the period 1970–2015. Their quantity-based measures of FI indicate a slow down in the degree of integration in the aftermath of the 2008–2009 subprime crisis. This due to (*i*) a retrenchment of cross-border banking activity implemented with the aim of reducing international balance sheet linkages and (*ii*) a larger contribution of less financially integrated economies in global GDP. Main studies adopting quantity-based measures to capture the FI process are listed in Table 3.

Pros and cons. Most frequently, the sum of foreign assets and liabilities over GDP has been proposed as a measure of *de facto* FI. While *de facto* measures are easy to be computed and interpreted, they have some drawbacks, especially tighted to data availability. First, and most importantly, retrieving reliable data on foreign assets and liabilities for a large number of economies is a difficult task. Moreover, if available, they do not span a sufficiently long time period. Second, most of the times, variables employed to compute *de facto* FI measures are available at relatively low frequency (i.e., annual or, at best, quarterly). Low frequency data may mask the short-term dynamics of financial transactions between countries. In other words, an annual sum of financial assets and liabilities (as a % of GDP) may not be able to capture the complexity and variation of financial transactions that occur at a higher frequency.

4.2.2. Priced-based measures

Price-based measures of FI assess the degree of synchronization of asset prices across different markets.[6] These measures are typically calculated using financial market data such as returns or prices of financial assets and can be further classified into two sub-categories: (*i*) static measures and (*ii*) dynamic measures.

Static measures Static measures of price-based FI provide a snapshot of the level of integration at a specific point in time. These measures use statistical techniques to analyze the co-movements of asset prices across different markets, and the degree of co-movement is used as an indicator of FI. Examples of static measures of FI include correlation coefficients, international CAPM, and non-parametric techniques to evaluate the absence of arbitrage opportunities.

Literature review. Ayuso and Blanco (2001) use the non-parametric approach proposed by Chen and Knez (1995) who measure equity market integration by calculating the distance between the estimated stochastic discount factor implied in observed equity returns and the theoretical discount factor under full integration. The authors focus on a small group of four ADV over the '90s (daily data). They then compare the empirical findings in two sub-samples (i.e.,1990–1994, 1995–1999) and find that the degree of FI increased after the mid-90s. Phylaktis and Ravazzolo (2002) focus on the real and financial links for a group of eight Pacific-Basin countries over the period 1980–1998 (monthly data). In particular, by using a VAR methodology, they decompose the variance of excess returns into innovations in excess returns, dividend growth rates, interest rates and exchange rates. In their framework, comovement in innovations in future expected stock returns and dividend growth rates represent a measure of FI and economic integration (EI), respectively. The authors find that EI and FI are two phenomena that occur together, especially since the 1990s, and that EI probably represents a transmission channel for FI.

Pros and cons. All these approaches have been shown to have a static nature (similarly to the *de jure* measures). In other words, they provide information about the status of FI of a country (or group of countries) in a specific time-interval. FI, however, is a dynamic concept and what matter most is mapping evolution of the FI process over time. For this reason, our survey gives little space to static measures. Instead, we devote more attention to dynamic measures which will be widely discussed in the next paragraph.

Dynamic measures Since risk premia have been shown to be time-varying any attempt to model FI by neglecting this time variation may yield ambiguous and partial results. A variety of measures have been proposed to address this issue, some of them more robust than others. Of course, the most commonly used approach to capture cross-country convergence in asset prices is the standard correlation (hereinafter SC).

Goetzmann et al. (2005) examine the correlation structure of the world equity markets over the period 1872–2000. They compute the

[6] This way of measuring integration is based on the so-called law of one price. According to this law, assets with the same risk characteristics and cash flows should exhibit the same price, independently of the location where they are traded.

time series of the average off-diagonal correlation of dollar-valued capital appreciation returns for all available markets using a backward-looking window of 60 months. They observe relatively high correlations during periods of high capital market integration. In their work, cross-county convergence in prices and international capital mobility are assumed to represent two distinct phenomena. One can actually argue that the average cross-country correlation of returns is induced by free movements of capital. However, if we focus on long-run trends only, we can notice that the "U" shape in the correlation structure found by Goetzmann et al. (2005) is not distant from the pattern of global capital market flows identified by Obstfeld and Taylor (2002) and the FI dynamics estimated via different methodologies by Volosovych (2011) and Zaremba et al. (2019) over a very similar time period.[7]

Carrieri et al. (2007) use GARCH-in-mean methodology to assess the evolution in the level of equity market integration for eight EM (i.e., Argentina, Brazil, Chile, India, Korea, Mexico, Taiwan and Thailand) over the period January 1977–December 2000. Country-by-country FI dynamics reveal that EM remained highly segmented until mid-90s and started to become more integrated from early '00s. In line with other studies, Carrieri et al. (2007) find that there are substantial cross-country differences in the degree of FI.

Pukthuanthong and Roll (2009) argue that the majority of quantitative integration measures proposed by the existing literature are flawed. Therefore, capturing FI with those measures could lead to misleading evidence about the actual level of FI. In particular, they question about the use of the average cross-country correlation of stock index returns, SC, as an indicator of FI. Their point is that two countries can be perfectly integrated even in the presence of a small correlation between their aggregate stock index returns. Ideally, there can be a set of global risk factors capturing, say 100%, of the variations of both country index stock returns even if these two are poorly correlated. In other words, we can have a common global factor that perfectly explains variations in the stock market return of both country A and country B (i.e., the R-square approaches one). However, the betas estimated from regressing countries' returns against the global common factor may have different signs (i.e., the two returns are uncorrelated). To overcome this issue, Pukthuanthong and Roll (2009) build a FI measure that relies on the proportion of a country's return that can be explained by a set of common global factors. If this proportion is small, local/regional factors matter most indicating thus poor integration. Instead, if a group of country stock index returns is highly exposed to the same global common factors, then we can say that those countries are highly integrated. Based on these arguments, they derive a new dynamic FI measure based on the explanatory power of a multi-factor model. They collect daily US$-based Total Return Indexes (RI) and Price Indexes (PI) for 51 countries spanning the period 01.01.1965 (or later) – 08.02.2008. For each calendar year, the dataset of country index returns is used to computed out-of-sample principal components (PCs), namely common global risk factors. The estimated global factors (out-of-sample PCs) serve as the common explanatory variables in a battery of regressions, one for each available country in each calendar year. The adjusted R-square from these regressions represents the proposed robust measure of FI. For each country group, FI is then captured by the average cross-country R-square (hereinafter $\bar{R}^2$). Broadly, they confirm existing findings indicating that global markets have become more integrated over the '80s, '90s and early '00s. However, some criticisms have been raised against the use of $\bar{R}^2$ as a measure of FI. First, it may lead to a greater FI level during times in which global factor volatilities are relatively high (e.g., during crisis periods). Put it simply, correlations can be biased by heteroskedasticity. Second, it depends on subjective choices like the type and number of global common factors that one decides to us as explanatory variables. For instance, the "ad hoc" use of a number of PCs that explains (on average) 90% of the returns' variations generates an artificially high $\bar{R}^2$, not reflecting thus the actual level of FI (see also Billio et al., 2017). As we will recall later, this is one of the reasons why one should focus on the trend of FI over a long time span and not on the level of magnitude of FI provided by the variety of proposed metrics.

Yu et al. (2010) employs a battery of high-frequency indicators to monitor the development of equity market integration in Asia. Their study covers stock market daily data for 10 Asian economies (e.g., Japan, Mainland China, Hong Kong SAR, Taiwan, South Korea, Singapore, Malaysia, Thailand, Indonesia, and the Philippines) spanning the period 16 March 1994–19 December 2008. The FI dynamics is captured by (i) a measure of cross-market dispersion (i.e., standard deviation of the log-differences of the benchmark equity indexes of various economies), (ii) the dynamic cointegration estimated using a rolling-window of 3-years, (iii) the $\bar{R}^2$ obtained from 3-year rolling OLS regressions of country stock returns on four common factors (i.e., cross-economy averages of currency return, excess equity return, dividend yield and the forward premia),[8] (iv) an indicator of market cycle synchronization and (v) the average pairwise dynamic conditional correlation estimated via a DCC model. Most of the indicators employed by Yu et al. (2010) indicate that following a period of lack of progress, the degree of FI in Asian equity markets has picked up again since late 2007. However, the integration process in not complete. Let us stress that is not straightforward to detect a common homogeneous trend in FI across the different measures employed by Yu et al. (2010). Most likely, this is due to the use of high frequency data and the presence of high volatility in the analyzed sample.

Volosovych (2011, 2013) proposes a methodology based on the principal component analysis (PCA) to capture FI, which is immune to outliers and accounts for global and country-specific shocks. FI is captured by estimating (in a rolling window fashion) the proportion of total variation in individual returns explained by the first PC.[9] The methodology accounts for several dimensions of integration (markets co-movement and segmentation) and delivers more credible conclusions concerning the patterns of FI than conventional techniques. The PCA-based FI measure proposed by Volosovych (2011, 2013) addresses thus some of the issues involved in using the SC or the $\bar{R}^2$. Using long time series for sovereign bond markets of 15 ADV from 1875 to 2009, he finds FI to be decreasing from the end of 20th century to (approximately) the end of the first World War and increasing in the aftermath. Volosovych (2011, 2013) concludes that FI exhibits a J-shaped trend.

Bekaert et al. (2013) build a novel equity markets segmentation measure based on the intuition that the process of market integration should cause valuation differentials between industries in different countries to converge.[10] The key variable in their metric is the absolute value of the difference between the two industry valuations, i.e., $|EY_{i,k,t} - EY_{j,k,t}|$ where $EY_{i,k,t}$ denote industry k's earnings yield in country i at time t and $EY_{j,k,t}$ the corresponding value for the same industry k in country j. The weighted sum of these bilateral industry

[7] Similar evidence can be found in Quinn and Voth (2008) who also examine a century of global equity market correlations. As in Goetzmann et al. (2005), they also observe that capital account liberalizations have been accompanied by higher correlations of national stock markets with those abroad.

[8] Notice that (Yu et al., 2010) estimate countries' R-square by relying on "traded factors". In this respect, they differ from Pukthuanthong and Roll (2009) who rely on "artificial factors".

[9] The percentage of variance explained by the first PC is estimated using a rolling window of 156 months.

[10] In other words, if markets are integrated then discount rates and expected growth opportunities should be similar within one industry, irrespective of the country.

valuation differentials is then used as a measure of *de facto* equity market segmentation, $SEG_{i,j,t}$,. Formally,

$$SEG_{i,j,t} = \sum_{k=1}^{N_{i,j,t}} IW_{i,j,k,t}|EY_{i,k,t} - EY_{j,k,t}|$$

where $IW_{i,j,k,t}$ is the relative market capitalization of industry k and $N_{i,j,t}$ is the number of industries for country-pair $i;j$ at time t. The relative market capitalization of each industry, k, is given by the sum of market capitalization of the industry in both countries divided by the market capitalization of all industries in both countries. By doing so, they ensure that the industry structure of the country with the larger equity market has more influence on the segmentation measure. Their analysis of the 1990–2007 period shows that joining the EU significantly lowered discount rate and expected earnings growth differentials across countries. However, the adoption of the Euro has not been found to be associated with increased integration.

In a previous empirical work, Bekaert et al. (2011) employ a similar segmentation-based metric to capture FI for a larger set of countries. To capture segmentation levels, instead of relying on bilateral industry valuation differentials, they use the difference between industry k's earnings yield in country i and the corresponding value for the same industry k in a benchmark global market (i.e., US).[11] Using data for 69 countries over a sample period of more than 20 years, Bekaert et al. (2011) observe decreased levels of segmentation in ADV. Differently, segmentation is found to remain relatively high in EM.

Donadelli and Paradiso (2014) examine the evolution of FI dynamics in four emerging macro-regions (i.e., Emerging (All), Asia, Eastern Europe and Latin America) and 10 different emerging market industries (consumer goods, consumer services, financials, industrials, basic materials, oil&gas, telecommunications, utilities, healthcare, technology). In the spirit of Volosovych (2011), FI in each emerging region (or emerging industry) is measured by the proportion of total variation in individual excess returns explained by the first PC. The first PC is estimated using a rolling window of 60 months and emerging market stock markets monthly data spanning the period January 1994–July 2012. They show that there is no a homogeneous increasing FI trend among different emerging regions. For instance, in Asia and Latin America FI is observed to decline over the '90s and early 00's. A more heterogeneous picture emerges when looking at FI patterns across the different industries. Over the period examined, J-shaped, U-shaped and increasing trends are observed. For instance, FI in the Latin American consumer goods and consumer services sectors follow a U-shaped trend whereas it follows an almost stable path in the Asian healthcare and technology sectors.

Lehkonen (2015) examines the dynamics of stock market integration and its consequences during the recent financial crisis for 23 ADV and 60 EM over the period 1987–2011. Integration is measured as an adjusted R^2 statistic from regressions of country index returns on global factors. As in Pukthuanthong and Roll (2009), global factors are estimated using out-of-sample PCs based on the covariance matrix in the previous calendar year computed using the returns from 18 ADV.[12] He finds that FI increased slightly for EM but decreased for ADV during the crisis, consistent with the FI patterns estimated by Pukthuanthong and Roll (2009) for different cohorts.

In an attempt to investigate whether consumption risk sharing is influenced by FI, Rangvid et al. (2016) examine first time variation in both FI and consumption risk sharing over the very long run. Following the idea that markets tend to behave more similarly when they are more integrated, FI is captured by the level of cross-sectional dispersion in global stock market returns. Using stock market return data for France, Germany, Spain, UK and USA for the period 1875–2012, they find that the degree of FI was high before World War I, stayed low until the 1970s, after which it increased rapidly. Importantly, this long-term FI pattern is similar to the one estimated by Volosovych (2011) using bond market data as well as to the U-shaped average correlation trend plotted by Goetzmann et al. (2005) and Quinn and Voth (2008).

Boubakri et al. (2016) extend the methodology of Carrieri et al. (2007) to account for foreign currency risk and examine the dynamics of FI for a group of 12 EM over the period 1988:M3–2015:M3. The authors find that stock markets in EM have become less integrated since the global crisis, except in countries that have not experienced a national or regional financial crisis.

In a comprehensive empirical study, Billio et al. (2017) compare the evolution of different FI paths estimated by a variety of different price-based measures, i.e., the average cross-country correlation, SC, the $\bar{R}^2$ of Pukthuanthong and Roll (2009), the $1stPC$ of Volosovych (2011), and several different correlation-based measures accounting for stochastic interdependence, crisis, and heteroskedasticity.[13] Using data on ADV (EM) running from January 1973 to January 2016 (May 1990 to January 2016), Billio et al. (2017) find that (i) all measures give rise to a very similar medium-run FI trend and (ii) the SC explains variations in diversification benefits as well or better than "more sophisticated and robust" measures. Therefore, over the analyzed sample period all these measures have been shown to generate virtually indistinguishable price convergence dynamics.

Let us point out that the aforementioned FI patterns rely on equity market data or, in some rare cases, on bond market data. In this respect, we should refer to equity market integration. However, one can have benefits from rising FI also from other asset classes (e.g., bonds with different maturies, t-bills, currencies, credits, real estate etc....). In a recent empirical study, Zaremba et al. (2019) compute the FI dynamics across different asset classes through the long run using monthly return data on equities, government bonds, treasury bills, and currencies for 83 markets over the period 1845–2019. In the spirit of Pukthuanthong and Roll (2009), FI in each market and country group is measured by the average cross-country R-square. The $\bar{R}^2$ is obtained from regressing individual asset returns on three previously extracted global PCs using months from $t-119$ to $t-60$. In line with existing studies, Zaremba et al. (2019) observe an increasing FI path from the 1970s until the subprime crises and a slow down in the degree of FI in the post-subprime crisis period. Before the '70s, FI does not follow a linear, J-shaped, or U-shaped trend. Instead, FI is found to be quite volatile moving mainly in peaks and troughs. Importantly, the FI dynamics plotted in Zaremba et al. (2019) is not distant from the average correlation dynamics depicted in Fig. 3 of Goetzmann et al. (2005).

[11] In Bekaert et al. (2011) the segmentation index for each country i reads as follows:

$$SEG_{i,t} = \sum_{k=1}^{N} IW_{i,k,t}|EY_{i,k,t} - EY_{w,k,t}|$$

where $EY_{i,k,t}$ denotes industry k's earnings yield (i.e., the inverse of the price earnings ratio) as determined locally in country i and $EY_{w,k,t}$ the corresponding earnings yield as determined in the global capital market (i.e., US) and $IW_{i,k,t}$ captures the weight of industry k in country i.

[12] As in Pukthuanthong and Roll (2009), only ADV returns are used in the estimation of global factors.

[13] As in Goetzmann et al. (2005), the SC is represented by the average off-diagonal correlation of equity returns for all available markets (i.e., average of upper or lower triangular elements in the correlation matrix). Bilateral correlations are estimated using a rolling window of 60 months. For each window and country, the adjusted R-square is estimated from regressing the country index return on three global common factor. As in Pukthuanthong and Roll (2009), the three global common factors are represented by the first three PCs extracted using the correlation matrix from the dataset of international equity returns. On average, Billio et al. (2017) show that the first three PCs explain around 75% of total returns variation. From the PCA analysis carried out to retrieve the common factors, for each 60 months-window (Billio et al., 2017) extract also the percentage of variance explained by the first PC, which gives the FI measure proposed by Volosovych (2011).

Table 4
List of papers: FI → Priced-based measures.

Paper	Methodology	Countries	Period	Market segment	Main results
Goetzmann et al. (2005)	SC	16 Countries	1890:M1–2000:M12	Equity market	$FI^{\nearrow}_{[pre-WWI]}/\ FI^{\leftrightarrow}_{[interwar]}/FI^{\nearrow}_{[post-WWII]}$
Carrieri et al. (2007)	$GARCH$	8 EM	1977:M1–2000:M12	Equity market	$FI^{\leftrightarrow}_{[pre-1990]}/FI^{\nearrow}_{[1990--2000]}$
Quinn and Voth (2008)	SC	16 ADV	1890–2001	Equity market	$FI^{\nearrow}_{[pre-WWI]}/\ FI^{\leftrightarrow}_{[interwar]}/FI^{\nearrow}_{[post-WWII]}$
Pukthuanthong and Roll (2009)	$\bar{R}^2$	51 Countries	01.01.1965–08.02.2008	Equity market	$FI^{\nearrow}$
Yu et al. (2010)	σ_c, $\bar{R}^2$, DCC $DynCoint$, $MktSynch$	10 Asian Countries	16.03.1994–19.12.2008	Equity market	$FI^{\leftrightarrow}$
Volosovych (2011, 2013)	$1stPC$	12 ADV	1875:M1–2008:M9	Gov bond market	$FI^{\nearrow}_{[pre-WWI]}/\ FI^{\searrow}_{[interwar]}/FI^{\nearrow}_{[post-WWII]}$
Bekaert et al. (2011)	SEG	69 Countries	1980–2005	Equity market	$SEG^{\searrow}$
Bekaert et al. (2013)	SEG	33 EU	1990–2007	Equity market	$SEG^{\searrow}_{[EuroMembership]}/SEG^{\leftrightarrow}_{[EuroAdoption]}$
Donadelli and Paradiso (2014)	$1stPC$	18 EM 10 IND	1994:M1–2012:M7	Equity market	$FI^{\leftrightarrow}$ $FI^{\leftrightarrow}$
Lehkonen (2015)	$\bar{R}^2$	23 ADV 60 EM	1986–2011	Equity market	$FI^{\nearrow}_{pre-GFC}/\ FI^{\leftrightarrow}_{post-GFC}$
Rangvid et al. (2016)	σ_c	5 ADV	1975–2012	Equity market	$FI^{\nearrow}_{[pre-WWI]}/\ FI^{\searrow}_{[interwar]}/FI^{\nearrow}_{[post-WWII]}$
Boubakri et al. (2016)	$GARCH$	12 EM	1988:M3–2015:M3	Equity market	$FI^{\nearrow}_{[pre-GFC]}/FI^{\searrow}_{[post-GFC]}$
Billio et al. (2017)	SC, $\bar{R}^2$, $1stPC$ DCC, $BEKK$ $\hat{\beta}$, $Corr_{FR}$	16 ADV 11 EM	1973:M1–2016:M1 1990:M5–2016:M1	Equity market	$FI^{\nearrow}_{[pre-GFC]}/\ FI^{\leftrightarrow}_{[post-GFC]}$
Akbari et al. (2020)	$STDCC$	21 ADV 20 EM	1989–2015	Equity market	$FI^{\nearrow}_{[1989-2007]}/FI^{\searrow}_{[2008-2015]}$
Zaremba et al. (2019)	$\bar{R}^2$	83 Countries	1848:M7–2019:M1	Equity market Gov bond market T-Bill market Currency market	$FI^{\nearrow}_{[post-70s]}/FI^{\uparrow\downarrow}_{[pre-70s]}$
Hoffmann et al. (2020)	SEG σ_c σ_c σ_c	EMU2001+EMU2011	1995:M1–2019:M11	Equity market Money market Gov bond market Banking market	$FI^{\nearrow}_{[1995-2007]}/\ FI^{\searrow}_{[2008-2013]}/FI^{\nearrow}_{[2014-2018]}$
Donadelli and Gufler (2021)	SC, $\bar{R}^2$	G7, G20, EU	1970:Q1 to 2018:Q4	Equity market	$FI^{\nearrow}_{[pre-GFC]}/FI^{\searrow}_{[post-GFC]}$

Notes: SEG := equity market segmentation index of Bekaert et al. (2011, 2013). GFC := Great Financial Crisis.
In Yu et al. (2010): $DynCoint$ = dynamic cointegration analysis, $MktSynch$ = indicator of market cycle synchronization.
In Billio et al. (2017): SC = cross-country average correlation; DCC := Dynamic Conditional Correlation (DCC)-GARCH; $BEKK$:= BEKK-GARCH model; $\hat{\beta}$ = conditional time-varying beta captured by the conditional sensitivity of local equity market index returns to changes in the global portfolio, $Corr_{FR}$ = Forbes and Rigobon (2002)'s correlation. σ_c := denotes cross-country standard deviation (i.e., cross-market returns dispersion).
$\leftrightarrow$:= mixed evidence.
$\leftrightarrow$:= stable FI trend.
$\nearrow$:= increasing FI trend.
$\searrow$:= decreasing FI trend.

Akbari et al. (2020) propose a novel metric to capture two different aspects of market integration, i.e., economic integration (EI) and financial integration (FI). Using firm-level data for 21 ADV and 20 EM they capture FI (EI) by estimating a common risk-pricing dynamic (common cash-flow dynamic). FI (EI) is then proxied by the squares of conditional correlations of country risk-pricing adjustments (cash-flow news) and world risk-pricing adjustments (cash-flow news). Akbari et al. (2020) estimate correlation values via a smooth-transition dynamic conditional correlation (STDCC) model. They provide further evidence of increasing FI from late '80s until the beginning of the GFC both in ADV and EM. Also, they confirm that FI starts to decrease in the aftermath of the GFC. EI both in EM and ADV follows a similar path. Importantly, EM are found to be (on average) less economically and financially integrated than ADV.

Hoffmann et al. (2020) build a novel price-based composite indicator of FI (i.e., FI is based on intra-euro area asset price differentials) for the euro area using "prices/interest rates" from the money, bond, equity and banking markets. For the money, bond and banking markets, each price-based indicator is built by invoking the law of one price. In other words, cross-country standard deviations of interest rates serve as indicators of FI. For the equity market, instead, they rely on the measures developed by Bekaert et al. (2011) and Adjaouté and Danthine (2004). The composite FI pattern indicate that EU countries became gradually more financially integrated in all the market segments after joining the euro. However, this trend started reverting with the onset of the GFC in 2007. Notably, FI is observed to follow a decreasing trend from the beginning of the GFC to the end of the sovereign debt crisis.

Donadelli and Gufler (2021) examine whether a significant link between FI and consumption volatility (i.e., consumption smoothing) exists. They capture FI by relying on two widely used measures, i.e., the SC and the $\bar{R}^2$. Both indicators are estimated using a rolling window of 40 quarters.[14] The empirical analysis uses quarterly data for three different country groups (i.e., G7, G20 and EU) spanning the period 1970:Q1 to 2018:Q4. FI is found to exhibit an increasing trend from the '70s until the early '00s and decline in the aftermath of the GFC.

The key empirical findings on global FI dynamics found by the aforementioned studies are summarized in Table 4.

Pros and cons. The major advantage of using price-based measures is flexibility, especially, with respect to methodology and data. Moreover, priced-based measures can be updated easily and more frequently than other *de jure* and quantity-based measures. Since price-based indicators invoke the law of one price, they also have a clear-cut economic

[14] The R^2 (for each window and each country) is computed by regressing the stock market index return on PCs. As in Pukthuanthong and Roll (2009), they select a number of PCs such that the explained variability is around 90%. However, such procedure applied to a sample of only industrialized economies leads to an artificially high $\bar{R}^2$. In fact, it ranges from a minimum of 0.7 to a maximum of 0.95 (see Fig. 2 in Donadelli and Gufler 2021).

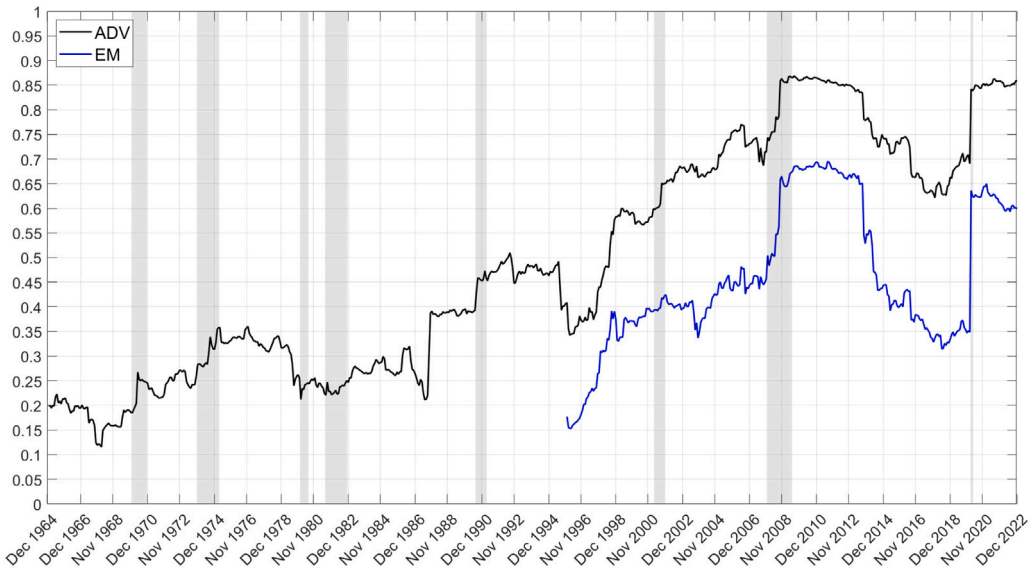

Fig. 3. Financial integration: Standard correlation (SC). *Notes*: This figure depicts the evolution of the FI process in ADV (black line) and EM (blue line). FI is computed as the average of upper or lower triangular elements in the correlation matrix of share price returns (i.e., average of the correlations of all dyads). For each dyad, the correlation is computed using a rolling window of 60 months. **ADV**: Australia, Canada, France, Germany, Ireland, Italy, Japan, Sweden, UK, USA. Sample period: 1960M1–2022M12. **EM**: Chile, Colombia, Greece, Israel, Mexico, New Zealand, Portugal, Brazil, India, South Africa. Shading denotes NBER-dated recessions. Sample period: 1991M1–2022M12.
Source: OECD (MEI).

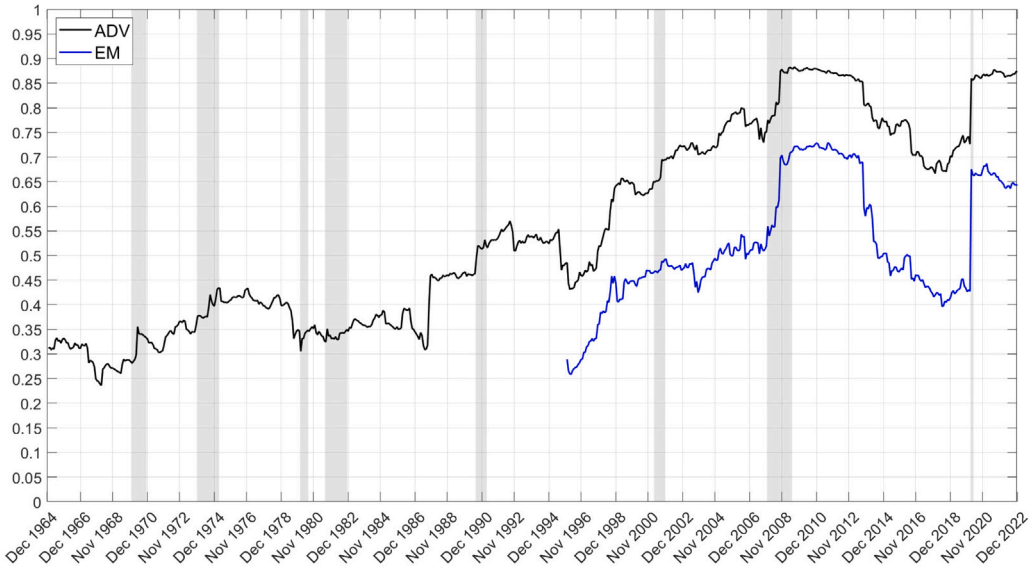

Fig. 4. Financial integration: $1st PC$. *Notes*: The figure depicts the evolution of the FI process in ADV (black line) and EM (blue line) countries. FI is computed as the proportion of variance explained by the first principal component (1stPC) computed from the matrix of country share price returns using a rolling window of 60 months. **ADV**: Australia, Canada, France, Germany, Ireland, Italy, Japan, Sweden, UK, USA. Sample period: 1960M1–2022M12. **EM**: Chile, Colombia, Greece, Israel, Mexico, New Zealand, Portugal, Brazil, India, South Africa. Shading denotes NBER-dated recessions. Sample period: 1991M1–2022M12.
Source: OECD (MEI).

interpretation. This is not so while using quantity-based indicators that rely on flow data. However, all these measures based on price convergence could lead to misleading outcomes. Loosely speaking, the rise in the degree of comovement across country equity price returns does not necessarily represent a symptom of market completeness. In this respect, there can be a disconnection between the high level of FI identified by priced-based measures (i.e., high degree of convergence in returns) and the presence of a full set of state contingent securities to get full risk sharing (i.e., fully integrated markets), as predicted by the IBC literature.

4.3. Revisiting FI dynamics: A "Global" tour

For the sake of completeness and in order to corroborate some of the existing evidence on global market integration dynamics, in this section we re-estimate the evolution of the FI process for both ADV and EM using a variety of commonly used priced-based indicators. First, we

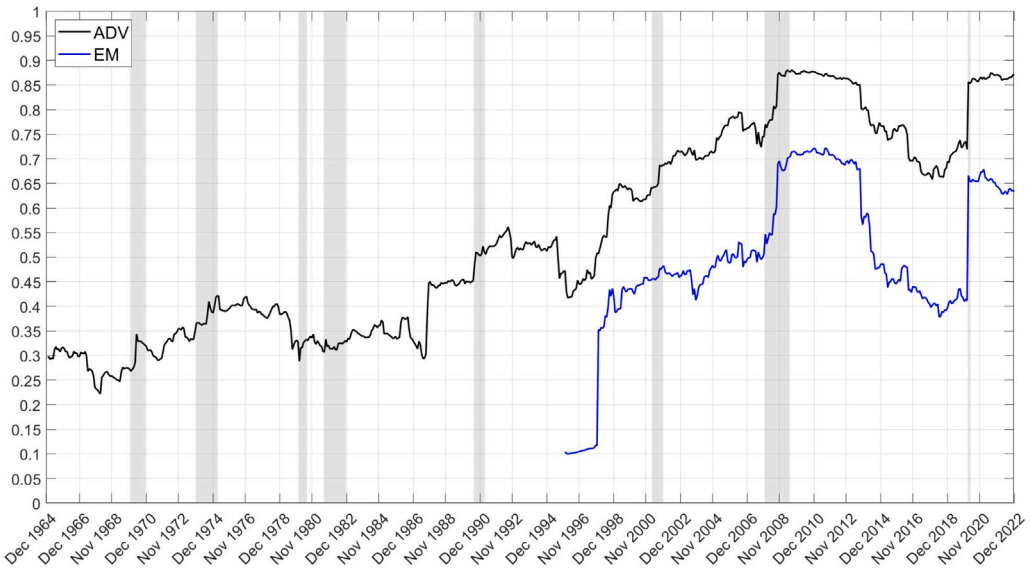

Fig. 5. Financial integration: $\bar{R}^2$. *Notes*: The figure depicts the evolution of the FI process in ADV (black line) and EM (blue line) countries. FI is computed as average cross-country R-square ($\bar{R}^2$). For each country, the R-square is obtained from regressing country return on the first principal component (1stPC) computed from the matrix of country share price returns. R-squares are then estimated using a rolling window of 60 months. **ADV**: Australia, Canada, France, Germany, Ireland, Italy, Japan, Sweden, UK, USA. Sample period: 1960M1–2022M12. **EM**: Chile, Colombia, Greece, Israel, Mexico, New Zealand, Portugal, Brazil, India, South Africa. Shading denotes NBER-dated recessions. Sample period: 1991M1–2022M12.
Source: OECD (MEI).

capture FI dynamics in ADV and EM using post-war monthly frequency data (Section 4.3.1). We then re-examine the historical evolution of FI using annual data on share price returns for 12 ADV over the period 1886–2020 (Section 4.3.2).

4.3.1. Post-war global market integration dynamics.

For comparison purposes, we re-estimate equity market integration patterns using three different well known metrics, i.e., SC, $1stPC$ and $\bar{R}^2$. FI is estimated for two country groups: (i) 10 ADV and (ii) 10 EM. For both country groups, share price returns are retrieved from the OECD (MEI) and span the period 1960M1 (or later) – 2022M12. FI dynamics plotted in Figs. 3–5 are in line with existing empirical findings. First, and most importantly, we confirm that the different metrics provide very similar FI paths (Billio et al., 2017). Second, the newly estimated trends confirm that FI in ADV (EM) keeps rising from the post-war (mid-90s) until the GFC and declines in the aftermath. Let us further stress that the rapid rise in the FI process from the mid-90s until the GFC in EM is consistent with the strong acceleration of the financial opening process (i.e., equity market liberalizations) that happened over the late ’80s and early ’90s (Chinn & Ito, 2008). Finally, the equity market integration paths depicted in Figs. 3–5 confirm that FI is (on average) lower in EM than in ADV (see, among others, Akbari et al., 2020, 2021; Billio et al., 2017; Lehkonen, 2015). Therefore, despite the large number of equity market liberalizations, the intensification of the global trade network and the rise in cross-border capital flows, EM are still more segmented than ADV.

4.3.2. Long-term global market integration

The dynamics plotted in Section 4.3.1 suggest that FI has generally been trending up over the post-Bretton Woods period, with the exception of the post-2008 era where it declined. In this respect, some have argued that there has been too little time variation in the degree of FI over the last 50 years and, for this reason, they turned their attention to the long-run FI process (Rangvid et al., 2016). For the sake of robustness, we re-estimate the SC, $1stPC$ and $\bar{R}^2$ using data for 12 countries from 1886 to 2012. Regardless of the measured employed, FI exhibits a J-shaped trend (see Fig. 6).[15]

In Fig. 7, we capture long-term FI using the level of comovement of returns across countries, i.e., cross-country dispersion of equity returns.[16] As in Rangvid et al. (2016) and Zaremba et al. (2019), we find that equity market integration exhibits a U-shaped trend. FI is high during the period from 1886 until the beginning of the first World War. After the first World War, FI declines rapidly and remains rather low between the two World Wars and during the Bretton Woods regime. FI starts then following an increasing path from the late ’70s.

5. Financial integration and economic growth

In an comprehensive review on the empirical effects of financial globalization on EM, Prasad et al. (2003) conclude that it is extremely difficult to detect an unequivocal effect of FI on economic growth. They provide a research summary of the ’90s and very early ‘00s’s works on the FI-growth nexus. Due to the lack of price-based measures during those times, the 14 reported empirical works rely on capital account liberalizations (i.e., *de jure* integration). Out of the 14 empirical works surveyed by Prasad et al. (2003), only three find a positive effect of FI on growth. The remaining works report either no significant or mixed effects.[17] Further, Prasad et al. (2003) report standard stylized growth and market liberalization facts on 24 EM for the period 1980–2000.

[15] The use of long-term bond market data provides almost virtually indistinguishable FI dynamics, which are also in line with those estimated by Volosovych (2011, 2013). Results are not reported but available upon request from the authors.

[16] As for other employed measures, the idea is that markets tend to behave more similarly when they are more integrated.

[17] A potential narrative issue with the survey proposed by Prasad et al. (2003) is that the empirical works that capture FI by means of *de jure* indicators are not distinguished from those ones employing *de facto* indicators of FI. Since these works have been already reviewed in Prasad et al. (2003), focus only capital market liberalizations and do not follow our main papers selection criteria, we have decided to not include them in our survey.

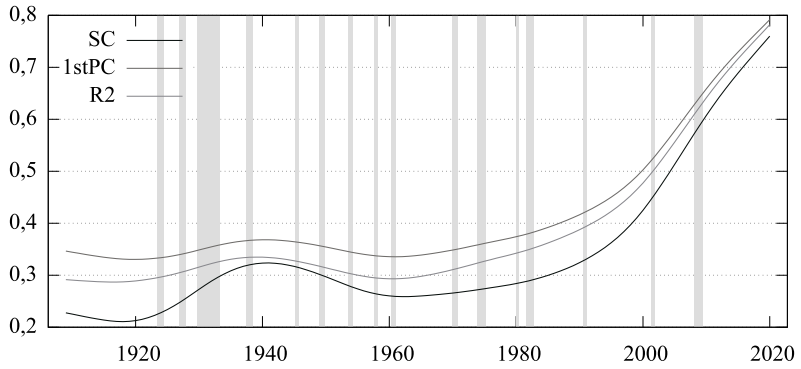

Fig. 6. Long-run global equity market integration. *Notes*: This figure depicts the dynamics of FI over the period 1886 to 2020 for a group of 12 ADV (i.e., Australia, Belgium, Denmark, France, Germany, Italy, Japan, Norway, Portugal, Sweden, UK, USA). SC := FI is defined as the average of upper or lower triangular elements in the correlation matrix of equity price returns (i.e., average of the correlations of all dyads). $1sPC$:= FI is measured by the percentage of variance in equity returns explained by the first principal components. $\bar{R}^2$:= FI is measured by the average cross-country adjusted R-square. For each country, the adjusted R-square is estimated by regressing the country index return on the first (in-sample) PC extracted (once) using all available observations. SC, $1sPC$ and $R2$ are estimated using a rolling window of 24 years. HP filter smoothed series are depicted. Shading denotes NBER-dated recessions. Data on equity returns for the period 1886–2020 are from Jordà et al. (2019).

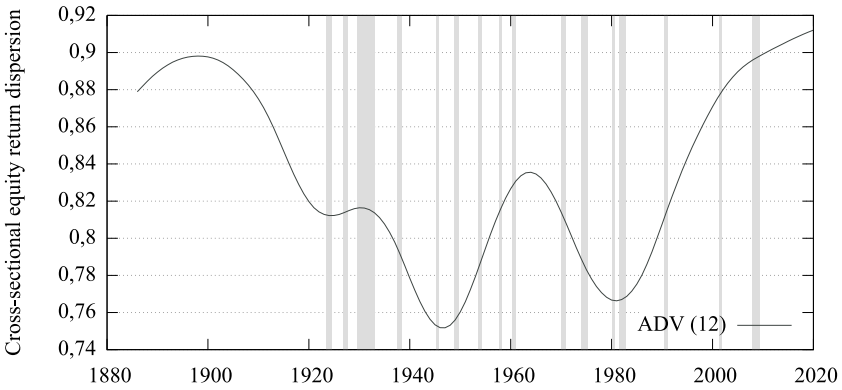

Fig. 7. Equity market integration: Cross-country dispersion. *Notes*: This figure depicts the evolution of equity market integration (HP filter smoothed series) over the period 1886 to 2020 based on the cross-sectional dispersion in global stock market returns for each year in our sample (scale inverted). For each year, cross-country dispersion of stock returns is computed as follows: $Dispersion_t = var(R_t)^{1/2}$, where R_t is a vector of stock returns for all countries with available data. The solid black line refers to a sample of 12 ADV (i.e., Australia, Belgium, Denmark, France, Germany, Italy, Japan, Norway, Portugal, Sweden, UK, USA) for which data are available for the full sample period (i.e., 1886–2020) in the Jordà et al. (2019)'s dataset. Shading denotes NBER-dated recessions.

They provide evidence that FI is not a necessary condition for achieving a high growth rate. For instance, even if in countries like Indonesia, South Africa and Peru cross-border capital restrictions became less strict their growth remained relatively poor.

The work of Edison et al. (2002) is probably the most thorough and comprehensive empirical work on the FI-growth nexus. They focus on 57 countries and measure countries' FI levels employing a wide array of *de jure* and *de facto* (quantity-based) measures for the period 1980–2000. After performing a battery of robust empirical tests,[18] the paper concludes that, overall, there is no robustly significant effect of FI on economic growth. Importantly, result depends on the types of FI measures and an assortment of econometric approaches employed.

Collins (2004) provide some empirical evidence on the effects of FI on growth among African economies. Due to the presence of heterogeneity in the liberalization measures, they find little evidence relating *de jure* integration to growth. Collins (2004) provides also novel evidence on the FI growth nexus indicating a positive link between FDI (as % of GDP) and growth, with this effect being stronger among less-developed countries.

Bekaert et al. (2005) estimate OLS regression of one-year GDP growth rates on different measures of equity market liberalization for four different country groups (with the largest ones covering 95 and 75 countries). They find a 1% increase in annual real economic growth following both equity market and capital account liberalizations. Notably, even with both fixed and time effects, the impact of the equity market liberalization variables is positive and around 1%. Moreover, the find that capital account liberalization boosts future economic growth.

Using *de jure* measures of capital account and financial current account openness for 94 countries spanning the period 1950–2005, Quinn and Toyoda (2008) test whether capital account liberalizations lead to higher economic growth. They argue that the inconclusive results provided by the existing empirical literature on the FI-growth nexus are due to measurement error, differing time periods examined, and collinearity among independent variables. Using different econometric approaches (i.e., pooled time-series, cross-sectional OLS and system GMM estimators), they find that capital account liberalizations had a positive association with growth in both ADV and EM. Quinn and Toyoda (2008) also confirm the finding of Bekaert et al. (2005) that equity market liberalizations appear to contribute positively to growth, independently of capital account liberalizations.

Quinn et al. (2011) build a large variety of proxies of capital account openness and submit all of them to the same experiment. They follow the approach of Bekaert et al. (2005) who use OLS in a seemingly unrelated regression (SUR) structure and GMM and additional controls (e.g., educational attainment). Estimates for the *de jure* FI indicators' coefficients are generally positive, even though not always significant. In line with Bekaert et al. (2005), equity market liberalization

[18] They account for the possibility that any observed association between FI and growth could occur because faster-growing economies are more likely to choose to liberalize their capital accounts.

has a (seemingly) large, positive, and highly statistically significant coefficient estimate.

The work of Schularick and Steger (2010) corroborate the thesis of Kose, Prasad, Rogoff et al. (2009) with respect to the fact that the vast empirical literature provides little robust evidence of a causal relationship between FI and growth. Schularick and Steger (2010) argue that this might be due to the different approaches and econometric techniques employed over the years by researches. For the sake of comparability with earlier studies, they rely on models and techniques already employed. Then, they follow narrative evidence from economic history about the key contribution European capital made to the economic growth. More importantly, historical studies observe that the degree of FI reached before 1914 was truly impressive. Based on this premise, they use newly assembled data on 24 countries for the first era of financial globalization (1880–1914) and find a significant growth effect of FI, as measured by the average capital inflow to GDP ratio. Finally, Schularick and Steger (2010) reproduce the benchmark analysis of Edison et al. (2002) using data for the period 1980–2002. Edison et al. (2002)'s main findings are confirmed. In fact, in the benchmark cross-section, there appears to be a positive growth impact of FI. However, the positive influence that FO exerts on the per capita growth rate becomes insignificant once TO and population growth are accounted for.

Bonfiglioli (2008) provides fresh empirical evidence on the FI-productivity nexus from a sample of 70 countries observed between 1975 and 1999 using first long-run cross-sectional analysis performed on 25-year averages, and then the dynamic panel regressions on non-overlapping 5-year observations. Results for both *de jure* and *de facto* measures suggest that FI has a positive direct effect on productivity. Further, this effect is found to be stronger among ADV.

Using macroeconomic annual data for 31 European countries (EU27 + Croatia, Ukraine, Russian Federation, Iceland and Norway) for the period 1996–2004, Masten et al. (2008) estimate a standard panel regression in order to examine the effects of FI on real GDP per capita growth. As indicators of FI, they employ several quantity-based measures (e.g., stock of total foreign assets and liabilities as a percent of GDP, total liabilities as a percent of GDP, sum of stocks of FDI inflows and outflows as a share of GDP, stock of FDI inflows as a share of GDP). Non-linear effects of FI on growth are also accounted for. Estimates in Masten et al. (2008) confirm a positive effect on growth both from FDEV and FI. However, the significant positive effect of FI on growth holds only for countries with a relatively high level of FDEV.

In a reappraisal on FGLOB and its implications for growth and volatility, Kose, Prasad, Rogoff et al. (2009) confirm that FGLOB is not a necessary condition for achieving high growth rates. For instance, Mauritius exhibits a high growth rate over the period 1980–2005. This even if its degree of FO is relatively low (see Table 2 at pag. 20 in Kose, Prasad, Rogoff et al. 2009). Their stylized facts indicate also that FI in not a sufficient condition for rapid economic growth. This is supported by evidence for Venezuela and Bolivia, which were partially open to foreign capital flows; yet, they had (on average) a negative growth rate.[19] They then provide an updated summary of key empirical studies on the FI-growth nexus. Out of the 26 works summarized, only 3 report positive effects of FI on growth whereas 19 report mixed evidence (see Table 3 in Kose, Prasad, Rogoff et al. 2009). Once again, all these studies rely on pre-2000 data, capital account liberalizations or quantity-based metrics only. For this reason, we stick to the review of Kose, Prasad, Rogoff et al. (2009) and do not discuss these papers in our survey. Moreover, none of these papers includes FI in the title, thus not satisfying our selection criteria.

Aizenman et al. (2013) use a variety of different cross capital flows measures to examine the FI-growth nexus. Standard panel and cross-sectional regression estimates – based on a sample of 98 countries for the period 1990–2010 – reveal a complex and mixed picture. The sign and intensity of the FI-growth nexus depend on the types of flows, economic structure, and global patterns of growth, accounting for the pre-crisis and the post crisis data, and empirical specifications for cross country and panel regressions.

De Nicolò and Juvenal (2014) examine the distinct impact of FI and FGLOB (i.e., FO) on three dimensions of real activity: growth, growth volatility and measures of macroeconomic instability. They rely on a sample of 48 countries (i.e, 24 ADV + 24 EM) spanning the period 1985–2008. Following Adjaouté and Danthine (2004), they capture FI by the distance of the market excess returns of a country from a measure of central tendency of the cross-country distribution of market excess returns. Let us remind that this measure records the position of the market excess return of a country relative to an equally weighted market excess return. The higher is the level of FI, the smaller should be the (quadratic) distance of a country's excess return from an equally weighted market excess return. As a proxy of FGLOB, they use the *de-facto* measure on external assets and liabilities proposed by Lane and Milesi-Ferretti (2007). When all countries are considered, FI is found to have a positive impact of growth. Differently, when the two country groups are analyzed separately a significant impact of FI on growth is observed only among EM. Instead, the positive impact of FO appears strong in both EM and ADV. Let us stress that De Nicolò and Juvenal (2014) departure from all the other existing empirical studies in that they explicitly distinguish between FI and FO.

Ahmed (2016) examines the impact of FI on economic growth focusing on 30 Sub-Saharan African (SSA) countries for the period 1976–2010. By employing a variety of quantity-based measure of FI as in Lane and Milesi-Ferretti (2003, 2007) and the *de jure* indicator of Chinn and Ito (2008), he finds strong empirical evidence of a negative and significant impact of FI on growth. Taken together, the empirical findings in Ahmed (2016) indicate that FI has not boosted growth in SSA.

Hoffmann et al. (2020) build a composite intra-EU indicator of FI by relying on ten different price-based FI measures for the period 1995:Q1 to 2019:Q3. Using a panel regression for 19 member states, they then examine the FI-growth nexus within the EU. Their findings show that intra-EU FI is (on average) positively associated with economic growth across the currency union. The effect is economically significant, with an increase of 0.1 in the composite indicator implying 0.35% higher annual growth on average.

A summary of the most relevant empirical evidence on the implications of FI for economic growth is reported in Table 5.

6. Financial integration and risk sharing

It is widely accepted that one of the potential benefits of globalization is provision of better RS opportunities for reducing volatility. Therefore, as also predicted by theoretical IBC models,[20] in the presence of higher integration levels better consumption smoothing/risk sharing opportunities should be observed. For instance, stylized facts from Kose, Prasad, Terrones (2009), indicate (*i*) a steady and substantial increase in the degree of RS during the globalization period in ADV and (*ii*) a decline in the degree of RS during the period of globalization in EM. Even more importantly, there are no clear-cut and ubiquitous evidence of decreased levels of consumption growth volatility following higher FI (Donadelli & Gufler, 2021; Kose et al., 2003).

FI, as already mentioned, is supposed to help economies to smooth consumption over time thanks to increasing RS opportunities. Intuitively, due to their relatively low levels of capital and greater macro-instability it has always been taught that EM should benefit more from

[19] Let us stress that Kose, Prasad, Rogoff et al. (2009) refer first to FGLOB and then to FI whereas in the title of their Table 2 at pag. 20 they refer to FO. Once again, it seems that these three concepts (i.e., dimensions of FI) are used interchangeably.

[20] This point will be reviewed in Section 8.

Table 5
List of papers: FI vs. Growth.

Paper	Countries (data)	Period (frequency)	Financial integration measures			FI → Growth (main results)
			de jure	*de facto* (quantity-based)	*de facto* (price-based)	
Edison et al. (2002)	57 countries	1980–2000	✓	✓		$FI \rightarrow Growth^{\sim}$
Prasad et al. (2003)	EM (24)	1980–2000	✓			$FI \rightarrow Growth^{\sim}$
Collins (2004)	EM (62)	1980–2000		✓		$FI \rightarrow Growth^{+}_{\{EM\}}$
	ADV (21)					$FI \rightarrow Growth^{+}_{\{ADV\}}$
Bekaert et al. (2005)	95 countries	1980–1987	✓			$FI \rightarrow Growth^{+}$
Bonfiglioli (2008)	70 countries	1975–1999	✓	✓		$FI \rightarrow TFP^{+}$
Quinn and Toyoda (2008)	94 countries	1955–2004	✓			$FI \rightarrow Growth^{+}$
Masten et al. (2008)	31 countries	1996–2004		✓		$FI \rightarrow Growth^{+}$
Kose, Prasad, Rogoff et al. (2009)	EM (20)	1980–2005	✓	✓		$FI \rightarrow Growth^{\sim}$
Schularick and Steger (2010)	24 countries	1880–1914	✓	✓		$FI \rightarrow Growth^{+}$
	56 countries	1980–2002	✓	✓		$FI \rightarrow Growth^{\sim}$
Quinn et al. (2011)	100+ countries	1953–2009	✓			$FI \rightarrow Growth^{+}$
Aizenman et al. (2013)	98 countries	1990–2010		✓		$FI \rightarrow Growth^{\sim}$
De Nicolò and Juvenal (2014)	48 countries	1985–2008			✓	$FI \rightarrow Growth^{+}$
	ADV (24)					$FI \rightarrow Growth^{\varnothing}_{\{ADV\}}$
	EM (24)					$FI \rightarrow Growth^{+}_{\{EM\}}$
Ahmed (2016)	SSA (30)	1976–2010	✓	✓		$FI \rightarrow Growth^{-}$
Hoffmann et al. (2020)	EU (19)	1995:Q1 to 2019:Q3			✓	$FI \rightarrow Growth^{+}$

Notes: +(−)[∅] indicates statistically positive (negative) [non] significant effects. ∼ indicates mixed evidence. TFP := Total Factor Productivity. The country group EM includes both developing and emerging economies. ADV := advanced/industrialized/developed economies. SSA := Sub-Saharan Economies.

the integration process. A first comprehensive attempt to examine the implications of FI for macroeconomic stability (i.e., macroeconomic volatility) is due to Kose et al. (2003). Using as proxy for FI the gross capital flows as a ratio to GDP (i.e., quantity-based measure of FO), they find a significant increase in the ratio of consumption volatility to income volatility following a rise in the degree of FO. This is in stark contrast with the idea that FI should improve RS, especially among EM. However, the FI-RS nexus is found to be non-linear. In fact, the coefficient on the squared of FI is negative and significant, in particular when the total consumption volatility and the ratio of consumption volatility to income volatility are used as RS proxies. In other words, a rise in the level of FO is associated with rising relative volatility of consumption, but only up to a certain threshold. The coefficient estimates indicate that this threshold is approximately 49% (ratio to GDP). Capital account openness, as measured by the restrictiveness indicator, is associated with higher output volatility, but this coefficient is only marginally significant. TO has a positive effect on the volatility of private consumption as well as that of total consumption. FI, seems to have only a marginal effect on the volatility of either measure of consumption. Differently, a higher degree of FI is found to improve macroeconomic stability in ADV.

Kose, Prasad, Terrones (2009) provide an empirical evaluation of the patterns of RS among different groups of countries and examine how FI has affected the evolution of these patterns. They employ annual data for 69 countries spanning the period 1960–2004. Different measures of *de jure* capital account openness and *de facto* FO (i.e., gross stocks of external assets and liabilities as ratios to GDP) are used as proxies for FI. In the spirit of earlier studies (Asdrubali et al., 1996; Sørensen et al., 2007; Sørensen & Yosha, 1998), as a benchmark measure of RS, they rely on the coefficient estimated from regressing deviations of own-country consumption growth from world consumption growth on deviations of own-country income growth from world income growth. Both for developing and emerging economies they find no evidence that financial globalization has helped to improve the degree of RS, as opposed to what conventional theoretical models predict. Instead, FI is found to improve RS only in ADV but for a limited period only. Overall, only ADV seem to have attained clear benefits from FI in terms of improved RS.

Jappelli and Pistaferri (2011) present a new empirical strategy for testing the effect of FI on RS. To capture FI, they rely on the European Monetary Union ascension that opened the possibility for the creation of a fully integrated European financial market (i.e., *de jure* measure). To evaluate the impact of FI on consumption smoothing they then use household-level data for Italy. Methodologically, their test is based on a decomposition of the variance of consumption growth into a component that depends on the variance of permanent income shocks and one that depends on the variance of transitory shocks. Their novel empirical findings indicate that the higher level of FI induced by the adoption of the euro has not affected the sensitivity of consumption with respect to income shocks in Italy, preserving thus households' chances to smooth consumption.

Kalemli-Ozcan et al. (2014) investigate the relationship between FI and volatility. Specifically, they provide firm- and regional-level evidence about the relationship between foreign equity investment and volatility during the period 1996–2008. Their firm-level analysis predicts a positive link between firm-level foreign investment and firm-level volatility. In other words, it is shown that foreign investors are relatively more willing to invest in risky firm. Importantly, the results of Kalemli-Ozcan et al. (2014) do not imply that FI is undesirable because of higher volatility. Therefore, they cannot state whether FI improves RS. In this respect, their evidence cannot be reconciled with existing macro-level findings on the FI-RS nexus.

Suzuki (2014) tests the joint rational expectation and permanent income hypothesis to clarify how and to what degree FI delinks national income and consumption. FI, which is captured by the stock-based measure proposed by Lane and Milesi-Ferretti (2003, 2018), is found to provide benefits in terms of consumption smoothing to both OECD and non-OECD economies.

In addition to examining the implications of rising FI for growth, De Nicolò and Juvenal (2014) focus also on the effects on macroeconomic volatility and macroeconomic stability. They find that FI is associated with lower growth volatility. However, this result holds only when all countries are included in the sample. Moreover, they observe a significant negative relationship between FI and the probability of systemic real risk realizations. Similar effects are due to FGLOB as proxied by a quantity-based measure of FO. It turns out that FI represents a channels for RS by lowering macroeconomic volatility.

Malik (2015) introduces a novel empirical strategy for identifying threshold effects of FI on RS. In his study, FI is captured by various quantity-based indicators whereas RS is measured in terms of the

coefficient on the annual country-specific consumption growth rates against country-specific output growth rates in a panel controlling for individual (and time) fixed effects. Using data from 1985 to 2007 for 64 economies (42 EM + 22 ADV), he finds that RS is negligible at low levels of FI, and significant (though imperfect) at high levels of FI. However, within these two estimated thresholds there is a regime with scarse RS opportunities. Thus, the intermediate regime has better FI but worse RS relative to first regime where FI level is low. This is at odd with theoretical predictions that higher FI should improve RS. Taken together, the novel evidence provided by Malik (2015) indicate the presence of a U-shaped relationship between FI and RS.

Mimir (2016) empirically investigates the relationship between FI, FDEV and RS for a group of 29 economies divided in three different sub-groups: (i) G7, (ii) Euro Area and (iii) OECD. Employed data are at quarterly frequency and run from 2000 to 2009. In the spirit of Lane and Milesi-Ferretti (2003, 2018) FI is computed as the ratio of the sum of foreign assets and liabilities of an individual country to its GDP. In a robustness check, he also utilizes the Chinn-Ito *de-jure* measure of FI. RS is instead captured by means of a standard regression-based measure as in Crucini (1999). This to identify whether individual country's income can be fully diversify by agents. If so, agents keep smoothing consumption. Standard cross-sectional estimates suggest that greater RS levels are associated with a higher degree of FI and a lower degree of FDEV. Precisely, he finds that a one unit increase in FI leads to 1.8% increase in RS.

Rangvid et al. (2016) is the first empirical study aimed at capturing the FI-RS nexus over the very long run. They estimate the evolution of FI and RS using data for 16 ADV spanning the period 1875–2012. Their point is that examining the FI-RS nexus for a shorter period would not lead to meaningful results. This because both FI and RS have generally been trending up over the last four decades.[21] They observe considerable time-variation in the degree of FI (captured by dispersion across countries' returns) and RS (captured by the β estimated from regressing of deviations of own-country consumption growth from world consumption growth on deviations of own-country income growth from world income growth) over the last 140 years. They find no strong contemporaneous relation between RS and FI. This result holds over time. Instead, rising FI is found to improve RS in the future (i.e., it takes 10 years before RS increases after equity markets become more integrated).

Donadelli and Gufler (2021) empirically examine the FI-RS nexus for three different panels of ADV, i.e., G7, G20 and EU. In each country group, FI is captured by two commonly used priced-based measures: (i) the SC (as in Billio et al. 2017) and (ii) the $\bar{R}^2$ (as in Pukthuanthong and Roll 2009). They then test whether changes in these two dynamic price-based indicators of FI influence consumption smoothing, as proxied by consumption growth volatility. Both, pooled and panel regressions indicate the presence of a statistically weak link between FI and consumption volatility (i.e., RS). Among the G7 only, Donadelli and Gufler (2021) find that higher levels of FI generate a significant increase in consumption volatility. They argue that this evidence is inconsistent with theoretical predictions. A battery of robustness tests, confirm the presence of statistically non-significant impacts of FI on consumption smoothing. When using the RER volatility as alternative proxy of RS, they still find no significant implications of FI variations for RS. It is worth noting that FI and FO are treated separately. In practice, FO in Donadelli and Gufler (2021) is used as additional explanatory variable (or, better, control variable). In this respect, their approach is close to De Nicolò and Juvenal (2014).

Using a dataset covering 31 countries between 1978 and 2018, Tang and Yao (2022) investigate the effect of FI on the synchronization of consumption, investment and output. FI in their analysis is captured by a *de facto* quantity-based measure, i.e., the value of real bilateral asset and liability holdings normalized by the sum of the two countries' real GDP.[22] They find that stronger cross-border banking linkages (i.e., higher FI) are associated with stronger synchronization of consumption and output during the 2008 crisis, resulting thus in worse RS. Differently, during tranquil times higher financial linkages are associated with lower synchronization of consumption and output. In other words, higher FI undermines consumption smoothing exclusively during crisis periods.

Ferrari and Picco (2023) examine whether the adoption of a common currency has improved or worsened consumption smoothing across EU member states over the period 1990–2018.[23] By simply comparing the EU countries' risk-sharing decomposition before and after the adoption of the common currency, Ferrari and Picco (2023) find that the ascension of the Euro has undermined RS. Estimates from a standard difference-in-difference confirm a worsening of RS for EU member states after the adoption of the euro.

A summary of the above studies including key information on data, types of FI indicators employed and main empirical results is provided in Table 6.

What emerges from this survey is that despite the existence of an abundant long-standing theoretical literature showing that RS improves as international financial markets become more integrated (or better more complete), the empirical literature on the implications of FI for RS is still rather scarse. And, more importantly, those few empirical works present a high degree of heterogeneity under several dimensions making hard any possible comparison.

7. Financial integration drivers

Via standard panel regressions, Lane and Milesi-Ferretti (2003) attempt to empirically identify the drivers of FI (as measured by the sum of foreign assets and liabilities over GDP). They rely on a panel of 18 OECD economies and six different sub-periods. Broadly, they observe FI variations to be successfully driven by variables such as TO, GDP per capita and stock market liberalizations. In practice, a *de jure* measure of FI is used to explain *de facto* (quantity-based) FI.

To understand the drivers of market integration across 7 emerging markets (i.e., Argentina, Brazil, Chile, India, Korea, Mexico, and Thailand), Carrieri et al. (2007) estimate a pooled cross-sectional time-series regression of the pre-estimated equity market integration indexes on the lagged values of a variety of chosen factors meant to be potential drivers of integration (i.e., equity market capitalization to GDP to capture financial markets development, size of the trade sector to the GDP as proxy for macroeconomic development, financial liberalization policies). Point estimates obtained from using data spanning the period January 1977–December 2000 indicate that the development of capital markets and the liberalization of stock markets are statistically important determinants of integration. Thus, as in Lane and Milesi-Ferretti (2003), *de jure* integration is used as a driver of *de facto* FI.

Vo and Daly (2007) construct several quantity-based indicators (e.g., among others, aggregate stock of assets and liabilities as a share of GDP, the stock of liabilities as a share of GDP, the aggregate stock of FDI and portfolio investment as a share of GDP, the aggregate flows of equity as a share of GDP) to capture the degree of FI. A battery of panel regressions (one for each volume-based *de facto* measure), indicate that some variables including the IMF capital control policy dummy variable, trade openness, domestic credit and economic growth are potential candidates for explaining variation in the degree of FI.

[21] Note that this is not always the case. RS dynamics depend heavily on the proxy one uses for the analysis. Moreover, trend is RS depend also on the sample of countries used (Donadelli & Gufler, 2021).

[22] Let us stress that (Tang & Yao, 2022) intentionally avoid to using a *de jure* measure of cross-border capital controls because subject to measurement errors.

[23] The sample includes 24 countries of which 11 are EU member states and 13 are OECD countries not in the EU.

Table 6
List of papers: FI vs. Risk-sharing.

Paper	Countries (data)	Period (frequency)	Financial integration measures			FI → RS (main results)
			de jure	*de facto* (quantity-based)	*de facto* (price-based)	
Kose et al. (2003)	ADV (21) EM (55)	1960–1999		✓		$FI \rightarrow \left(\frac{\sigma(\Delta C)}{\sigma(\Delta Y)}\right)^{+}_{\{ADV+EM\}}$ $FI^2 \rightarrow \left(\frac{\sigma(\Delta C)}{\sigma(\Delta Y)}\right)^{-}_{\{ADV+EM\}}$
Kose, Prasad, Terrones (2009)	ADV(21) EM (48)	1960–2004	✓	✓		$FI \rightarrow RS^{+}_{\{ADV\}}$ $FI \rightarrow RS^{-}_{\{EM\}}$
Jappelli and Pistaferri (2011)	*Household-level* IT	1980–2006	✓			$FI \rightarrow RS^{+}_{\{IT\}}$
Kalemli-Ozcan et al. (2014)	*Firm-level* EU (15) CHE	1996–2008		✓		$FI \rightarrow RS^{\sim}_{\{EU+CHE\}}$
Suzuki (2014)	OECD (22) Non-OECD (98)	1980–2011		✓		$FI \rightarrow RS^{+}_{\{OECD\}}$ $FI \rightarrow RS^{+}_{\{non-OECD\}}$
De Nicolò and Juvenal (2014)	48 countries ADV (24) EM (24)	1985–2008			✓	$FI \rightarrow \sigma(\Delta Y)^{-}$ $FI \rightarrow \sigma(\Delta Y)^{\varnothing}_{\{ADV\}}$ $FI \rightarrow \sigma(\Delta Y)^{\varnothing}_{\{EM\}}$
Malik (2015)	ADV (22) EM (42)	1985–2009		✓		$FI_{low} \rightarrow RS^{+}_{\{ADV+EM\}}$ $FI^{high} \rightarrow RS^{+}_{\{ADV+EM\}}$
Mimir (2016)	OECD (24) EU (13) G7	2000:Q3–2009:Q1	✓	✓		$FI \rightarrow RS^{+}_{\{EU\}}$
Rangvid et al. (2016)	ADV (16)	1875–2012			✓	$FI_t \rightarrow RS^{+}_{t+10}$
Donadelli and Gufler (2021)	G7 G20 (16) EU (22)	1970:Q2–2018:Q4			✓	$FI \rightarrow RS^{\varnothing}_{\{G7\}}$ $FI \rightarrow RS^{\varnothing}_{\{G20\}}$ $FI \rightarrow RS^{\varnothing}_{\{EU\}}$
Tang and Yao (2022)	OECD (20) EM(11)	1878–2018		✓		$FI \rightarrow RS^{-}_{GFC}$
Ferrari and Picco (2023)	EU (11) OECD (13)	1990–2018	✓			$FI \rightarrow RS^{-}_{\{EU\}}$

Notes: +(−)[∅] indicates statistically positive (negative) [non] significant effects. ∼ mixed/weak evidence. GFC := Great Financial Crisis. In the work of Kose et al. (2003) $\left(\frac{\sigma(\Delta C)}{\sigma(\Delta Y)}\right)$ denotes the ratio between total consumption growth and income growth. In the work of De Nicolò and Juvenal (2014) $\sigma(\Delta Y)$ corresponds to GDP growth volatility. $FI_{low}(FI^{high})$ identifies a regime in which countries exhibit a low (high) FI level (Malik, 2015).

However, such evidence depend heavily on the type of FI measure employed. Once again, among the potential drivers of *de facto* FI, Vo and Daly (2007) use also an indicator of *de jure* FI. So, instead of using jointly *de facto* and *de jure* indicators to capture the evolution of the FI process (see Section 4), in their study *de jure* FI is used to explain variations in *de facto* FI.

Chambet and Gibson (2008) examine the impact of the trade structure of EM on the evolution of the time-varying levels of FI. Using fixed effect panel estimation and averaged yearly data from 24 EM for the period 1995–2003, they observe that TO indicators positively contribute to FI (i.e., equity market integration). Their findings suggest thus that TO and FI are complementary rather than substitutes.

As discussed in Section 4.2.2, the empirical work of Volosovych (2011) provides an index of FI – based on bond market data for 11 ADV – covering more than 100 years (i.e., 1885–2009). In the second part of his study, he attempts to explain variations in FI levels. He relies on proxies for market frictions, policies and institutional arrangements in order to study which factors were associated with the observed pattern of FI. Precisely, he builds an average annual indicator of TO, the average inflation rate and the average government deficit to GDP. Additional controls to account for crises, periods of hyper-inflation, consumption disasters and country risk are added. Main findings are as follows: (i) TO is (on average) complementary to FI and (ii) high-inflation and high-government deficit policies are associated with a divergence of bond returns (i.e., lower integration).

Lehkonen (2015) examines the factors that affect FI and could represent channels of increased or decreased integration during crisis periods. Their dataset includes 22 ADV and 60 EM and spans the period 1987–2011. FI (in each country) is regressed against a bunch of explanatory variables. Estimates are obtained via pooled OLS accounting for cross-sectional dependence by clustering the standard error across country indexes. In the spirit of Pukthuanthong and Roll (2009), integration is measured as an $\bar{R}^2$ statistic from regressions of country index returns on global factors. Their main results confirm existing findings indicating that FI has increased over the last three decades and that financial liberalization, the institutional environment, and variables related to global financial uncertainty affected the degree of integration. In the spirit of Carrieri et al. (2007), Lane and Milesi-Ferretti (2003) and Vo and Daly (2007), market liberalization is assumed to be a driver of *de facto* FI and not used to measure the actual degree of FI as discussed in Section 4.1.

Alotaibi and Mishra (2017) develop and index of FI for stock markets belonging to the Gulf Cooperation Council Region (GCC) by employing an international asset pricing model of time-varying market integration and DCC-GARCH methodology. Stock market data for the six GCC members run from June 1995 to October 2013. As potential determinants of FI they use the following variables: TO (i.e., sum of exports and imports of goods and services, as a % of GDP), inflation, market capitalization (i.e., ratio of the market capitalization of listed companies and GDP), turnover (i.e., total value of shares traded divided by the average market capitalization), oil revenues and crises indicator (i.e., dummy capturing crisis periods). Alotaibi and Mishra (2017) find that TO, market capitalization and turnover have significant and positive impacts while inflation and the global financial crisis have significant and negative impacts on FI.

Table 7
List of papers: The drivers of FI.

Paper	Countries (data)	Period (frequency)	Financial integration measures			$(\tilde{X}) \rightarrow$ FI (main results)
			de jure	*de facto* (quantity-based)	*de facto* (price-based)	
Lane and Milesi-Ferretti (2003)	OECD (18)	1982–2001		✓		$TO \rightarrow FI^{+}$ $STKCAP \rightarrow FI^{+}$ $FINDEPTH \rightarrow FI^{+}$
Carrieri et al. (2007)	EM (7)	1977:M1–2000:12M			✓	$MCAP \rightarrow FI^{+}$ $LIBER \rightarrow FI^{+}$
Vo and Daly (2007)	79 countries	1980–2003		✓		$\tilde{X} \rightarrow FI^{\sim}$
Chambet and Gibson (2008)	EM (24)	1995–2003			✓	$TO \rightarrow FI^{+}$
Volosovych (2011)	ADV (11)	1985–2003			✓	$TO \rightarrow FI^{+}$ $INFL \rightarrow FI^{-}$ $GDEF \rightarrow FI^{-}$
Lehkonen (2015)	ADV (22) EM (60)	1987–2011			✓	$EMO \rightarrow FI^{+}_{ADV+EM}$ $IPR \rightarrow FI^{-}_{ADV+EM}$
Alotaibi and Mishra (2017)	GCC (6)	1995:M6–2013:M10			✓	$TO/MCAP/TV \rightarrow FI^{+}$ $INFL/GFC \rightarrow FI^{-}$
Akbari et al. (2021)	ADV (21) EM (20)	1989–2015			✓	$INTERNET \rightarrow FI^{+}$ $MCAP \rightarrow FI^{+}$ $INVP \rightarrow FI^{+}$
Nardo et al. (2022)	EU (22)	1999–2018			✓	$GDP/MKTCAP \rightarrow FI^{+}$ $INTERNET \rightarrow FI^{+}$ $INFL/EPU \rightarrow FI^{-}$

Notes: +(−)[∅] indicates statistically positive (negative) [non] significant effects. ∼ mixed evidence.
Lane and Milesi-Ferretti (2003): $FINDEPTH$ = financial development proxy (the ratio of liquid liabilities to GDP) and $STKCAP$ = ratio of stock market capitalization to GDP.
Carrieri et al. (2007): $MCAP$ = stock market capitalization to GDP and $LIBER$ = dummy set to one at the dates of official liberalization.
Vo and Daly (2007): $\tilde{X}$ = set of different variables (i.e., measures of capital controls, GDP, domestic credit as a share of GDP, inflation, financial deepening indicator).
Volosovych (2011): $INFL$ = inflation and $GDEF$ = average government deficit to GDP.
Lehkonen (2015): EMO = equity market openness and IPR = international political risk.
Alotaibi and Mishra (2017): TV = total value of shares traded divided by the average market capitalization and GFC = dummy for years of crisis.
Akbari et al. (2021): $INVP$: = investment profile index constructed to assess factors (i.e., country expropriation, profits repatriation, and payment delays) affecting the risk to investment and $INTERNET$ = annual number of internet users per 1000 people.
Nardo et al. (2022): $INTERNET$ = individuals using the Internet (% of population) and EPU = European policy-related economic uncertainty.

Akbari et al. (2021) propose a new approach to identifying drivers of EI and FI, separately, and across EM and ADV. As in Akbari et al. (2020), a smooth-transition dynamic conditional correlation (STDCC) specification is employed to analyze short- and long-term dynamics of integration. Integration measures are constructed from using firm-level data (39,202 firms) for 41 (21 ADV + 20 EM) countries worldwide. Their study shows that the levels of both forms of integration have increased across all countries over the period 1989–2015. As plausible explanatory variables for both EI and FI they use the following measures: (i) economic development, (ii) information environment and economic openness, (iii) FDEV, (iv) international trade, (v) FDI,[24] (vi) business cycle indicator. Using the random forests regression (RFR) technique, they find information (number of internet users per 1000 people), openness (investment profile) and FDEV (market cap) to be the most important drivers of FI.

In the spirit of of Pukthuanthong and Roll (2009), Nardo et al. (2022) estimate the degree of FI in the EU by quantifying the proportion of variance explained by a number of common factors, i.e, the $\bar{R}^2$. They consider the sample of daily returns for 28 European countries from January 1999 (or later) to June 2019. They then investigate what promotes FI exclusively among European countries. They consider as possible drivers of FI variables related to the country's financial development, macro-economic profile, and business characteristics. These are: GDP growth, sum of exports and imports of goods and services over GDP (i.e., TO), market capitalization (as % of GDP), inflation, technology improvement (i.e., share of a country's population using the Internet) and government's expenditure on R&D (as % of GDP). Some quality of government indicators are also adopted as potential FI drivers. Macroeconomic variables (i.e., GDP growth and inflation), market capitalization, the level of development of the financial market, overall political uncertainty, and technological developments are found to significantly explain variations in FI.

Table 7 summarizes the main empirical findings on the determinants of FI. Due to the different methodologies, country groups, sample periods and data frequency used, a comparison would lead to misleading conclusions. Most broadly, what we can say is that measures of openness and financial deepness and macro-variables like inflation represent (on average) significant drivers of FI. However, another important empirical issue emerges. As discussed above, some works have employed measures of *de jure* FI as potential drivers of *de facto* FI. Even more puzzling, some other works have used a *de facto* (quantity-based) measure as a potential driver of an another *de facto* (price-based) measure. A few natural questions arise: should we use *de jure* and *de facto* measures as alternative indicators of FI? Or, are *de jure* and *de facto* FI metrics complementary? Moreover, should we use quantity-based and price-based measures as complementary or as substitutes?

8. The role of financial integration in the IBC theory

In the case of market completeness (i.e., full FI), the implication of standard stochastic international dynamic business cycle models is that, for a given level of output volatility, FI should provide an avenue for increased RS and, by extension, lower consumption volatility. Consumption volatility can be thus be interpreted as proxy for RS. Furthermore, the possibility to get access to international securities for consumption smoothing purposes in case of global shocks put pressure on exchange rates making them more volatile. In this respect, FI is associated with higher RER volatility. Depending on the RS channel embedded in the IBC model, FI may lead to weaker or stronger

[24] Let us stress that Akbari et al. (2021) use a quantity-based measure of FI (i.e., FDI) to explain variations in "price-based FI".

co-movements of macroeconomic variables across countries. In what follows, we review the most relevant papers focusing on the interplay between FI, RS and macroeconomic stability, and asset prices.

When international financial markets are complete, relative marginal utility across borders should be perfectly correlated to the real exchange rate (Backus & Smith, 1993). The perfect risk sharing condition in Backus and Smith (1993) implies that the dynamic correlation between RER and consumption differentials equals one at any frequency for any given point in time. However, international macro and currency data do not support such theoretical condition. The macro-finance literature refers to this issue as to the Backus–Smith anomaly. Their IBC model account for two features of international time series: deviations from purchasing power parity and imperfect correlations of consumption fluctuations across countries.

Evans and Hnatkovska (2007) develop a two-country, two-sector general equilibrium model with production and dynamic portfolio choice to explain the role of international financial markets for dynamics of the real economy. They find that increased FI leads to higher output volatility, but its implications for consumption volatility are non-monotonic (i.e., it first rises and then falls as we move from financial autarky to low integration and then to high integration). Moreover, in the model volatility initially increases at the early stages of integration, and then declines as more assets for RS become available, consistent with findings in Kose et al. (2003). Importantly, the consumption-to-output volatility ratio increases in the presence of high integration. Therefore, in the model FI undermines macroeconomic stability. Evans and Hnatkovska (2007) further examine the welfare implications of increased FI. Despite the significant gains in RS, they find that the unconditional welfare gains from greater FI are very small because there is no change in the world's long-term growth rate.

Colacito and Croce (2010) propose a general equilibrium model that is able to simultaneously capture welfare benefits of FI and the dynamics of asset prices and macro-quantities. They build a two country-two good model where agents are equipped with recursive preferences (non-time separable). The model allows for characterizing two different international capital market regimes: (*a*) financial autarky (i.e., no FI) and (*b*) complete markets (i.e., full FI). The authors show that when markets are complete the model is able to reproduce (i) a high volatile and very persistent net export-output ratio, (ii) a decline in the contemporaneous correlation between domestic output and domestic consumption (i.e., consumption is less sensitive to income shocks), (iii) a more volatile RER. The model's features are consistent with UK-US international macro data. Moreover, they find that the implied benefits of FI can be as high as 10% of lifetime consumption. In particular, most of the benefits are due to RS for the long run.

Colacito and Croce (2013) extend their previous analysis (Colacito & Croce, 2010) by showing that an international endowment economy with Epstein-Zin preferences, frictionless markets, and correlated long-run growth shocks is able to address two well known international finance puzzle: (*i*) the forward-premium puzzle and (*ii*) the Backus–Smith anomaly. This when capital markets are complete both domestically and internationally. When the financial autarky regimes is active in the model the exchange rate growth is just a reflection of the difference in the short-run growth rates of the two goods' endowments. Since endowments are smooth, the exchange rate is smooth as well. Differently, the international trading of securities allowed by the full FI regime produces a substantial amount of pressure on the currency, making it twice as volatile. This is in line with post-1970 US-UK exchange rates data. In the financial autarky regime, the model predicts Backus–Smith correlation in the neighborhood of one (as in Backus and Smith 1993). In this regime, international RS does not take place. When instead markets are internationally complete the realization of a long-run news let the RER and consumption differential moving in the opposite direction, addressing thus the Backus–Smith anomaly.

Devereux and Sutherland (2011) develop a two-country model featuring different degrees of FI, ranging from financial autarky to an economy where both risk-free bonds and equities can be traded (i.e., high FI). Within each country there are borrowers (investors) and lenders (savers). Each economy can be hit either by a standard technology shock or by a financial shock (i.e., borrower-specific shock). Broadly, Devereux and Sutherland (2011) show that a different degree of FI influences macroeconomic quantities as well as welfare. For instance, when only the bond market is available in the economy, aggregate consumption volatility rises and welfare declines. When instead the degree of FI increases letting households able to trade both bonds and equities (i.e., a larger set of state contingent claims exists), the cross-country comovements of major macroeconomic variables increases (i.e., higher contagion risk) and welfare improves. Notably, in the presence of more integrated international financial markets output and investment volatility levels drop.

Dedola and Lombardo (2014) build a two-country model with financial frictions and cross-border capital investment to study how the international transmission of asymmetric shocks is affected by the presence of leveraged investors holding foreign and domestic risky assets. It is shown that introducing FI in bonds and capital markets allows to capture much better key co-movements of the domestic and international business cycle. Moreover, the international transmission of certain domestic policy interventions is found to be magnified by higher FI. In other words, FI amplifies contagion risk. In fact, model simulated macro-quantities reveal that consumption volatility relative to output and cross-country consumption and output growth correlations increase in the FI regime.

Bai and Zhang (2012) propose a novel theoretical framework designed to model the impact of financial liberalization on RS. The world economy consists of a continuum of small open economies and a large number of international financial intermediaries. All economies produce a homogeneous good that can be either consumed or invested. Financial intermediaries perform the functions of international financial markets, pooling savings and loaning funds across countries. Two key frictions exist in international financial markets. First, the markets are incomplete; only non-contingent debt claims are traded between financial intermediaries and countries. Second, debt contracts have limited enforcement; that is, countries have the option to default on their debt. The model assumes no frictions in domestic financial markets. Therefore, markets are domestically complete. Formally, a parameter τ drives the degree of capital controls in each economy. Bai and Zhang (2012) show that liberalization of financial markets does not necessarily lead to a significant increase in RS if contracts are incomplete and enforceability of debt repayment is limited. Default risk on sovereign debt endogenously constrains borrowing and makes borrowing more difficult in bad times. As a result, the observed increase in FI is too limited to significantly improve RS. The commonly proposed policy (i.e., the removal of capital controls and deregulation of financial markets) cannot automatically deliver significant improvements in RS so long as financial contracts are incomplete and imperfectly enforced.

Evans and Hnatkovska (2014) provide evidence of greater FI by using paths in the US ownership of foreign equity, bonds and capital (as % of GDP) and e foreign ownership of US bonds, equity, and capital (as % of GDP). They rationalize rising levels of cross-border holdings in a two-country theoretical model. When only bonds can be traded (i.e., during the early stages of financial integration), the model predicts that international capital flows are large (in absolute value) and very volatile. Then, as soon as households start getting access to world equity markets (i.e., international capital markets become less segmented), the size and volatility of international bond flows decline. This as a consequence of greater RS due to increased integration (i.e., more complete markets). To sum up, volatility of bond, equity and foreign exchange returns should decline with FI. This pattern is consistent with the declining macro-volatility observed during the period 1975–2007 in the G7 (see also Donadelli & Gufler, 2021).

Yu (2015) examines welfare implications for various countries in the process of FI in a parsimonious center-periphery DSGE model featuring

Table 8
List of papers: FI in the IBC Theory.

Paper	International economy		Utility	International capital markets			FI effects
	Endowment	Production		Financial autarky	Partially segmented	Financial integration	$(main\ results)^{\aleph}$
Backus and Smith (1993)	✓		CRRA			✓	$\rho[\Delta(RER), \Delta(c_h) - \Delta(c_f)] \rightarrow 1$
Evans and Hnatkovska (2007)		✓	LOG	✓	✓	✓	$\rho[\Delta(c_h), \Delta(c_f)] \uparrow$ $\sigma[\Delta(c)]/\sigma[\Delta(y)] \uparrow$ $welfare^{\sim}$
Bai and Zhang (2012)		✓	CRRA	✓	✓	✓	$RS^{\sim}$
Devereux and Sutherland (2011)	✓	✓	CRRA	✓	✓	✓ ✓ ✓	$\sigma[\Delta(c)]/\sigma[\Delta(y)]/\sigma[\Delta(y)] \downarrow$ $\rho[\Delta(y_h), \Delta(y_f)] \uparrow$ $\rho[\Delta(i_h), \Delta(i_f)] \uparrow$
Colacito and Croce (2010)	✓		EZ	✓		 ✓ ✓	$\sigma(\Delta(RER)] \uparrow$ $welfare \uparrow$ $\rho[\Delta(c_h), \Delta(c_f)] \uparrow$
Colacito and Croce (2013)	✓		EZ	✓		 ✓ ✓	$\rho[\Delta(RER), \Delta(c_h) - \Delta(c_f)] \downarrow$ $\sigma[\Delta(RER)] \uparrow$ $\rho[\Delta(c_h), \Delta(c_f)] \downarrow$
Dedola and Lombardo (2014)		✓		✓		✓ ✓ ✓	$\sigma(\Delta c)/\sigma(\Delta y) \uparrow$ $\rho[\Delta(y_h), \Delta(y_f)] \uparrow$ $\rho[\Delta(c_h), \Delta(c_f)] \uparrow$
Evans and Hnatkovska (2014)		✓ ✓		✓ ✓		✓ ✓	$\sigma[R_B] \downarrow \sigma[R_E] \downarrow$ $\sigma[RER] \downarrow$
Yu (2015)	✓		CRRA	✓	✓	✓	$welfare^{\sim}$
Tretvoll (2018)		✓	EZ			✓ ✓	$\rho[\Delta(c_h), \Delta(c_f)] \downarrow$ $\sigma[\Delta(RER)] \uparrow$
Devereux and Yu (2020)		✓	GHH	✓	✓	✓ ✓ ✓	$contagion \uparrow$ $crisis\ impact \downarrow$ $welfare^{\sim}$

Notes: CRRA := power utility. EZ := recursive preferences. LOG := log-utility. $\aleph$:= only results from FI are reported. $\rho[\bullet]$:= correlation between the variables in the square brackets. $\sigma[\bullet]$:= volatility of the variable in the square brackets. $\Delta(\bullet)$:= growth rate of the variable in the parentheses. $\rho[\Delta(RER), \Delta(c_h) - \Delta(c_f)] \rightarrow 1$:= correlation between the RER and consumption growth differentials approaches 1. c_h := consumption of the home country. c_f := consumption of the foreign country. y_h := output of the home country. y_f := output of the foreign country. RER := real exchange rate. R_B := bond yield. R_E := equity yield. RS := risk-sharing.

endogenous international portfolio choice. International financial architectures are exogenously divided into four stages according to the degree of FI. The first stage is financial autarky, in which countries do not hold external assets. In the second stage, two-country FI, central country A becomes financially integrated with peripheral country B, while peripheral country C still remains segmented from international financial markets. In the third stage, center-periphery FI, the central country becomes financially integrated with the peripheral countries but there is no FI. In the last stage, there is full FI (i.e., all financial markets integrate into the world economy and assets freely move across borders). A country moving from financial autarky to some degree of FI, faces positive FI effects. This because the country has access to both domestic and foreign assets. Second, from two-country FI (countries A and B) to center-periphery FI (countries A, B and C), central country A becomes better off while peripheral country B is worse off. In equilibrium, country B has to reduce its foreign asset holdings and is left holding more of its own assets, and thereby faces a higher domestic income risk exposure. Lastly, from two-country FI directly to global FI, the large country gains from FI, while the small one loses. Global integration provides all countries with a larger variety of assets and leads to positive global diversification effects.[25] Nevertheless, financial terms of trade effects may work in favor, or against, some country since endogenous asset prices are determined by relative market sizes. However, in this theoretical framework results are driven by the fact that demand and market size effects play an important role in determining diversification effects and financial terms of trade effects.

Tretvoll (2018) builds on Colacito and Croce (2013) by introducing recursive preferences in a standard two-country IBC model. The asymmetry in the impact of long-run productivity shock across countries induced by the presence of home bias generates strong depreciation of the RER and resources are transferred abroad due to risk-sharing between households, which is allowed by the presence of international complete markets. This mechanism puts pressure on currency making it as volatile as in the data. Moreover, the RS mechanism embedded in the model generates a relatively low cross-country consumption growth correlation, consistent with international macroeconomic data.

Devereux and Yu (2020) examine the effects of FI on the incidence of financial crises, their correlation across countries, and the severity of crises. To do so, they build a stochastic general equilibrium model where FI facilitates RS, but also alters the incentives and willingness of agents to make risky investments financed by borrowing. In the model, three different degrees of FI are considered: financial autarky (i.e., investors get funds only from local bankers and hold only local equity assets), bond market integration (i.e., investor obtains funding from a global bank that accepts deposits from savers in all countries), and equity market integration (i.e., investors borrow from a global bank but can also make investments in domestic or foreign projects). FI is found to generate a significant increase in global leverage. In the model, this doubles the probability of balance sheet crises for any one country (i.e., contagion risk increases). However, the higher degree of RS induced by the presence of integrated international financial markets makes the macroeconomic effects of a crisis less severe. There is thus a trade-off between the probability of crises and the severity of crises. The impact of FI on welfare is ambiguous since it depends on the scale of macroeconomic risk.

The above discussed theoretical studies with the main related results are listed in Table 8.

What emerges from surveying the IBC literature is that FI should come with a relatively low consumption and output volatility, a relatively high RER volatility, a relatively low cross-country consumption growth correlation and low/high correlation between consumption

[25] Let us point out that this theoretical result is at odd with the empirical evidence of Billio et al. (2017) who show that international diversification benefits have decreased is the presence of higher FI levels.

differentials and RER.[26] To build thus a bridge between theoretical predictions and data, the international finance literature should put an effort to examine the link between the aforementioned IBC equilibrium features and measures of FI. Since IBC implications of higher FI rely on the concept of market completeness, then we should expect that the proposed FI indicators embrace such a concept. However, we are aware that this is not always the case. In other words, increasing convergence in international equity returns or capital market openness do not necessarily imply the presence of complete markets (in the sense of theoretical foundations).

The analysis of these papers reveals a clear pattern. Each paper focuses on a pair of countries, identifies stylized facts, and builds either an international endowment economy or an international production economy that is able to replicate these stylized facts. In this "reverse-engineering" exercise, the contribution is to identify the main channel through which these stylized facts are explained. Unfortunately, these models are not flexible enough to explain alternative stylized facts (e.g., those involving other country groups). Moreover, they tend to be very sensitive to changes in parameter values.

9. Concluding remarks

This paper reviews the long-standing, vast and controversial literature on financial integration (FI). After focusing on the variety of measures proposed by the international finance literature to capture the evolution of the FI process, we have narrowed our interest to the empirical and theoretical implications of FI for growth, macroeconomic stability and RS. For the sake of completeness, an overview of those studies aimed at examining the drivers of FI has also been added.

What emerges clearly from our survey is that the FI literature is characterized by a wide variability of results, both empirical and theoretical. In fact, we can observe only one common empirical regularity, i.e., FI follows an increasing paths from early '70s until the mid-00s and starts declining in the aftermath of the GFC. On the empirical side, the results related to the factors influencing FI or those concerning the macroeconomic effects of FI are rather vague. Different variables, financial, real, and technological, seem to influence FI, but it is difficult to determine which variable is the most important. In addition, the effects of FI on growth and RS are not always the same. Some empirical works indicate FI to be growth-enhancing and RS-improving whereas others find opposite evidence. Since a wide variety of FI measures have been proposed by the international finance literature, it is not then clear whether the use of different measures leads to similar empirical findings.

On the theoretical side, the results related to the effects of FI are also uncertain. Some theoretical models suggest that FI can have positive effects on the economy, such as increasing economic growth and improving RS. Other theoretical models suggest instead that FI can have negative effects on the economy, such as increasing the volatility of financial markets and amplifying macro and financial contagion risk. This difference in theoretical results could be due to the fact that IBC studies tend to focus on trying to "match" key stylized facts on country pairs, not considering thus the global dimension of finance.

Based on these considerations, we believe that the FI literature can make significant progress if future research will focus on the following aspects. First, there should be an effort to better understand the relationship between different measures of FI. In this respect, it is important to determine whether different measures provide concordant results. For example, if one measure suggests that FI has a positive effect on economic growth, another measure should provide similar evidence. If the different measures provide discordant results, it would be then worth exploring the reasons for this discrepancy. Second, it is also key to determine if the empirical results related to the drivers and effects of FI are robust to using different indicators of FI. Are, for instance, both quantity and price based FI measures equally driven by international trade? Third, there is the need to develop more flexible theoretical models. Current IBC theoretical models are often too rigid to be able to (*a*) capture all the dimensions of FI and (*b*) explain the various implications of FI.

To conclude, the FI literature is a rapidly evolving field of research. The progress made in the last 20 years has contributed to improving our understanding of this complex phenomenon, but there are still many open questions and issues. In particular, it is necessary to deepen the understanding of the differences and effects of the different measures of integration, as well as to develop more flexible theoretical models.

[26] Simulated results on the Backus–Smith correlation depend on the type of preferences embedded in the model.

CRediT authorship contribution statement

M. Donadelli: Conceptualization, Methodology, Software, Data curation, Writing – original draft, Visualization, Investigation, Supervision, Validation, Writing – reviewing & editing, Formal analysis. **I. Gufler:** Conceptualization, Methodology, Software, Data curation, Writing – original draft, Visualization, Investigation, Supervision, Validation, Writing – reviewing & editing, Formal analysis. **A. Paradiso:** Conceptualization, Methodology, Software, Data curation, Writing – original draft, Visualization, Investigation, Supervision, Validation, Writing – reviewing & editing, Formal analysis.

Data availability

Data will be made available on request.

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