Can Cross-Border Funding Frictions Explain Financial Integration Reversals?*

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Abstract

We examine the role of funding frictions in international investments. Guided by an international CAPM with funding constraints, we use the differences in the betting-against-beta portfolio performance between countries to infer the magnitude and the implicit cost of barriers that impede the funding of cross-border positions. We find such cross-border funding barriers to be economically significant. Despite an overall downward trend, our measure reveals periods when cross-border funding frictions become more severe. These periods coincide with increases in market segmentation documented in the literature but not explained by the variation in other international investment barriers.

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1 Introduction

International financial markets have become more integrated over the past decades. Researchers have attributed this long-run trend to the progressive reduction of barriers to foreign investment, such as capital controls or taxes on repatriation, around the world.[1] However, in the wake of the 2008 financial crisis, concerns over a potential reversal of these global market integration trends came to dominate the academic and policy debates.[2] Yet, even transitory reversals in integration are at odds with an apparent lack of new barriers to international capital flows. Nonetheless, when they materialize, such reversals can decrease international risk sharing and increase the cost of capital around the world.

In this paper, we shed new light on the dynamics of financial integration by considering the role of funding-constrained investors. The premise of our analysis is that, in addition to restricted or costly access to foreign assets, international investors are also constrained in their ability to access funding for their cross-border positions.[3] Such constraints arise for a variety of reasons. For example, foreign collateral may command higher haircuts relative to domestic collateral (the limiting case being the restrictions on assets eligible as collateral for central bank refinancing), foreign currency positions imply higher regulatory capital requirements (irrespective of investors' attitude towards foreign exchange (FX) risk), and foreign currency funding or FX risk hedging involve additional costs that ultimately reflect the balance sheet constraints of financial intermediaries supplying them.[4]

Our first contribution to the literature is to infer the importance of these frictions from the effect they have on asset prices. To do so, we construct a novel measure of cross-

[1]See Bekaert and Harvey (1995), Carrieri, Errunza, and Hogan (2007), Bekaert, Harvey, Lundblad, and Siegel (2011, 2013), Carrieri, Chaieb, and Errunza (2013), and Eiling and Gerard (2015), among others.

[2]See Rose and Wieladek (2014), Van Rijckeghem and Weder (2014), Giannetti and Laeven (2012, 2016), Jeanne and Korinek (2010), Ostry, Ghosh, Chamon, and Qureshi (2012), Forbes, Fratzscher, and Straub (2013), Pasricha, Falagiarda, Bijsterbosch, and Aizenman (2015), and Bussiere, Schmidt, and Valla (2016).

[3]Stulz (1981) and Errunza and Losq (1985) introduce holding costs and ownership restrictions for international investments, respectively. Our focus on funding frictions separates us from international integration literature based on these two seminal contributions.

[4]See for example CPSS (2006), BCBS (2016), Corradin and Rodriguez-Moreno (2016), Du, Tepper, and Verdelhan (2018), and Cenedese, Della Corte, and Wang (2016).

border funding frictions based on the distance between the expected returns of betting-against-beta (BAB) portfolios of the countries in our sample. The expected returns of these BAB portfolios are driven by the lower slope of the security market line, compared to the risk-based benchmark, and capture the effect of funding considerations on expected returns in a given country.[5] We show that the distance between expected BAB returns of the countries are informative about cross-border funding frictions, and we find these frictions to be economically important. Next, we relate the variation in country-level indicators of the cross-border frictions to available funding liquidity proxies and institutional features that correlate with the presence of funding constraints. Finally, using our country indicators, we find that the difficulty to fund cross-border positions can help explain financial integration reversals (i.e., transitory increases in market segmentation) documented in the literature but not explained by the variation in other foreign investment barriers.

As a first step, we build an international asset pricing model in which investors have to fund a fraction of their position in each security with their own capital, and we set these capital requirements higher for cross-border positions.[6] In an equilibrium where funding constraints bind for at least some investors, the expected excess return on any security depends not only on its exposure to market risk, but also on the interaction between the capital required to maintain the position in this security and investors' funding liquidity as measured by their shadow price of capital. In turn, the BAB portfolios, which are long the low-beta assets and short the high-beta assets in their respective countries, are constructed to have zero exposure to market risk and load on the country funding component only. Because access to foreign markets is subject to higher capital requirements, domestic funding liquidity and foreign investors' funding liquidity have a different effect on a given market. This leads to differences in expected BAB returns across countries and to imperfect correlation between expected BAB returns in response to investors' funding liquidity shocks. The latter in turn leads to lower correlation between realized BAB returns. In contrast, when capital

[5]See Black (1972), Frazzini and Pedersen (2014), and Jylhä (2017).

[6]The model builds on Frazzini and Pedersen (2014) and Malkhozov, Mueller, Vedolin, and Venter (2017).

requirements are the same for foreign and domestic positions, expected BAB returns in all countries depend on the representative global investor's shadow price of capital.

Next, we construct the BAB portfolios for 49 countries (21 developed markets and 28 emerging markets) for the period from 1973 to 2014. The average returns of these country BAB portfolios are positive, at 1.08% monthly for developed markets and 1.31% for emerging markets, and are statistically significant for most countries. We find important differences between average BAB returns in our sample of countries. After accounting for the country-level determinants of expected BAB returns, such as the market volatility and the spread between high- and low-beta portfolios, the BAB portfolio returns are different from their global average by 0.26% in developed markets and 0.67% in emerging markets. We also find that BAB returns are positively correlated between countries, and this correlation is stronger for developed markets compared to emerging markets, with the average correlation between developed market BAB returns increasing substantially between 1997 and 2004. However, we document that in crisis periods BAB portfolios tend to co-move less across countries, in stark contrast to market-wide stock indices, which tend to co-move more.[7,8]

Building on our model and the above observations, we create a measure of the severity of the funding frictions for cross-border positions for each country in our sample. We use Bayesian methods to estimate the unobserved driver of the expected country BAB returns, controlling for the country-level market volatility and the spread between high- and low-beta portfolios. We interpret this latent variable as a proxy for the shadow price of capital. For every country we measure the distance between its own shadow price of capital and that of the other countries. In the context of our model, this distance increases either when cross-border capital requirements increase or when the funding liquidity of investors in different countries diverge, making a given cross-border capital requirement more costly.

[7]See Longin and Solnik (2001) and Forbes and Rigobon (2002) for additional evidence on the market-wide correlations during market distress periods.

[8]Higher correlation of fundamental shocks during crisis periods has been a challenge for the analysis of market integration dynamics. See Carrieri et al. (2007) and Pukthuanthong and Roll (2009) who discuss empirical and theoretical issues with using market-wide correlations as a measure of market integration.

The above approach allows us to construct a cross-border funding barrier (CFB) indicator for multiples countries and over long periods, unlike most existing funding liquidity proxies that have limited cross-sectional or time-series information, and are also often difficult to compare internationally. We find that the CFB indicators exhibit properties that are in line with our expectations. Their magnitude is lower for developed markets, they display a downward trend across all markets, and this downward trend is more pronounced for emerging markets. The economic significance of the cross-border funding barriers that can be inferred from this unobserved component is three times as large for emerging markets, but interestingly it is also sizeable for developed markets. Furthermore, the indicators reveal that large increases in the severity of funding barriers, albeit transitory, are a salient feature of both developed and emerging country stock markets.

In the following step, we examine the drivers of the variation in the CFB measure across countries and over time. First, we find a strong and positive relationship between the CFB indicators and global funding liquidity. The differences in expected BAB returns, at the core of our country indicators, widen when global funding conditions deteriorate. In particular, proxies from the U.S. funding market, like the leverage of broker-dealers, from the credit market, like the TED spread, and from the foreign exchange market, like the covered interest parity (CIP) basis, are all significantly related to the CFB indicators. Second, there is no significant association between the indicators and standard foreign investment barrier proxies, suggesting that differences in expected BAB returns captured by our measure are not driven by these previously studied foreign investment barriers, but rather reveal a separate channel. Third, for countries and periods where country-level funding condition proxies are available, these country-level proxies have significant explanatory power over and above global funding conditions, suggesting that the information on funding frictions contained in the CFB indicators is not subsumed by a single global factor. Fourth, the long-run downward trend in the CFB indicators is in line with the progressive liberalization in cross-border funding that we measure by the number of foreign banks that are primary dealers in the U.S. Treasuries.

Finally, we examine whether cross-border funding frictions contribute to international stock market segmentation. We note that the empirical properties of the CFB indicators are broadly in line with market segmentation facts documented in the literature. More formally, we find a statistically and economically significant relationship between funding barriers and the segmentation measure proposed by Bekaert et al. (2011, 2013). Furthermore, this relationship is particularly strong during financial integration reversals identified by the segmentation measure. While acknowledging such reversals, previous literature has not directly explored possible explanations. We propose a mechanism based on funding frictions that can rationalize financial integration reversals. Unlike traditional investment barriers which vary across countries but change very slowly over time, the shadow cost of a given cross-border capital requirement can change significantly when funding liquidity conditions across countries change. The dependence of our measure on the shadow cost of capital constitutes an important qualitative difference between funding and other barriers. This dependence explains why we can empirically observe global financial integration reversals even when investment barriers are not markedly changing.

We perform several robustness checks and we find that our results remain unchanged when we consider separately the U.S., all the countries in our sample excluding the U.S., or when we exclude the 2007-2009 global financial crisis period. We also carefully distinguish between funding and market liquidity. Bekaert, Harvey, and Lundblad (2007) and Lee (2011), among others, demonstrated the importance of market liquidity for international investments. However, the effect of funding liquidity is different from the effect of market liquidity, although the two could potentially be linked (Brunnermeier and Pedersen, 2009). We control for market liquidity and find only a weak relationship between market liquidity and the cross-border funding measure, consistent with the results of Goyenko and Sarkissian (2014).

This paper is related to several literature strands. Brunnermeier and Pedersen (2009), Geanakoplos (2010), Gârleanu and Pedersen (2011), He and Krishnamurthy (2012, 2013), Adrian and Shin (2014), Gârleanu, Panageas, and Yu (2015) among many others, study the effect of constrained investors on asset prices. We apply the theoretical insights of this literature to an international setting. In this respect, we extend the literature on the dynamics of financial integration in the post-liberalization period. Carrieri et al. (2007), Pukthuanthong and Roll (2009), Bekaert et al. (2011, 2013), Carrieri et al. (2013), and Eiling and Gerard (2015) empirically study the dynamics of financial integration and identify the role of explicit and implicit barriers to foreign investment in driving it. Relative to these papers, we propose a new mechanism that contributes to international stock market segmentation and is useful in explaining integration reversals. Our findings are consistent with the notion that in periods when leveraging cross-border positions is more difficult and global capital flows reverse, more risk should be borne by local investors, which would lead to increase in market segmentation. In fact, the literature on the dynamics of home bias, such as Warnock and Warnock (2009), Hoggarth, Mahadeva, and Martin (2010), Jotikasthira, Lundblad, and Ramadorai (2012), and Giannetti and Laeven (2012, 2016) documents that investors decrease their international holdings following funding shocks. Similarly, Rey (2015) argues that a global factor related to the constraints of leveraged global banks and asset managers explains the dynamics of international capital flows.

The rest of the paper is organized as follows. Section 2 introduces the Cross-border Funding Barrier indicator. The data and the estimation results are presented in Sections 3 and 4. Section 5 concludes.

2 Cross-border Funding Barriers Indicator

2.1 A Model with Funding Barriers to International Investment

We consider an economy with two dates $t = 0, 1$ and two countries $j = d, f$.[9] In each country there exist a set $\mathcal{K}_j$ of stocks indexed by k and a set $\mathcal{I}_j$ of n_j competitive investors indexed by i. We denote $\mathcal{K} = \bigcup_j \mathcal{K}_j$, $\mathcal{I} = \bigcup_j \mathcal{I}_j$, and $n = \sum_j n_j$.

Each stock k is in fixed supply and its gross return between dates 0 and 1 is denoted by R_k. Investors also have access to a riskless asset with gross return R_0 given exogenously. Finally, the purchasing power parity holds and all prices are expressed in U.S. dollars.[10]

Each investor i can invest in all assets of the world economy. She maximizes

$$\max_{\left\{x_{i,k}\right\}_{k\in\mathcal{K}}} \mathrm{E}_0\left[W_{i,1}\right] - \frac{\alpha}{2}\mathrm{Var}_0\left[W_{i,1}\right]$$

subject to her budget constraint

$$W_{i,1} = W_{i,0}R_0 + \sum_{k\in\mathcal{K}} \left(R_k - R_0\right) x_{i,k}, \tag{1}$$

where $W_{i,0}$ is investor's initial wealth, $x_{i,k}$ is the dollar amount investor i holds in stock k at time 0.

Investors' leverage is limited, capturing the combined effect of regulatory constraints and market discipline.[11] Specifically, investing in or shorting securities requires investor i to commit the amount of capital equal to the multiple $m_{i,k}$ of her position size:

$$\sum_{k\in\mathcal{K}} m_{i,k} \left|x_{i,k}\right| \leq W_{i,0} + \zeta_i, \tag{2}$$

[9] We can also think about the second country as the rest of the world.
[10] See, e.g., Bekaert et al. (2007) who make a similar assumption.
[11] Investors who are active in international financial markets can be subject to bank capital requirements, participation constraints imposed by debtholders, margin requirements, etc.

where ζ_i is a shock that tightens or relaxes the leverage constraint before investor chooses her optimal portfolio. These shocks are a reduced form way to model changes in investors' capital position through past investment gains/losses and any exogenous shocks to their funding liquidity. Stock $k \in \mathcal{K}_j$ capital requirement is given by

$$m_{i,k} = \begin{cases} m, & \text{if } i \in \mathcal{I}_j \\ m + \kappa, & \text{if } i \notin \mathcal{I}_j. \end{cases}$$

When $\kappa > 0$, investor have to commit more capital to take foreign leveraged positions relative to domestic leveraged positions. Finally, in line with Frazzini and Pedersen (2014), we focus on the case where $x_{i,k} > 0$.

Conditionally on the realisations of funding liquidity shocks ζ_i, we have

Theorem 1. *The equilibrium expected return on a self-financing market-neutral portfolio that is long in low-beta securities and short in high-beta securities in country j is*

$$\mathrm{E}_0\left(R_j^{BAB}\right) = \left(\frac{1}{\beta^L} - \frac{1}{\beta^H}\right) m \Psi_j, \tag{3}$$

where

$$\Psi_j = \frac{1}{n} \sum_{i \in \mathcal{I}} \psi_i + \frac{\kappa}{m} \frac{1}{n - n_j} \sum_{i \notin \mathcal{I}_j} \psi_i, \tag{4}$$

β^L, β^H are global market betas of the long and short legs of the portfolio, respectively, ψ_i are Lagrange multipliers associated with Equation (2).

The proof, presented in Appendix A, follows Stulz (1981) and Frazzini and Pedersen (2014). From (3) and (4), in addition to the compensation required by all investors for tied-down capital m, the expected return on country j BAB portfolio depends on the compensation required by foreign investors for the additional cross-border capital requirement κ. This compensation, and therefore the effect of cross-border capital requirements, is conditional on foreign investors' shadow price of capital. [12]

The realisation of funding liquidity shocks ζ_i determines the shadow prices of capital ψ_i, and thereby the expected performance of BAB portfolios. Our first proposition pertains to the correlation between the BAB portfolio returns.

Proposition 1. *The correlation between the expected performance of BAB portfolios across countries is decreasing in the cross-border funding barriers.*

The funding liquidity shocks introduce commonality in the betting-against-beta portfolio performance, even assuming that these shocks are independent across investors. Indeed, when $\kappa = 0$, (4) implies that $Corr_\zeta(\Psi_d, \Psi_f) = 1$. However, the correlation between the expected performance of BAB portfolios is decreasing in the funding barrier κ. As shown in the appendix, $\frac{\partial Corr_\zeta(\Psi_d, \Psi_f)}{\partial \kappa} < 0$ for $\kappa > 0$. Next, we consider a way to capture both the level of the cross-border funding barriers and their implicit cost.

Proposition 2. *The distance between the expected BAB returns of the two countries, adjusted for the beta spread and the level of capital requirements, is increasing in the cross-border funding barriers and the difference in funding liquidity of foreign and domestic investors.*

Indeed, from (4) we have

$$|\Psi_d - \Psi_f| = \frac{\kappa}{m} \left| \frac{1}{n_f} \sum_{i \in \mathcal{I}_f} \psi_i - \frac{1}{n_d} \sum_{i \in \mathcal{I}_d} \psi_i \right|. \tag{5}$$

Finally, we highlight the difference between the funding barriers and the previously studied barriers arising from costly access to foreign assets. To this end, we assume that, in addition to cross-border capital requirements, investors are subject to a tax proportional to

[12] The literature proposed other possible explanations for the low slope of the security market line, including investors' disagreement (Hong and Sraer, 2016), sentiments (Antoniou, Doukas, and Subrahmanyam, 2016), delegated portfolio management (Brennan, Cheng, and Li (2012), Baker, Bradley, and Wurgler, 2010), lottery demand (Bali, Brown, Murray, and Tang, 2017), and trading activity of arbitrageurs (Huang, Lou, and Polk, 2018). Most recent evidence in Jylhä (2017) points to funding frictions as the primary explanation for the low slope of the security market line.

their foreign country positions. Unlike the capital requirements which enter into investors' funding constraint (2), the tax enters directly into investors' budget constraint (1). As a result, the shadow costs of the two cross-border frictions are not the same as they depend on multipliers associated with the two respective constraints. More formally, investor i the budget constraint becomes

$$W_{i,1} = W_{i,0}R_0 + \sum_{k\in\mathcal{K}} \left(R_k - R_0\right) x_{i,k} - \sum_{k\in\mathcal{K}} \tau_{i,k} \left|x_{i,k}\right|,$$

where $\tau_{i,k}$ for stock $k \in \mathcal{K}_j$ is given by

$$\tau_{i,k} = \begin{cases} 0, & \text{if } i \in \mathcal{I}_j \\ \tau, & \text{if } i \notin \mathcal{I}_j. \end{cases}$$

As shown in the appendix, the expected BAB return is then given

$$E_0\left(R_j^{BAB}\right) = \left(\frac{1}{\beta^L} - \frac{1}{\beta^H}\right)\left(m\Psi_j + \tau\frac{\alpha}{n-n_j}\right). \tag{6}$$

From (6), the tax τ has an effect on expected BAB return but this effect does not depend on the shadow price of capital and, hence, on the realisation of funding liquidity shocks.

2.2 Empirical Implementation

This section describes the empirical proxies for the latent component of expected BAB returns Ψ_j and the distance $|\Psi_d - \Psi_f|$.

We follow Frazzini and Pedersen (2014) in constructing BAB portfolios. At each period t and in each country j, all securities are grouped according to their beta with respect to global market into high- and low-beta portfolios. In each portfolio, securities are weighted by the corresponding portfolio beta. The BAB portfolio for country j is then formed by going long in the low-beta portfolio, leveraged to beta one, and shorting the high-beta portfolio, de-leveraged to a beta of one. Additional details are provided in Appendix B.

For each country we posit the following BAB return dynamics

$$R^{BAB}_{j,t+1} = \Psi_t Z_{j,t} + \varepsilon_{j,t+1}, \tag{7}$$

$$Z^j_t = \left(\frac{1}{\beta^L_{j,t}} - \frac{1}{\beta^H_{j,t}}\right)\sigma_{j,t}, \tag{8}$$

$$\Psi_{t+1} = \phi_0 + \phi_1(\Psi_t - \phi_0) + \epsilon_{t+1}. \tag{9}$$

where $\Psi_t Z^j_t$ and $\varepsilon_{j,t+1}$ are the expected and unexpected components of BAB returns, respectively. Ψ_t is the latent funding liquidity factor that is common across all countries under the null of $\kappa = 0$. The term $Z_{j,t}$ controls for the effect that the variation in the beta spread and in market volatility has on BAB returns over time and across countries. Following Fostel and Geanakoplos (2008) and Brunnermeier and Pedersen (2009), we assume that capital requirements in each country are proportional to that country market volatility $m_{j,t} = m\sigma_{j,t}$ and, hence, include it in $Z_{j,t}$.[13]

Estimated betas and volatility in (8) are available from the BAB portfolio construction. Assuming persistence in the latent funding liquidity factor captured by the AR(1) process in (9), we use Markov Chain Monte Carlo (MCMC) and Gibbs Sampling to estimate the unknown parameters in (7) and (9). Estimation details are provided in Appendix C.[14,15]

Given the estimated $\hat{\Psi}_{h,t}$ in each country h, we define our cross-border funding barrier

[13] Jurek and Stafford, 2010 provide further motivation for the link between volatility and funding constraints. See also Gorton and Metrick (2010), who show evidence of time variation and cross-sectional differences of repo haircuts backed by different securities. In practice, this link is built into Basel bank regulatory capital requirements and the way exchanges adjust their margin requirements. For instance, Chicago Mercantile Exchange adjusts margin requirements based on historical, intraday, and implied volatilities. See Figure A1 in the online appendix.

[14] Jostova and Philipov (2005) and Ang and Chen (2007) implement a similar methodology to estimate conditional market betas for the single-factor CAPM. The authors use simulation analysis to show that their approach generates significantly more precise beta estimates than several competing models. As a simpler alternative, we can use a rolling-window estimate, similar to Lewellen and Nagel (2006). Our results are robust to using this approach.

[15] Because of the averaging underlying the methodology, using Gibbs Sampler reduces concerns over the "error-in-variable" issue resulting from noisy estimates for the beta spread and market volatility.

(CFB) indicator for country j at date t as

$$\mathrm{CFB}_{j,t} = \left| \sum_{h \in \mathcal{J}} w_{h,t} \hat{\Psi}_{h,t} - \hat{\Psi}_{j,t} \right|,$$

where $w_{h,t}$ is the weight of country h in the world market portfolio. Under the null of no funding barriers, the distance between the estimates should be zero up to an estimation error. Multiplied by the corresponding $\hat{Z}_{j,t}$, the country j indicator $\mathrm{CFB}_{j,t}$ measures by how much country j expected BAB returns would have been different had average global funding conditions $\sum_{h \in \mathcal{J}} w_{h,t} \hat{\Psi}_{h,t}$ prevailed in that country:

$$\mathrm{CFB}_{j,t} \hat{Z}_{j,t} = \left| \left(\sum_{h \in \mathcal{J}} w_{h,t} \hat{\Psi}_{h,t} \right) \hat{Z}_{j,t} - \hat{\Psi}_{j,t} \hat{Z}_{j,t} \right|.$$

3 Data

We collect the dollar denominated total return index, the market capitalization, and the price-earning ratio for individual stocks at daily frequency from January 1973 to October 2014 from DataStream and WorldScope databases. In addition, we use DataStream market indexes for country and global market portfolios. Finally, we use the one-month T-bill rates from Kenneth French's website as the risk-free rate.

Excluding countries with short or incomplete data history (representing in total 1.3% of the global market capitalization, as measured by the DataStream's world total market index), we have data for 21 developed (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Singapore, Spain, Sweden, Switzerland, the U.K., and the U.S.) and 28 emerging (Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Israel, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Russia, Slovenia, South Africa, South Korea, Taiwan, Thailand, Turkey) markets according to the FTSE classification of each country prevailing through the sample history. In total, we have data for 118,300 securities.

We apply additional data filters, similar to Karolyi, Lee, and van Dijk (2012). First, we include only common equity securities and exclude depositary receipts, real estate investment trusts, preferred stocks, investment funds, and other stocks with special features. Second, we require that each security in the sample has at least 750 trading days of non-missing return data in each five year window. Finally, to limit the survivorship bias, we include the dead stocks in the sample. The filtered sample includes 58,405 securities.

Motivated by a vast literature, see Adrian and Shin (2010), Gârleanu and Pedersen (2011), Fontaine and Garcia (2012), Hu, Pan, and Wang (2013), Adrian, Muir, and Etula (2014), Cenedese et al. (2016) among many others, we consider a range of funding liquidity proxies. These alternative proxies are not uniformly available across countries, frequencies and time periods, and can potentially capture different dimensions of funding liquidity, despite their co-movement. Specifically, we consider the following variables: the spread between the three-month U.S. dollar LIBOR and the three-month Treasury Bill rate (the TED spread), available at daily frequency from the Federal Reserve Bank of St. Louis from 1986; the CBOE S&P 500 implied volatility index (the VIX index), available at daily frequency from 1990; the leverage of U.S. broker-dealers calculated from the Table L.128 of the Federal Reserve Flow of Funds data, available at quarterly frequency from 1968; the 3-month cross-currency basis for ten widely traded currencies (AUD, CAD, CHF, DKK, EUR, GBP, JPY, NOK, NZD, SEK) against the USD from Du et al. (2018), available at monthly frequency from 2000.[16] Higher TED spread, VIX index, and absolute value of the cross-currency basis, as well as lower broker-dealer leverage indicate tighter funding liquidity conditions. In addition, we use the nominal bilateral exchange rate data from Datastream, the trade weighted U.S. Dollar exchange rate index from the Federal Reserve Bank of St. Louis, and the data from the Federal Reserve Bank of New York on its trading counterparties.[17].

[16]We thank Wenxin Du for sharing the data.

[17]https://www.newyorkfed.org/markets/primarydealers

Finally, we collect data on foreign investment barrier proxies, other local market characteristics, and global economic condition state variables that have been considered in the international financial integration literature. See, for instance, Bekaert et al. (2011). We take measures of country investment profile (expropriation, contract viability, profits repatriation, and payment delay risks) and of law and order (legal system strength and impartiality, and law observance) from the International Country Risk Guide by Political Risk Services. We use the capital account openness measure based on International Monetary Fund data from Quinn and Toyoda (2008). We obtain the ratio of private credit (financial resources available to the private sector through loans, purchases of non-equity securities, and trade credit and other accounts receivable) to GDP, the ratio of market capitalization to GDP, and world GDP growth data from the World Bank World Development Indicators. We compute a world growth uncertainty measure as the log of the cross-sectional standard deviation of real GDP growth across countries from data of the International Monetary Fund World Economic Outlook.

Appendix D lists all the variables with description and data sources.

4 Empirical Results

In this section we present, in turn, the properties of the BAB portfolios used to construct the measure of cross-border funding barriers, our indicators of these barriers, the factors driving the variation in the barriers across countries and through time, and the contribution of these barriers to the international stock market integration dynamics. In all the panel regressions, to account for heteroskedasticity, serial autocorrelation, and cross-correlation in error terms, p-values are calculated based on the double clustered (by time and country) standard errors, following Petersen (2009).

4.1 The Cross-Section of BAB Portfolios

We begin by reviewing the properties of the BAB portfolios that underlie our analysis. We compute the beta of each stock with respect to the global market portfolio and construct the BAB portfolios following Frazzini and Pedersen (2014) methodology. The summary statistics of these portfolios are reported in Table 1.[18] The average BAB returns are positive and statistically significant for most of the countries in our sample, in line with the predictions of the model with funding constraints, see Theorem 1. The average monthly BAB return is 1.08% with a monthly standard deviation of 4.27% for developed markets and 1.31% with a monthly standard deviation of 8.04% for emerging markets. The difference between the leverage applied to the low beta leg and the high beta leg of the BAB portfolio $1/\beta_L - 1/\beta_H$, referred as beta spread, is similar for developed and emerging markets, with an average of 0.57 and 0.63, respectively.

[Place Table 1 about here]

To gauge the range in the correlations and the differences between BAB portfolio returns for the countries in our sample, we construct a global BAB portfolio as the value-weighted average of all the countries' BAB portfolios. In Table 2, we first observe that the correlation between the country BAB portfolio returns and the global BAB portfolio is lower than the correlation between the returns of country market portfolios and the global market portfolio. In addition, both BAB and market-wide correlations are on average lower for emerging markets compared to developed markets. In the context of our model, this lower level of BAB correlations for emerging markets can be explained by the presence of higher cross-border funding barriers between these markets and the rest of the world, as formalized

[18] Table A1 in the online appendix reports the summary statistics for the local market portfolios. The properties of BAB portfolios constructed using betas with the respective local market portfolio are reported in Table A2 in the online appendix and are both quantitatively and qualitatively similar to BAB portfolios constructed using betas with respect to the global market portfolio. This is in line with the evidence in Frazzini and Pedersen (2014) who also examine portfolios constructed with betas with respect to both local and global benchmarks, and find similar results.

in Proposition 1.

Table 2 also reveals additional information on the cross-country variation in funding liquidity implied by BAB returns. After adjusting for differences in beta spread and volatility, the average absolute value difference, or average distance, between the returns of each country BAB portfolio and the global BAB portfolio is 0.26% per month for developed markets and 0.67% per month for emerging markets. These figures provide us with a first assessment of the potential economic significance of the funding barriers. An interesting pattern emerges from the numbers reported in Table 2. Across countries, lower correlations between a country BAB portfolio and the global BAB portfolio tend to be associated with higher distance between the respective country average BAB portfolio return and the global BAB portfolio return. This pattern is in line with the prediction from Propositions 1 and 2 of our model that cross-border funding barriers lower the correlation and increase the differences between BAB expected returns across countries.[19]

[Place Table 2 about here]

The analysis of the time-variation in return correlations reveals interesting differences between the correlations of BAB portfolios and the correlations of market portfolios. Figure 1 plots the monthly equal-weighted average of the two-year rolling window correlations between country BAB returns and the global BAB portfolio. For developed markets, the BAB portfolio correlations increase substantially from 0.2 to 0.6 from 1997 to 2004. For emerging markets, we notice an upward trend in BAB correlations throughout, reaching an average of almost 0.4 at the end of the sample period. Most interestingly, the dynamics of the BAB correlations often differ noticeably from those between country-level market portfolios and the global market portfolio, also plotted in Figure 1. In particular, we observe that BAB portfolio correlations tend to decrease in crisis periods such as the October 1987 stock market crash, the withdrawal of the pound sterling from the European Exchange Rate Mechanism in September 1992, the East Asian crisis in July 1997, the Long-Term Capital Management

[19] An expected BAB return shock is a discount rate shock that is reflected in realized BAB returns.

collapse in September 1998, and the subprime crisis in September 2008. This is in stark contrast to market portfolios that tend to co-move more during those same periods.

[Place Figure 1 about here]

This observation is confirmed by formal regressions in Table 3. While BAB and market correlations show a positive association in column (2), even after controlling with fixed effects for unspecified country characteristics, they display opposite reaction to global market turmoil. Both a crisis dummy variable and the TED spread, a market stress indicator, have a statistically significant negative coefficient in the regressions of column (3) and (4) where the BAB correlations are the dependent variable. Conversely in column (1), the crisis dummy coefficient is positive and significant for the regression of the country market correlations with the global market portfolio, confirming the extensive evidence of increases in correlations among markets during financial distress (see, for instance, Longin and Solnik, 2001). In our model, lower BAB correlations during crisis periods can be explained by higher cross-border funding barriers during crisis.

[Place Table 3 about here]

4.2 Cross-border Funding Barrier (CFB) Indicator

Motivated by the observations above, we construct a CFB indicator for each country using the methodology described in Section 2. Empirically, the indicator measures the cross-country distance between the estimated expected BAB returns adjusted for differences in beta spread and volatility ($\hat{Z}_j$). In the model, the indicator is equal to zero in the absence of cross-border funding barriers. Otherwise, it is increasing in the capital requirements for cross-border positions and in the differences between shadow cost of capital of investors from different countries. Thus it aims to capture both the level of the funding barriers and their shadow cost.

Figure 2 illustrates the time series and cross-sectional properties of the CFB indicators. The top panel of Figure 2 plots the time-series of the CFB indicators averaged across developed and emerging markets, respectively. Over most of the time sample the indicators are higher for emerging markets, suggesting that funding barriers, similar to other types of international investment barriers, are higher for those countries. There is a long-run downward trend in both developed and emerging market averages, more pronounced for the latter. We also observe several large but transitory increases in both developed market and emerging market averages.

The lower panel of Figure 2 helps us in assessing the economic importance of the barriers obtained from our estimates. The diamond symbol shows for each country the average over the sample months of its CFB indicator, multiplied at each t by the corresponding beta spread and market volatility ($\mathrm{CFB}_j \hat{Z}_j$).[20] According to our estimates, had the average global funding conditions prevailed in all countries, their expected monthly BAB returns would have been different (higher or lower, depending on country and period) on average by 0.46% for developed markets and by 1.26% for emerging markets. The lower panel of Figure 2 also plots with bars the unconditional correlations between the estimated latent funding liquidity factor that drives the expected BAB returns of each country (Ψ_j) and those of the world (Ψ_G) computed as a value-weighted average of all the Ψ_js. Across countries, correlations and CFB indicators tend to be negatively related, in line with Propositions 1 and 2.

[Place Figure 2 about here]

Table A3 in the online appendix reports the summary statistics for the CFB indicators. We formally test some of the qualitative conclusions one can reach by visually examining the CFB series. We strongly reject the null that the average of the CFB indicators for emerging markets is equal to that of developed markets, both in panel regressions that pool all, DM or EM cross-sectional observations and in univariate regressions with the time-series

[20] After multiplying by $\hat{Z}_j$, the cross-sectional differences in $\mathrm{CFB}_j \hat{Z}_j$ are driven by the estimated effect of the barriers, as well as cross-country differences in beta spread and market volatility.

of the monthly average of the CFB indicators for the cross-sections above. We also confirm the statistical significance of the time trends for the CFB series of developed and emerging markets. These results are not reported for parsimony.

4.3 The Drivers of CFB Indicators

In this section, we examine the extent to which funding liquidity proxies, foreign investment barrier proxies, other local market characteristics, and global economic conditions explain the variation in the CFB indicators of our country panel.

Table 4 reports evidence with respect to global funding conditions. Results in Panel A strongly support the association between CFB^j and global funding liquidity proxies. In the four regression specifications where we use alternatively the TED spread, the VIX index, the average CIP deviation for a basket of currencies, or the negative of the U.S. broker-dealer leverage ratio as a funding liquidity proxy, we find a positive and strongly statistically significant relationship with CFB^j. Lower funding liquidity of the global investors who rely on U.S. markets to fund international investments increases the shadow cost of cross-border funding barriers, as captured by a higher level of CFB^j.

Our model suggests, see equation (5), that we should expect to see non-zero slope coefficients of CFB^j on funding liquidity proxies only when cross-border funding frictions are present ($\kappa \neq 0$). Indeed, absent such frictions, variation in investors' funding liquidity has the same effect on BAB portfolios across all countries, adjusting for differences in beta spread and volatility, and does not result in any change in CFB^j. This is true even in presence of other barriers (τ in the model). From equation (6), these non-funding barriers do not interact with the funding liquidity and should not have an effect on the slope coefficients on funding liquidity proxies.

We thus include proxies for foreign investment barriers, other local stock market characteristics, and global economic conditions in the regression specifications of panel B in Table 4. First, consider the evidence on the proxies for funding liquidity. The magnitude and the statistical significance of the slope coefficients for the alternative funding liquidity proxies remains unaffected. On the other hand, none of the additional variables are strongly related to CFB^j. In particular, we find no significant association between CFB indicators and a range of previously studied foreign investment barrier proxies, indicating that this comprehensive set of non-funding barriers are not the primary driver of the differences in expected BAB returns captured by the CFB^j in our country panel.[21] Similarly, except in the regression with CIP deviations, we do not find a significant relationship between CFB^j and market liquidity, measured by the proportion of zero-return days. Previous work, see e.g. Lee (2011), points to an important role of market liquidity for international investments. However, our results suggest that it is not a primary driver of the expected BAB return differences among countries.

[Place Table 4 about here]

Table A4 in the online appendix confirms the robustness of the above results in subsamples and subperiods. Our findings are the same in the samples with only the CFB indicator of the U.S. market, with all countries excluding the U.S., with developed as well with emerging markets. Most interestingly, the results are robust to the exclusion of the global financial crisis of 2007-2009, a period when the effect of funding frictions is most pronounced.[22] In addition, Table A5 in the online appendix confirms our results using quantile regressions that identify periods of tight and relaxed funding conditions. This analysis helps alleviate the concerns linked to persistence in some of the explanatory variables of Table 4 (see Ferson, Sarkissian, and Simin, 2003). It also verifies that our CFB indicators are able to reproduce across countries the dynamics of the global funding cycle.

[21] We follow the recent literature on market segmentation and study *de jure* and *de facto* barriers to foreign investment. We include variables proxying the explicit restrictions in accessing local securities, the investment and legal profile of each country, the health of the financial institutions, and stock market characteristics. See Appendix D for detailed description and data sources of these variables. The signs of the estimated coefficients for the vast majority of these variables are consistent with our prior. However, the lack of statistical significance suggests they are not driving the variation in CFB^j.

[22] For parsimony, we report the results with the TED spread. The results with alternative global funding liquidity proxies are qualitatively similar.

Next, where possible, we consider the effect of country-specific funding conditions that we measure by the CIP deviations of the currency of that country against the U.S. dollar. As reported in Table 5, there is a positive and statistically significant relationship between local currency CIP deviations and the CFB indicator for the corresponding country. This association is significant in regression (1) with fixed effects and in regression (2) and (3) that control for foreign investment barriers and other economic conditions, both at the country and global level. Moreover, our proxies for local funding conditions remain strongly significant in regression (4) when we also control for global funding conditions using the TED spread, suggesting that the information on funding frictions contained in the CFB indicators is not subsumed by a single global factor. Finally, in regression (5) we focus only on the period after 2007 as results in Du et al. (2018) suggest that CIP deviations are informative about funding conditions primarily after the global financial crisis. We find that the CIP association with CFB^j is still present in the more recent time sample. We conclude that CFB indicators are useful in capturing both the cross-sectional and time series variation in the effect of funding frictions when other funding liquidity proxies may not be available.

We also explore whether other foreign exchange market variables matter for our measure of cross-border funding barriers. Avdjiev, Du, Koch, and Shin (2016) and Avdjiev, Bruno, Koch, and Shin (2018) argue that the strength of the U.S. dollar is a proxy for the financial institutions' shadow price of capital, with stronger dollar going hand in hand with tighter funding conditions (both ΔFX>0 and ΔTWUSD>0 denote a dollar appreciation). The last column of Table 5 reports a positive and statistically significant relationship between the trade-weighted U.S. dollar exchange rate index and CFB indicators. At the same time, bilateral exchange rates with the U.S. dollar are not significant, in line with the above authors who also find weaker evidence for their channel through bilateral exchange rates.[23]

[Place Table 5 about here]

[23] As a check on possible multicollinearity from including the two exchange rates, we also run the same specification with the nominal effective exchange rates in place of the bilateral exchange rates. Our conclusions remain unaffected.

Finally, we investigate whether the variation in the CFB indicators is in line with the progressive opening around the world of the banking and intermediary sector, that likely lead to a decrease in the impediments to cross-border funding (κ in our model). To measure this institutional trend, we use the history of the Federal Reserve Bank of New York trading counterparties available from 1960 with monthly updates.[24] The network of primary dealers consisted exclusively of U.S. institutions in the 70s, but became progressively more international in the 80s and 90s.[25] The ratio of international institutions over the total number of primary dealers ranges from 0 at the beginning of our sample to 0.68 at its end, when 15 of the 22 accredited primary dealers are foreign.[26] As reported in Table 6, in regression (1) and (2) we find a negative and statistically significant relationship between this ratio and the CFB indicators. Similarly, in regression (3), there is a negative and statistically significant relationship between the ratio for the eight countries that have primary dealers and the corresponding country CFB indicator. This association does not change when we also add the TED spread in regression (4) to account for short-term dynamics in global funding markets.

[**Place Table 6 about here**]

We conclude that there is a strong relationship between CFB indicators and institutional features that correlate with the presence of funding constraints across countries. The association is equally strong with funding liquidity proxies that measure their shadow cost. At the same time, the information on funding frictions contained in CFB^j is not subsumed by other available variables. In sum, the results in this section suggest that our CFB measure

[24] He, Kelly, and Manela (2017) focus on the set of Primary Dealers with the Federal Reserve in computing an intermediary equity capital ratio measure.

[25] The first non-U.S. primary dealer with the Federal Reserve was Midland Montagu (a U.K. merchant bank) in 1975, followed by Kleinwort Benson (another U.K. institution) in 1980 and then Nomura Securities (a Japanese bank) in 1986 and Deutsche Bank (a German bank) in 1988. The first U.S. prime brokerage business abroad was created by Merrill Lynch's London office in the late 1980s. Comparable information can also be gathered from the list of globally systemically important banks (G-SIBs), but only for a short history.

[26] To identify the headquarter we use the ultimate risk basis criterion that refers to the risk of the ultimate bearer.

captures a new dimension of impediments to cross-border investment.

4.4 Funding Frictions and International Financial Integration

In this section, we examine the contribution of funding frictions captured by the CFB indicators to the dynamics of international stock market integration, and in particular to financial integration reversals. We consider a measure of market segmentation proposed by Bekaert et al. (2011, 2013). This measure, henceforth referred to as the SEG index, is based on valuation differentials across international industry portfolios and can be constructed for the entire history of each country in our sample. As an additional check, we also consider the parity violations in the American Depositary Receipt (ADR) market.[27]

We find a significant positive relationship between CFB indicators and Bekaert et al. (2011) segmentation measure (SEG), suggesting that funding barriers increase market segmentation.[28] As reported in Table 7, this relationship is significant in the panel of all countries and it is stronger in the developed market sub-sample. Specifically, one standard deviation increase in CFB increases on average the differences in earning yields that underlie the SEG measure by 53 basis points for developed markets and 43 basis points for emerging markets. This can be related to the average SEG magnitude of approximately 300 basis points. Moreover, the relationship remains significant in the sub-sample that excludes the global financial crisis of 2007-2009, a period when funding frictions were particularly severe.

While significant, the CFB indicators do not drive out other SEG explanatory variables proposed by the literature: country investment profile, capital account openness, the ratio of market capitalization to GDP, or past local market performance are significant across most specifications. These variables are found to be significant determinants of segmentation in Bekaert et al. (2011), and we confirm their findings in our sample. This result is also in

[27] We focus primarily on the SEG index and report ADR results in the online appendix because of the longer time series and larger cross-section for the former.

[28] It is worth pointing out that the CFB^j in all the regressions of the tables that follow are generated regressors that will be biased downward. Furthermore, in testing all our hypotheses we continue to use robust standard errors and thus we are conservative in reaching our conclusions.

line with our measure itself not being related to these variables, as discussed in section 4.3, highlighting the important independent role of the cross-border funding barriers. In addition, the relationship between SEG and CFB indicators remains significant and, in fact, becomes stronger when we control for global funding liquidity, using the TED spread as a proxy.

[Place Table 7 about here]

Table A6 in the online appendix confirms the robustness of the above results to additional control variables.

Next, we consider the explanatory power of the CFB indicators specifically for financial integration reversals, i.e. large temporary increases in market segmentation. We note that the SEG index, plotted on Figure A2 in the online appendix, exhibits such large transitory increases. To formally define reversal periods, we borrow the criterion Forbes and Warnock (2012) use to identify large capital flow movements. For each country, we identify a reversal in a given month if the SEG index is more than one standard deviation higher during three consecutive months (or more than two standard deviations higher) than its average over the previous 12 months. For developed markets on aggregate, we identify eight reversal episodes over 142 months, or 32.4 percent of their sample period. For emerging markets, we identify six reversals over 94 months, or 36.1 percent of their sample period. We observe prolonged periods when stock market integration advanced unimpeded, starting at the end of 1989 for five years among developed markets and also between 2003 to 2008 among all markets. We also notice that the reversal episodes often coincide with periods of financial market turmoil, such as Black Monday (1987), the Russian default and east Asia crisis (1997-1999), the global financial crisis (2007-2009) and the European sovereign crisis (2011-2012).

Using probit panel regressions, we find that an increase in CFB^j significantly increases the likelihood of financial integration reversals, as reported in Table 8. The relationship between the CFB indicators and the probability to observe a reversal is equally strong for developed and emerging markets, and remains significant in the sub-sample that excludes the global financial crisis of 2007-2009. Moreover, it becomes stronger when we control for global funding liquidity conditions as measured by the TED spread. With the exception of past local stock market performance, other foreign investment barrier proxies are not consistently significant across specifications, pointing to the key role of funding barriers for integration reversals.

[Place Table 8 about here]

Finally, we illustrate the relationship between funding barriers and reversals at the aggregate global level using the receiver operating characteristic (ROC) curve. We borrow this tool from Schularick and Taylor (2012) who use it in a different context to assess the predictive power of credit growth on financial crises. Figure 3 plots the rate of true positive reversal identifications against the rate of false positive reversal identifications for different *CFB* thresholds. The area under the ROC curve measures the diagnostic ability of *CFB* for reversals. A value below 0.50 suggests that the classifier (here *CFB*) on average fails to identify reversals better than a random classifier. In our case, the area under ROC curve in Figure 3 is equal to 0.71, similar to the level in Schularick and Taylor (2012).

[Place Figure 3 about here]

We confirm the above conclusions studying an index of ADR parity violations. With no need for an underlying asset pricing model, Chen and Knez (1995) regard violations of the Law of One Price as a useful approach to investigate market segmentation between assets with similar payoff across market types or national borders. Thus, as an alternative to the valuation based approach of the BHLS measure, we consider deviations from the Law of One Price in the market of ADRs. Errunza and Losq (1985) highlight the role played by securities available to global investors like American Depositary Receipts in spanning markets of inaccessible countries and affecting their integration. Pasquariello (2014) links ADR parity violations to a range of market indicators, including funding conditions, whereas

Pasquariello (2017) considers an alternative explanation for the parity violations based on market liquidity and government interventions in the foreign exchange market.[29]

The ADR parity violation index (ADRP) is aggregated from a sample of foreign stocks cross-listed in the United States (210 home-U.S. pairs of closing stock prices from 41 developed and emerging countries) between January 1, 1973, and December 31, 2009. Table A8 in the online appendix reports a significant and positive relationship between the global CFB indicator, computed from the average of the country indicators in each month, and ADRP. One standard deviation increase in the global CFB indicator increases the index by 14 basis points. Similar to the SEG index, the ADRP series, plotted on Figure A2 in the online appendix, also exhibits large transitory increases. Using probit regressions, we find a positive and significant relationship between the global CFB indicator and the probability to observe reversals identified as ADR parity violations above the preceding historical levels (also in Table A8 in the online appendix).

We conclude that funding frictions captured by the CFB indicators contribute to the dynamics of international stock market integration. The nature of funding barriers can help understand their explanatory power for integration reversals. The previously studied barriers, such as capital controls or taxes on repatriation, are typically slow moving processes that help explain the long-run trends in international market segmentation but fail to explain its short-run dynamics. Unlike these previously studied investment barriers, the effect of funding barriers on asset prices depends on the interaction between the level of cross-border capital requirement and their shadow cost. The latter depends on funding conditions across countries and can vary considerably over short periods of time, as witnessed, for instance, during the global financial crisis. This feature of the funding barriers is captured by CFB^j and it can explain why we can observe global financial integration reversals even at times when other investment barriers are not markedly changing.

The importance of funding barriers is consistent with Forbes and Warnock (2012), who

[29] We thank Paolo Pasquariello for sharing the data. For an exhaustive review of ADRs see Karolyi (2006) and Gagnon and Karolyi (2010).

find that factors related to investors' risk taking capacity are more important in explaining extreme capital flows than, for instance, capital controls. Similarly, the importance of funding barriers is consistent with the literature that relates home bias dynamics to market conditions and finds that investors increase their local holdings following funding shocks.[30].

These results are also supported by the theoretical models in the literature of limits to arbitrage (e.g. Basak and Croitoru (2000), Gârleanu and Pedersen, 2011), which show deviations from Law of One Price during funding distress periods. More specifically related to our arguments, Gromb and Vayanos (2002) show that when financial intermediaries, as the liquidity providers in isolated markets, face funding frictions and fail to close the price gap between similar assets across markets, then the price of assets are governed by the local supply and demand, as opposed to the aggregate (global) supply and demand. We would expect that at these times, in the terminology of international finance, we are likely to observe reversals in market integration.

5 Conclusion

This paper studies the role of funding frictions in an international context. We propose a new way to measure the constraints on investors' ability to access funding for their cross-border positions from the differences between expected BAB returns across countries. We construct cross-border funding barrier indicators for 49 emerging and developed markets and relate their variation to available funding liquidity proxies and institutional features that correlate with the presence of funding constraints. We further show the extent to which funding barriers are significant for the dynamics of financial integration.

The international finance literature has explored the empirical importance of financial development and credit for financial integration. Our work contributes to this area of research by considering an additional financial channel: the role of funding constraints. For instance,

[30]See for instance, Warnock and Warnock (2009), Hoggarth et al. (2010), Jotikasthira et al. (2012), and Giannetti and Laeven (2012, 2016)

the identified funding frictions are helpful in explaining the transitory increases in market segmentation documented in the literature but not related to other common determinants of market integration. Focusing on the funding frictions is important going forward, as most of other impediments affecting international investments have been reduced and even eliminated. Indeed, our results show that such frictions are more significant in explaining integration reversals among developed markets.

In the wake of the global financial crisis, a vast literature has highlighted the important role played by funding frictions for asset prices. The contribution of these frictions to international stock market integration has been less explored and our evidence shows that it is critical to take this dimension into account. From a policy standpoint, the relevance of cross-border funding barriers arise in part through the regulatory treatment of cross-border, and in particular foreign currency denominated, positions. In this regard, our work provides a new element for consideration in the cost-benefit analysis of regulatory capital requirement. Our results also suggest that global institutional trends in the financial intermediary sector are related to international funding barriers. Considering explicitly the role of global intermediaries in shaping financial integration dynamics is thus an interesting avenue of future research.

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Appendix

A Proofs

We consider the general case with non-zero taxes. Investor $i \in \mathcal{I}_j$ first order conditions for stocks $k \in \mathcal{K}_j$ and $k \notin \mathcal{K}_j$ are respectively

$$\mathrm{E}_0\left(R_k - R_0\right) - \alpha \mathrm{Cov}_0\left(R_k, \sum_{h \in \mathcal{K}} R_h x_{i,h}\right) - \psi_i m = 0 \tag{10}$$

$$\mathrm{E}_0\left(R_k - R_0\right) - \tau - \alpha \mathrm{Cov}_0\left(R_k, \sum_{h \in \mathcal{K}} R_h x_{i,h}\right) - \psi_i\left(m + \kappa\right) = 0 \tag{11}$$

where the shadow price of investor's leverage constraint ψ_i. Combining (10) and (11) with market clearing, we find that stock $k \in \mathcal{K}_j$ equilibrium expected stock return is given by

$$\mathrm{E}_0\left(R_k - R_0\right) = \beta_k \mathrm{E}_0\left(R_m - B_m - R_0\right) + m\Psi_j + \tau \frac{\alpha}{n - n_j}, \tag{12}$$

where $\beta_k = \frac{\mathrm{Cov}_0(R_k, R_m)}{\mathrm{Var}_0(R_m)}$, $R_m = \sum\limits_{h \in \mathcal{K}} R_h w_h$, $B_m = \sum\limits_j \sum\limits_{h \in \mathcal{K}_j}\left(m\Psi_j + \tau \frac{\alpha}{n - n_j}\right) w_h$, and w_k is the share of stock k in the global market capitalisation.

Using (12), the expected return on a self-financing market-neutral portfolio that is long in low-beta securities and short in high-beta securities in country j is

$$\mathrm{E}_0\left(R_j^{BAB}\right) = \left(\frac{1}{\beta_L} - \frac{1}{\beta_H}\right)\left(m\Psi_j + \tau \frac{\alpha}{n - n_j}\right),$$

where β_L and β_H are betas of the long and short legs of the portfolio, respectively.

Assuming ζ_i independent across investors and denoting $\mathrm{Var}_\zeta\left(\psi_i\right) = \sigma_i^2$, equation (4) implies

$$Corr_{\zeta}\left(\Psi_f, \Psi_d\right) = \frac{1}{\sqrt{1 + \left(1 + \frac{\kappa}{m} - \frac{1}{1+\frac{\kappa}{m}}\right)^2 \frac{\sum\limits_{i\in\mathcal{I}_d} \sigma_i^2 \sum\limits_{i\in\mathcal{I}_f} \sigma_i^2}{\left(\sum\limits_{i\in\mathcal{I}_d} \sigma_i^2 + \sum\limits_{i\in\mathcal{I}_f} \sigma_i^2\right)^2}}}.$$

From the above, we have $\frac{\partial Corr_{\zeta}\left(\Psi_d, \Psi_f\right)}{\partial \kappa} < 0$ for $\kappa > 0$.

B BAB Portfolio Construction

We follow Frazzini and Pedersen's methodology in constructing BAB portfolios. For each asset, we compute beta by separately estimating volatilities and correlations. Security j beta at each period is computed as the product of this security's correlation with the global market portfolio in the last five years and the ratio of security volatility to market volatility in the last year:

$$\beta_j^{TS} = \widehat{\rho_{jm}} \frac{\widehat{\sigma_j}}{\widehat{\sigma_m}}$$

Since correlations appear to move more slowly than volatilities, we use a shorter window to estimate volatility. We use one-day log returns for volatility and three-day log returns for correlation estimation to control for non-synchronous trading. Moreover, at least 120 trading days of non-missing data is required to estimate volatilities. Similarly at least 750 trading days of non-missing return data is required to estimate correlations. Finally, following Vasicek (1973), betas are shrunk toward the cross-sectional mean (i.e. 1) to reduce the influence of outliers:

$$\beta_j = 0.6\beta_j^{TS} + 0.4.$$

To form the BAB portfolio, at each period, securities are grouped into high- and low-beta portolios based on their beta relative to the median beta. In each portfolio, securities are weighted by the ranked betas (i.e., lower-beta securities have larger weights in the low-beta portfolio and higher-beta securities have larger weights in the high-beta portfolio). The portfolios are rebalanced every calendar month. BAB is then formed by going long the low beta portfolio, de-leveraged to beta one, and shorting the high beta portfolio, leveraged to a beta of one. This results in a zero beta portfolio, ex-ante. More formally if $\boldsymbol{R_t}$ is the vector of monthly asset returns and $\boldsymbol{\beta_t}$ is the vector of betas we have:

1. $R^H_{t+1} = \boldsymbol{R}^\top_{\boldsymbol{t+1}} \boldsymbol{w^H_t}$, and $R^L_{t+1} = \boldsymbol{R}^\top_{\boldsymbol{t+1}} \boldsymbol{w^L_t}$
2. $\beta^H_{t+1} = \boldsymbol{\beta}^\top_{\boldsymbol{t+1}} \boldsymbol{w^H_t}$, and $\beta^L_{t+1} = \boldsymbol{\beta}^\top_{\boldsymbol{t+1}} \boldsymbol{w^L_t}$
3. $R^{BAB}_{t+1} = \frac{1}{\beta^L_t} \left(R^L_{t+1} - R^f\right) - \frac{1}{\beta^H_t} \left(R^H_{t+1} - R^f\right)$.

C MCMC and Gibbs Sampler Estimation

In the model defined by (7)-(9) we are looking to estimate the parameters ϕ_0, ψ_1, and the variances σ^2_ε and σ^2_ϵ of the normal shocks $\varepsilon_{j,t}$ and ϵ_{t+1}, respectively.

First, we choose marginal prior distributions for the model parameters and assume that the joint prior distribution is the product of the independent priors. For ϕ_0, we posit a normal prior with mean $\hat{\Psi}$ and standard deviation 10. $\hat{\Psi}$ is the OLS estimate of Ψ_t, assuming time-invariant process in (7). For ϕ_1, we posit a truncated normal prior with mean 0.5 and standard deviation 10 that lies in the interval $(-1, 1)$. This range of values for ϕ_1 ensures stationarity of Ψ_t. For σ^2_ε and σ^2_ϵ, we posit inverse gamma priors with shape and scale parameters equal to 0.001.

Next, in the model Ψ_t and R^{BAB}_t are conditionally normally distributed

$$\begin{aligned} \Psi_t|\Psi_{t-1} &\sim \mathcal{N}\big(\phi_0 + \phi_1(\Psi_{t-1} - \phi_0), \sigma^2_\epsilon\big) \\ R^{BAB}_t|\Psi_t, Z_t &\sim \mathcal{N}\big(\Psi_t Z_t, \sigma^2_\varepsilon\big), \end{aligned}$$

and the likelihood function is given by:

$$L(\boldsymbol{\Psi}, \phi_0, \phi_1, \sigma_\epsilon, \sigma_\varepsilon | \mathbf{R^{BAB}}, \mathbf{Z}) \propto \prod_{t=1}^{T} \mathcal{N}\left(\phi_0 + \phi_1(\Psi_{t-1} - \phi_0), \sigma^2_\epsilon\right) \times \prod_{t=1}^{T} \mathcal{N}\left(\Psi_t Z_t, \sigma^2_\varepsilon\right),$$

where, $\mathbf{\Psi} = [\Psi_1, \ldots, \Psi_T]$, $\mathbf{R^{BAB}} = [R_1^{BAB}, \ldots, R_T^{BAB}]$, and $\mathbf{Z} = [Z_1, \ldots, Z_T]$.

By Bayes' Law the posterior distribution, $p(\boldsymbol{\theta}|\boldsymbol{y})$, is proportional to the prior distribution times the likelihood function. Formally, $p(\boldsymbol{\theta}|\boldsymbol{y}) \propto p(\phi_0, \phi_1, \sigma_\epsilon, \sigma_\varepsilon) \times L(\boldsymbol{\theta}|\boldsymbol{y})$, where, $\boldsymbol{\theta}$ is defined as a vector of $(\mathbf{\Psi}, \phi_0, \phi_1, \sigma_\epsilon, \sigma_\varepsilon)^\top$ and $\boldsymbol{y}$ is the vector of $(\mathbf{R^{BAB}}, \mathbf{Z})^\top$. Since the prior distribution is not a well-defined joint distribution, we use the Gibbs Sampler which enables us to draw samples from the conditional posterior distributions, $p(\theta_k|rest)$, instead. In each iteration $i = 1, \cdots, I$ of the Gibbs Sampler, and for each model parameter $k = 1, \cdots, K$ we draw samples iteratively from the conditional prior distributions. More specifically, we draw the current sample of θ_k conditional on the current samples of $\theta_1, \cdots, \theta_{k-1}$ and the previous samples of $\theta_{k+1}, \cdots, \theta_K$, where K is the number of unknown parameters:

$$p(\theta_k^{(i+1)}|\theta_1^{(i+1)}, \cdots, \theta_k^{(i+1)}, \theta_{k+1}^{(i)}, \cdots, \theta_K^{(i)}, \boldsymbol{y}).$$

We randomly draw 10,000 samples from the posteriors, discarding the first 1,000 draws.

D Variable Description

Variable	Description
Funding Liquidity Proxies	
TED	The spread between the three-month U.S. dollar LIBOR and the three-month Treasury Bill rate. Source: Federal Reserve Bank of St. Louis.
VIX	The implied volatility from the cross-section of S&P500 index options. Source: Chicago Board of Option Exchange.
CIP	The three-month cross-currency basis for AUD, CAD, CHF, DKK, EUR, GBP, JPY, NOK, NZD, SEK against USD. Source: Du et al. (2018).
BD Lev.	The leverage ratio of U.S. broker-dealer defined as their asset to equity values. Source: Federal Reserve Flow of Funds.
FLib.	The ratio of non-US primary dealers to U.S. primary dealers with the Federal Reserve Bank of New York. Source: Federal Reserve Bank of New York.
ΔFX	The change in the nominal bilateral exchange rate of the US dollar against the local currency. Source: Datastream.
ΔTWUSD	The change in the trade-weighted US dollar exchange rate index. Source: Federal Reserve Bank of St. Louis.
Country Economic Conditions and Foreign Investment Barrier proxies	
Investment Profile	A measure of expropriation, contract viability, profits repatriation, and payment delay risks. Source: Political Risk Services International Country Risk Guide.
Law and Order	A measure of the legal system strength and impartiality, and law observance. Source: Political Risk Services International Country Risk Guide.
Cap. Account Openness	The capital account openness measure constructed from the text of the annual volume of Exchange Arrangements and Exchange Restrictions published by the International Monetary Fund. Source: Quinn and Toyoda, 2008.
Private Credit	Financial resources available to the private sector through loans, purchases of non-equity securities, and trade credit and other accounts receivable scaled by GDP. Source: World Bank World Development Indicators.
Market Cap. to GDP	The ratio of stock market capitalization to GDP. Source: World Bank World Development Indicators and Datastream.
Market Liquidity	The proportion of zero daily returns over the year. Source: Datastream.
Market Return$_{-1}$	Past-year local stock market index return. Source: Datastream.
Global Economic Conditions	
World Market Return	Global stock market index return. Source: Datastream.
World GDP Growth	Source: World Bank World Development Indicators.
World Growth Uncertainty	Log of the cross-sectional standard deviation of real GDP growth across countries. Source: International Monetary Fund World Economic Outlook.

Table 1. BAB portfolios: The table reports the number of firms (Firms), the number of observations (Obs.), average monthly return in percentage (Mean), monthly return volatility (Vol.), and average beta spread $1/\beta_L - 1/\beta_H$ (β Sprd.) of the Betting-Against-Beta (BAB) portfolios constructed for each of the 21 developed markets (DM) and 29 emerging markets (EM). Data run from January 1973 to October 2014. The data source is DataStream.

Country	Firms	Obs.	Mean	Vol.	β Sprd.	Country	Firms	Obs.	Mean	Vol.	β Sprd.
Australia	2,525	438	1.53	4.35	0.79	Argentina	107	191	0.45	5.81	0.37
Austria	161	438	1.10	5.23	0.44	Brazil	258	179	1.16	4.89	0.38
Belgium	243	438	0.91	3.80	0.52	Chile	258	240	0.42	5.23	0.70
Canada	3,815	438	1.25	5.37	0.78	China	2,578	192	1.28	11.05	1.00
Denmark	312	438	1.00	5.39	0.47	Colombia	81	186	-0.29	10.24	0.24
Finland	203	256	0.83	4.63	0.58	Czech	85	188	2.33	15.11	0.92
France	1,599	438	0.97	3.94	0.53	Egypt	128	153	2.12	8.85	0.77
Germany	1,390	438	0.91	3.31	0.59	Greece	374	234	1.07	8.12	0.50
Hong Kong	1,078	438	0.68	4.45	0.55	Hungary	62	205	1.07	6.29	0.43
Ireland	104	438	1.07	6.67	0.72	India	2,672	234	0.07	10.72	0.88
Italy	506	438	0.80	3.29	0.50	Indonesia	538	225	0.59	6.13	0.43
Japan	4,823	438	0.80	3.47	0.53	Israel	487	198	1.39	3.85	0.56
Netherlands	293	438	1.47	4.01	0.52	Malaysia	1,178	282	1.30	3.59	0.55
New Zealand	200	258	1.69	5.36	0.46	Mexico	207	242	1.13	4.93	0.85
Norway	437	354	1.34	4.84	0.51	Morocco	79	168	1.84	11.29	0.57
Singapore	811	438	1.07	3.64	0.54	Pakistan	210	204	2.04	10.22	0.83
Spain	270	268	0.99	3.63	0.58	Peru	168	186	3.67	10.87	1.53
Sweden	703	330	1.21	4.50	0.48	Philippines	241	259	1.18	7.17	0.46
Switzerland	372	438	0.98	3.68	0.60	Poland	541	184	1.13	3.84	0.38
United Kingdom	3,916	438	1.14	3.55	0.56	Portugal	132	234	1.73	8.40	0.77
United States	16,406	438	0.95	2.46	0.69	Romania	142	151	3.76	12.92	0.53
						Russia	500	138	1.63	8.05	0.64
						Slovenia	58	125	0.70	9.88	0.41
						South Africa	681	438	1.34	9.24	0.65
						South Korea	2,116	262	1.44	6.43	0.56
						Taiwan	1,914	254	0.01	6.11	0.56
						Thailand	698	270	1.07	5.47	0.77
						Turkey	386	257	1.10	10.37	0.43
Mean DM	1,912	403	1.08	4.27	0.57	Mean EM	602	217	1.31	8.04	0.63

Table 2. BAB return correlations and differences: The table reports the correlation of each country market portfolio returns with the global market portfolio (ρ_{Mkt}), the correlation of each country BAB portfolio returns with the global BAB portfolio computed from the value-weighted average of all the country BAB portfolios (ρ_{BAB}), and the absolute value difference between each country average BAB return and the global BAB return adjusted for average volatility and beta spreads ($\Delta_{BAB} = \left|\bar{R}_j^{BAB} - \bar{R}_G^{BAB}\bar{Z}_j/\bar{Z}_G\right|$). Data are monthly and run from January 1973 to October 2014.

Country	ρ_{Mkt}	ρ_{BAB}	Δ_{BAB}	Country	ρ_{Mkt}	ρ_{BAB}	Δ_{BAB}
Australia	0.65	0.28	0.07	Argentina	0.51	0.14	0.51
Austria	0.54	0.20	0.14	Brazil	0.67	0.01	0.04
Belgium	0.70	0.39	0.07	Chile	0.46	0.08	0.86
Canada	0.76	0.39	0.15	China	0.41	0.01	1.72
Denmark	0.64	0.32	0.17	Colombia	0.38	0.03	0.93
Finland	0.69	0.44	0.61	Czech Republic	0.55	0.13	0.30
France	0.74	0.53	0.16	Egypt	0.40	0.01	0.20
Germany	0.73	0.53	0.13	Greece	0.52	0.05	0.15
Hong Kong	0.54	0.21	0.63	Hungary	0.65	0.15	0.30
Ireland	0.69	0.23	0.39	India	0.36	0.12	2.81
Italy	0.59	0.38	0.21	Indonesia	0.46	0.09	0.87
Japan	0.71	0.55	0.10	Israel	0.56	0.30	0.36
Netherlands	0.83	0.52	0.65	Malaysia	0.43	0.19	0.14
New Zealand	0.63	0.16	0.91	Mexico	0.59	0.11	0.82
Norway	0.68	0.33	0.26	Morocco	0.27	0.10	0.89
Singapore	0.64	0.19	0.07	Pakistan	0.15	0.04	0.34
Spain	0.77	0.52	0.03	Peru	0.42	-0.08	0.75
Sweden	0.76	0.52	0.24	Philippines	0.46	0.14	0.06
Switzerland	0.74	0.44	0.14	Poland	0.63	0.30	0.05
United Kingdom	0.76	0.62	0.24	Portugal	0.66	0.21	0.48
United States	0.86	0.82	0.06	Romania	0.47	0.22	0.89
				Russia	0.61	0.18	0.64
				Slovenia	0.50	0.16	0.09
				South Africa	0.55	0.17	0.23
				South Korea	0.56	0.15	0.25
				Taiwan	0.43	0.26	1.44
				Thailand	0.52	0.18	1.15
				Turkey	0.38	0.02	1.62
Mean DM	0.70	0.41	0.26	Mean EM	0.48	0.12	0.67

Table 3. BAB return correlations: The table presents the slope coefficients from panel regressions of time-varying correlations over January 1978 to October 2014. In column (1) and (2), the dependent variable ($\rho^j_{\text{Mkt.}}$) is the time-varying monthly correlation of a country market portfolio with the global market portfolio. In column (3) through (6) the dependent variable (ρ^j_{BAB}) is the time-varying monthly correlation of a country BAB portfolio with the global BAB portfolio computed from the value-weighted average of all the country BAB portfolios. Other regressors include the international financial market crisis dummy (1_{Crisis}) and the TED spread (TED). The crisis dummy indicates the October 1987 stock market crash, the withdrawal of the pound sterling from the European Exchange Rate Mechanism in September 1992, the East Asian crisis in July 1997, the Long-Term Capital Management collapse in September 1998, and the subprime crisis in September 2008. Time-varying correlations are estimated using a two-year rolling window. P-values are calculated with double clustered standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\text{Reg. 1-2:} \quad \rho^j_{Mkt,t} = \alpha^j + \delta\, \text{Y}_t + \gamma\, \rho^j_{BAB,t} + \varepsilon^j_t$$
$$\text{Reg. 3-6:} \quad \rho^j_{BAB,t} = \alpha^j + \delta\, \text{Y}_t + \gamma\, \rho^j_{Mkt,t} + \varepsilon^j_t$$

	$\rho^j_{\text{Mkt.}}$		ρ^j_{BAB}			
	(1)	(2)	(3)	(4)	(5)	(6)
1_{Crisis}	0.063***		−0.023*	−0.039***		
	(0.009)		(0.014)	(0.013)		
TED					−0.099***	−0.093***
					(0.018)	(0.018)
ρ^j_{BAB}		0.205***				
		(0.036)				
$\rho^j_{\text{Mkt.}}$				0.257***		0.217***
				(0.046)		(0.044)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	14,103	14,103	14,103	14,103	12,890	12,890
Adjusted R^2	0.228	0.255	0.287	0.325	0.310	0.338

Table 4. Funding barriers and global funding conditions: The table reports slope coefficients from panel regressions of the CFB indicators on global funding liquidity proxies such as the TED spread (TED), the VIX implied volatility index (VIX), the average of the three-month cross-currency basis for available currencies (CIP), and the U.S. broker-dealer leverage (BD Lev.). Panel A regressions include country fixed effects. Panel B regressions include foreign investment barrier proxies (investment profile, capital account openness, market capitalization to GDP), other local market characteristics (market liquidity, private credit, law and order), and global economic conditions (world market return, GDP growth, and GDP growth uncertainty). P-values are estimated using double clustered standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\text{Panel A: CFB}_t^j = \alpha^j + \delta \text{FL}_t + \varepsilon_t^j$$

$$\text{Panel B: CFB}_t^j = \alpha + \delta \text{FL}_t + \gamma \text{X}_t^j + \varphi \text{Y}_t + \varepsilon_t^j$$

Panel A	(1)	(2)	(3)	(4)
TED	7.771***			
	(1.531)			
VIX		0.604***		
		(0.092)		
CIP			0.484***	
			(0.079)	
BD Lev.$\times -1$				7.717***
				(2.886)
Country FE	Yes	Yes	Yes	Yes
Observations	12,921	12,025	8,412	14,494
Adjusted R^2	0.191	0.196	0.093	0.194

Panel B	(1)	(2)	(3)	(4)
TED	6.643***			
	(1.905)			
VIX		0.455***		
		(0.170)		
CIP			0.772**	
			(0.315)	
BD Lev.$\times -1$				5.303**
				(2.251)
Investment Profile^j	1.329*	1.151	1.291**	1.258
	(0.780)	(0.856)	(0.586)	(0.830)
Cap. Account Openness^j	−0.218	−0.228	−0.174**	−0.226
	(0.161)	(0.164)	(0.071)	(0.169)
Market Cap. to GDP^j	0.004	0.005	−0.003	0.004
	(0.012)	(0.012)	(0.005)	(0.013)
Market Liquidity^j	0.241	0.259	0.203**	0.219
	(0.200)	(0.226)	(0.091)	(0.190)
Private Credit^j	−0.026	−0.032	−0.068***	−0.023
	(0.061)	(0.063)	(0.019)	(0.063)
Law and Order^j	−2.661	−1.880	0.868	−2.761
	(2.828)	(2.837)	(0.933)	(2.977)
World Market Return	−0.386**	−0.260	−0.255	−0.497***
	(0.181)	(0.202)	(0.196)	(0.183)
World GDP Growth	−0.974	−0.122	−1.571**	−0.655
	(0.754)	(0.890)	(0.669)	(0.910)
World Growth Uncertainty	4.047	4.285	−39.045**	6.867
	(9.619)	(10.596)	(17.464)	(11.113)
Observations	12,667	11,771	8,237	13,038
Adjusted R^2	0.041	0.042	0.128	0.039

Table 5. Funding barriers and local funding conditions: The table reports in column (1) through (5) slope coefficients from panel regressions of the CFB indicators on the three-month cross-currency basis of ten countries with available data (CIP^j). Regressions in the first through the fourth column are over the full time sample of CIP deviations starting from January 2000, while the fifth column focuses only the period after January 2007. Column (6) reports slope coefficients from a panel regression of the CFB indicators on the change in the value of the USD against the currency of the ten countries (ΔFX^j) and the change in the trade-weighted USD exchange rate index (ΔTWUSD). Controls include foreign investment barrier proxies (country investment profile, capital account openness, local market capitalization to GDP), other local market characteristics (market liquidity, private credit, law and order), and global economic conditions (world market return, GDP growth, GDP growth uncertainty, and the TED spread). P-values are estimated using double clustered, standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\text{Reg. 1-5: } \mathrm{CFB}_t^j = \alpha^{(j)} + \delta \mathrm{CIP}_t^j + \gamma \mathrm{X}_t^j + \varphi \mathrm{Y}_t + \varepsilon_t^j$$
$$\text{Reg. 6: } \mathrm{CFB}_t^j = \alpha + \delta\ \Delta\mathrm{FX}_t^j + \gamma \mathrm{X}_t^j + \varphi \mathrm{Y}_t + \varepsilon_t^j$$

	(1)	(2)	(3)	(4)	(5)	(6)
CIP^j	0.401***	0.280***	0.311***	0.214***	0.275***	
	(0.089)	(0.086)	(0.098)	(0.069)	(0.069)	
ΔFX^j						−0.508
						(0.522)
ΔTWUSD						2.118**
						(1.018)
Investment Profile^j		0.719	0.895*	0.395	0.439	0.487
		(0.487)	(0.535)	(0.385)	(0.304)	(0.404)
Capital Account Openness^j		0.099	0.079	0.118	−0.094	0.157
		(0.128)	(0.121)	(0.129)	(0.138)	(0.102)
Market Cap. to GDP^j		0.001	0.003	−0.003	−0.018	−0.023
		(0.026)	(0.025)	(0.024)	(0.019)	(0.028)
Market Liquidity^j		22.792**	21.120**	24.703***	13.871***	18.149***
		(9.334)	(8.704)	(8.467)	(4.916)	(6.972)
Private Credit^j		−0.077**	−0.070**	−0.070**	−0.006	−0.050*
		(0.037)	(0.035)	(0.035)	(0.030)	(0.029)
Law and Order^j		−0.153	−0.311	−0.574	−1.200	0.132
		(1.280)	(1.210)	(1.272)	(1.201)	(1.008)
World Market Return			−0.423**	−0.093	0.021	−0.539*
			(0.213)	(0.188)	(0.222)	(0.282)
World GDP growth			−2.046***	−1.539***	−0.391	−1.707**
			(0.729)	(0.584)	(0.503)	(0.723)
World Growth Uncertainty			−20.266**	−12.754*	−3.384	3.143
			(9.583)	(7.229)	(6.484)	(5.525)
TED				14.869***	17.934***	
				(3.508)	(3.862)	
Trend	Yes					
Country FE	Yes					
Observations	3,450	3,450	3,450	3,450	1,818	3,450
Adjusted R^2	0.235	0.143	0.181	0.282	0.535	0.105

Table 6. Funding barriers and funding liberalization: The table reports in column (1) and (2) the slope coefficients from panel regressions of the CFB indicators on the funding liberalization ratio (FLib.). Column (3) and (4) report the slope coefficients from panel regressions of the CFB indicators on the funding liberalization ratio (FLib.^{j}) for the eight countries that have a primary dealer in our sample. Other regressors include foreign investment barrier proxies (investment profile, capital account openness, market capitalization to GDP), other local market characteristics (market liquidity, private credit, law and order), and global economic conditions (world market return, GDP growth, and GDP growth uncertainty) and the TED Spread. P-values are estimated using double clustered standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\mathrm{CFB}_t^j = \alpha^{(j)} + \delta \mathrm{FLib.}_t^{(j)} + \gamma \mathrm{X}_t^j + \varphi \mathrm{Y}_t + \varepsilon_t^j$$

	(1)	(2)	(3)	(4)
FLib.	-0.181^{***}	-0.423^{**}		
	(0.055)	(0.175)		
FLib.^{j}			-0.007^{***}	-0.008^{***}
			(0.002)	(0.003)
Investment Profile^j		1.576^{*}	0.738	0.525
		(0.855)	(0.580)	(0.689)
Cap. Account Openness^j		-0.198	-0.220	-0.157
		(0.164)	(0.274)	(0.346)
Market Cap. to GDP^j		0.005	0.109^{*}	0.107^{*}
		(0.013)	(0.057)	(0.061)
Market Liquidity^j		0.274	0.232	0.235
		(0.202)	(0.170)	(0.202)
Private Credit^j		-0.012	-0.122^{*}	-0.112
		(0.065)	(0.072)	(0.083)
Law and Order^j		-3.788	3.588	3.536
		(3.044)	(5.877)	(6.340)
World Market Return		-0.451^{***}	-0.455^{***}	-0.361^{**}
		(0.174)	(0.119)	(0.152)
World GDP Growth		-2.412^{***}	-1.769^{**}	-2.213^{***}
		(0.605)	(0.759)	(0.615)
World Growth Uncertainty		-8.598	2.387	-1.492
		(6.689)	(4.515)	(3.530)
TED				7.386^{***}
				(1.953)
Country FE	Yes			
Observations	14,543	13,086	2,905	2,737
Adjusted R^2	0.197	0.048	0.086	0.090

Table 7. **Funding barriers and market segmentation:** This table reports the slope coefficients from panel regressions of the Bekaert et al. (2011) segmentation index (SEG) on the cross-border funding barrier indicator (CFB). Regressions are over the full time sample (January 1978 to October 2014) except in the fourth and sixth column that exclude the year 2007 to 2009. Other regressors include foreign investment barrier proxies (investment profile, capital account openness, market capitalization to GDP), lagged local market index return (Market Return$^{j}_{-1}$), and the TED spread (TED). P-values are estimated using double clustered, standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\mathrm{SEG}_t^j = \alpha + \delta \mathrm{CFB}_t^j + \gamma \mathrm{X}_t^j + \varphi \mathrm{TED}_t + \varepsilon_t^j$$

	All	DM	EM	Ex. 07-09	All	Ex. 07-09
CFB^j	0.562**	0.918**	0.343*	0.924*	0.760**	1.531***
	(0.266)	(0.459)	(0.178)	(0.479)	(0.376)	(0.454)
Investment Profile^j	−0.247***	−0.134***	−0.513**	−0.256**	−0.241**	−0.265**
	(0.095)	(0.043)	(0.258)	(0.100)	(0.120)	(0.122)
Capital Account Openness^j	−0.008	−0.049***	0.021	−0.009	−0.003	−0.003
	(0.008)	(0.016)	(0.017)	(0.008)	(0.009)	(0.009)
Market Cap. to GDP^j	−0.012***	−0.008**	−0.008**	−0.013***	−0.011***	−0.012***
	(0.002)	(0.003)	(0.004)	(0.003)	(0.002)	(0.003)
Market Return$^{j}_{-1}$	−1.107***	−1.037***	−1.235***	−0.913***	−1.133***	−0.921***
	(0.238)	(0.285)	(0.345)	(0.261)	(0.257)	(0.299)
TED					0.085	−0.358
					(0.169)	(0.427)
Observations	13,756	7,931	5,825	12,066	11,476	9,786
Adjusted R^2	0.113	0.245	0.119	0.112	0.108	0.109

Table 8. Funding barriers and market integration reversals: This table reports the coefficients of the probit panel regressions of the integration reversals in the Bekaert et al. (2011) segmentation index (SEG) on the cross-border funding barrier indicator (CFB). Reversals are defined following Forbes and Warnock (2012) as periods of large increases in SEG. Regressions are over the full time sample (January 1978 to October 2014) except in the fourth and sixth column that exclude the year 2007 to 2009. Other regressors include foreign investment barrier proxies (investment profile, capital account openness, market capitalization to GDP), lagged local market index return (Market Return^j_{-1}), and the TED spread (TED). P-values are estimated using double clustered, standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$1_{\text{Reversal}^j_t} = \alpha + \delta \text{CFB}^j_t + \gamma \text{X}^j_t + \varphi \text{TED}_t + \varepsilon^j_t$$

	All	DM	EM	Ex. 07-09	All	Ex. 07-09
CFB^j	0.115**	0.148***	0.141***	0.105**	0.134***	0.148***
	(0.049)	(0.049)	(0.049)	(0.049)	(0.045)	(0.049)
Investment Profile^j	0.017*	0.036***	−0.032***	−0.018*	0.041***	0.003
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.011)
Capital Account Openness^j	0.400	−12.842***	3.265***	0.200	0.366	0.755
	(1.078)	(1.078)	(1.078)	(1.078)	(0.998)	(1.123)
Market Cap. to GDP^j	−0.013	1.096**	0.023	−0.244	−0.400	−0.401
	(0.466)	(0.466)	(0.466)	(0.466)	(0.410)	(0.477)
Market Return^j_{-1}	−2.297***	−3.075***	−1.770***	−2.217***	−2.285***	−2.383***
	(0.098)	(0.098)	(0.098)	(0.098)	(0.092)	(0.111)
TED					0.475***	0.169
					(0.061)	(0.107)
Observations	13,756	7,931	5,825	12,066	11,476	9,786
McFadden's Pseudo R^2	0.095	0.097	0.109	0.081	0.112	0.092

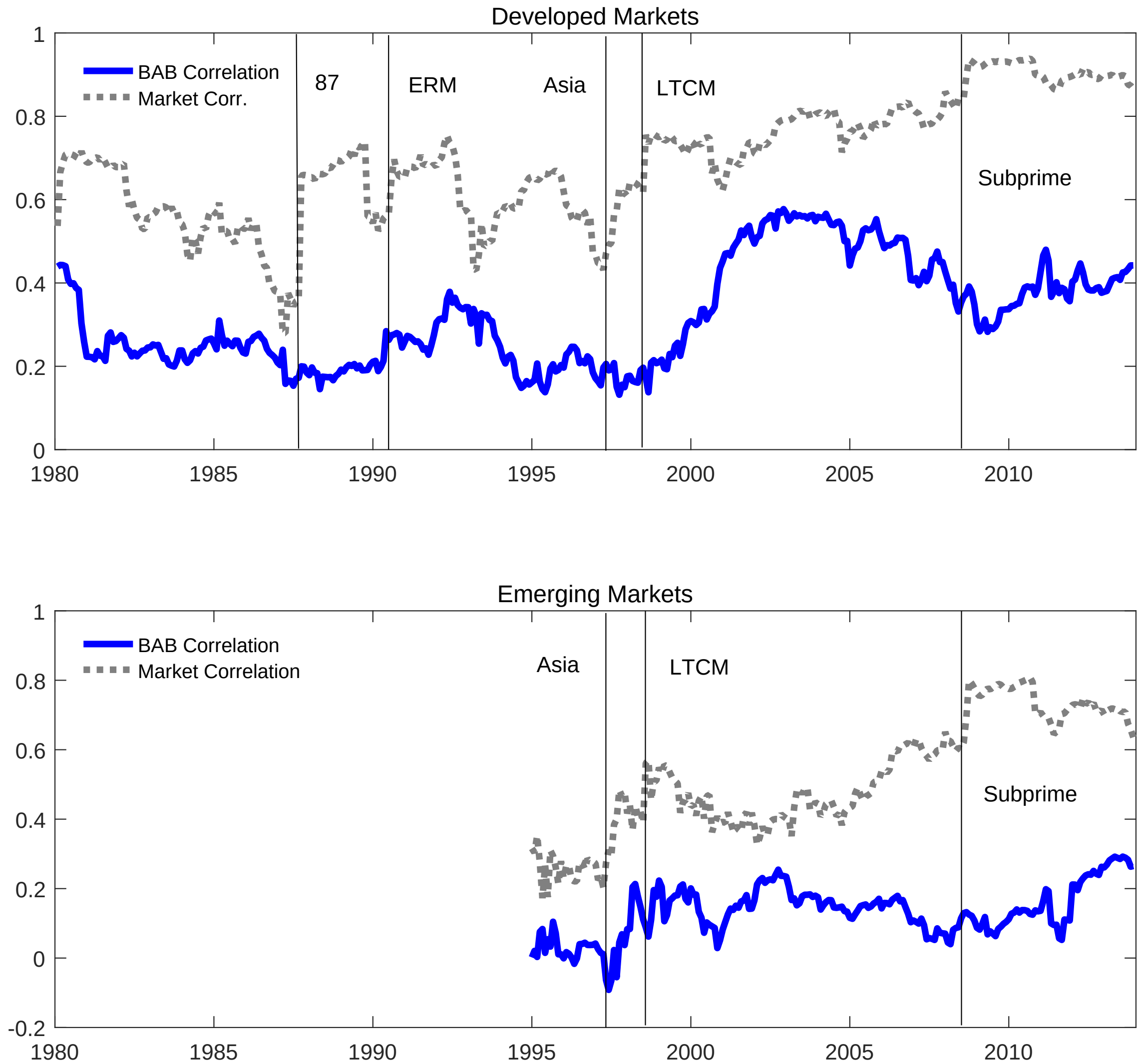
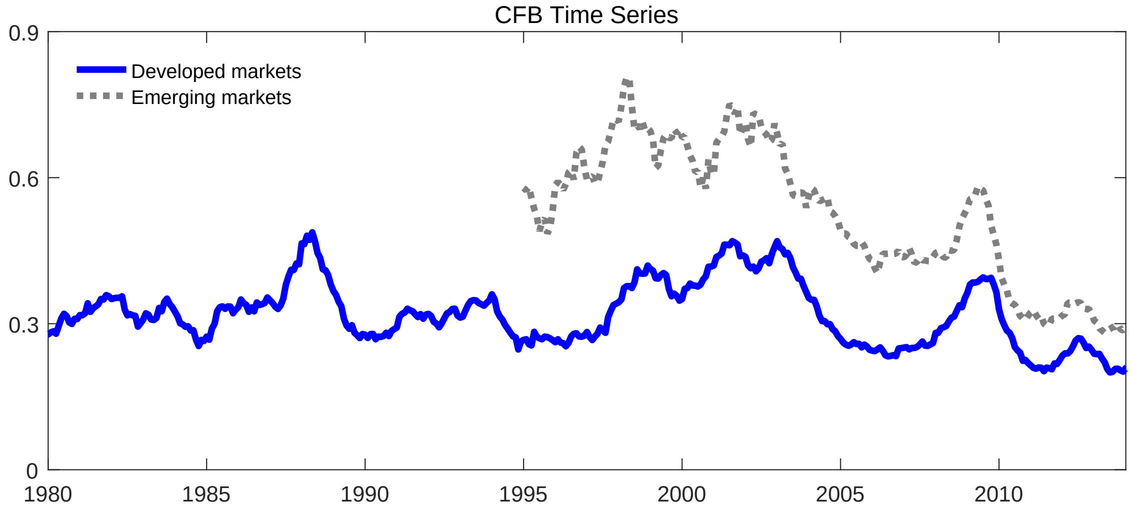


Figure 1. BAB and market return correlations: The top panel shows the monthly equal-weighted averages of the correlations between country BAB returns and the global BAB returns, computed from the value-weighted average of all the country BAB portfolios (solid line), and the monthly equal-weighted averages of the correlations between country market portfolio returns and the global market portfolio returns (dotted line) for developed markets. The lower panel shows the same monthly equal-weighted averages of the correlations for emerging markets. Correlations are computed using a two-year rolling window. Vertical lines indicate the October 1987 stock market crash (87), the withdrawal of the pound sterling from the European Exchange Rate Mechanism in September 1992 (ERM), the East Asian crisis in July 1997 (Asia), the Long-Term Capital Management collapse in September 1998 (LTCM), and the subprime crisis in September 2008 (Subprime).



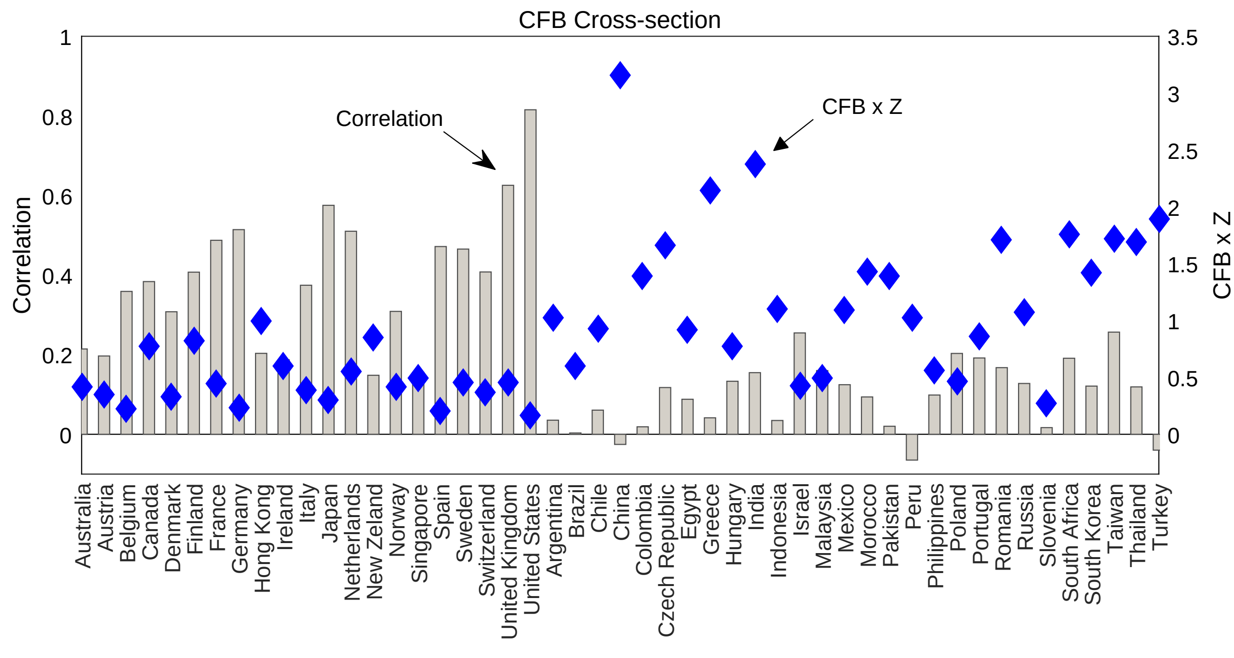


Figure 2. The cross-border funding barrier indicators: The top panel plots the monthly equal-weighted averages of the cross-border funding barrier (CFB) indicators for developed markets (solid line) and emerging markets (dotted line). The y-axis units are those of BAB returns divided by the beta spread and market volatility. The lower panel plots the unconditional correlations of the estimated latent factor driving expected BAB returns for each country (Ψ_j) with the global latent factor, computed from the value-weighted average of all the country latent factors (bar plot, left y-axis), and the average of the monthly CFB indicator for each country multiplied by the corresponding beta spread and market volatility at each month (diamond, right y-axis).

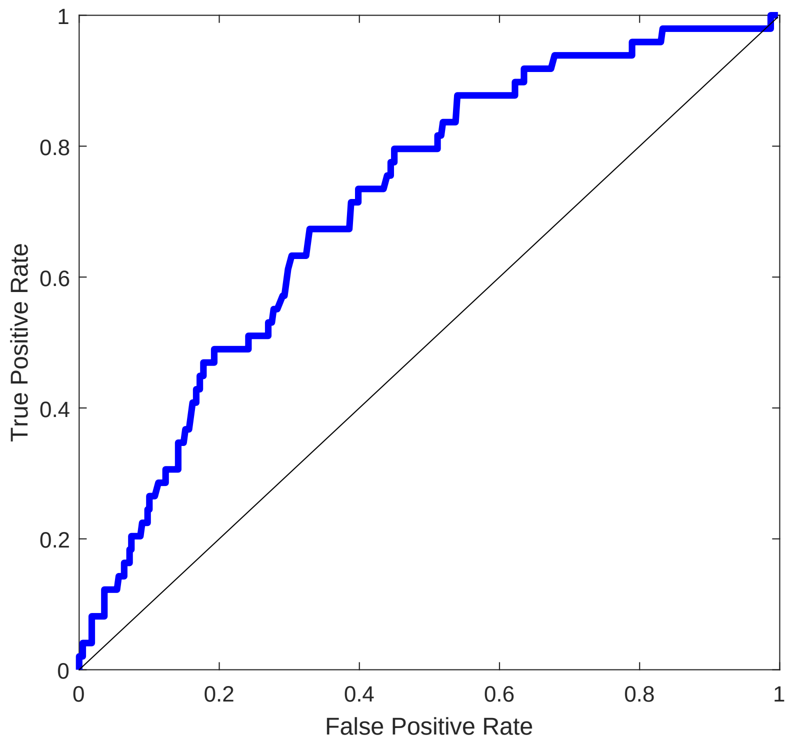


Figure 3. Receiver operating characteristic curve: The figure plots the receiver operating characteristic curve for reversals in market integration as implied by the SEG Index of Bekaert et al. (2011) detected using the cross-border funding barrier (CFB) measure (solid line). Reversals are defined following Forbes and Warnock (2012) as periods of large increases in SEG above its historical average. The area under the ROC curve is 0.71.

E Online Appendix

Table A1. Market portfolios returns: The table reports the starting year of data (Start Year), average monthly return (Mean), monthly standard deviation (Vol.), lowest monthly return (Min) and highest monthly return (Max) for the local market portfolios in our sample of 21 developed markets (DM) and 29 emerging markets (EM). Data end in October 2014 and are collected from Datastream.

Country	Start Year	Mean	Vol.	Min	Max	Country	Start Year	Mean	Vol.	Min	Max
Australia	1973	0.86	7.36	-56.66	22.41	Argentina	1993	0.36	9.51	-36.23	24.29
Austria	1973	0.76	6.65	-41.93	31.69	Brazil	1994	0.86	10.50	-40.82	33.45
Belgium	1973	0.87	5.87	-39.05	21.85	Chile	1989	1.18	6.59	-27.49	16.55
Canada	1973	0.81	5.52	-30.79	18.51	China	1993	0.94	10.39	-30.88	39.45
Denmark	1973	1.01	5.88	-30.64	20.69	Colombia	1992	0.94	7.87	-31.29	19.27
Finland	1988	0.75	8.39	-33.82	26.10	Czech Republic	1993	0.87	8.62	-31.28	52.30
France	1973	0.93	6.70	-25.76	24.82	Egypt	1996	0.80	8.84	-32.65	33.74
Germany	1973	0.81	6.01	-23.13	17.67	Greece	1990	0.37	10.11	-40.95	46.08
Hong Kong	1973	0.93	9.70	-60.50	56.21	Hungary	1991	0.58	10.12	-49.67	46.86
Ireland	1973	0.88	7.10	-28.84	35.84	India	1990	0.87	10.19	-38.36	43.15
Italy	1973	0.66	7.54	-26.28	24.19	Indonesia	1990	0.19	11.52	-53.12	43.78
Japan	1973	0.61	6.01	-19.30	23.98	Israel	1993	0.65	6.80	-21.50	15.66
Netherlands	1973	0.94	5.65	-36.98	21.64	Malaysia	1986	0.90	8.32	-40.22	37.95
New Zealand	1988	0.79	6.23	-20.56	26.20	Mexico	1989	1.21	8.60	-41.20	21.59
Norway	1980	0.92	8.08	-36.56	22.14	Morocco	1994	1.01	5.02	-14.45	21.17
Singapore	1973	0.71	8.16	-46.24	48.95	Pakistan	1992	0.67	9.78	-48.36	28.40
Spain	1987	0.81	6.77	-27.56	19.56	Peru	1994	0.88	6.69	-34.82	27.31
Sweden	1982	1.11	7.23	-30.27	20.23	Philippines	1987	0.90	8.51	-31.71	39.62
Switzerland	1973	0.94	5.09	-20.14	15.14	Poland	1994	0.38	10.53	-40.58	31.87
United Kingdom	1973	0.91	6.21	-23.87	43.79	Portugal	1990	0.41	6.25	-32.85	16.30
United States	1973	0.84	4.52	-23.26	16.17	Romania	1997	0.68	13.88	-57.79	61.50
						Russian Federation	1998	0.96	13.54	-83.49	39.45
						Slovenia	1999	0.47	6.43	-26.55	18.04
						South Africa	1973	0.95	8.29	-43.61	18.05
						South Korea	1987	0.60	10.28	-38.67	53.41
						Taiwan	1988	0.42	10.11	-40.36	45.08
						Thailand	1987	0.98	10.37	-39.34	34.28
						Turkey	1988	0.78	15.26	-52.47	53.38
Mean DM		0.85	6.70	-32.48	26.56	Mean EM		0.74	9.39	-39.31	34.36

Table A2. **Summary Statistics (BAB local Rm):** The table reports the average monthly return in percentage (Mean), return volatility (Vol.), and average beta spread $1/\beta_L - 1/\beta_H$ (β Sprd.) of the Betting-Against-Beta (BAB) portfolios constructed with respect to the local market portfolio for each of the 21 developed markets (DM) and 29 emerging markets (EM). In addition, the table reports the correlation of each country BAB portfolio returns with the global BAB portfolio computed from the value-weighted average of all the country BAB portfolios (ρ_{BAB}). Data are monthly and run from January 1973 to October 2014. The data source is Datastream.

Country	Mean	Vol.	β Sprd.	ρ_{BAB}	Country	Mean	Vol.	β Sprd.	ρ_{BAB}
Australia	1.55	3.69	0.56	0.18	Argentina	-0.11	5.57	0.30	0.23
Austria	0.63	4.10	0.40	0.13	Brazil	1.28	5.74	0.41	0.05
Belgium	0.82	3.36	0.43	0.24	Chile	0.34	3.78	0.63	0.10
Canada	1.09	3.91	0.66	0.36	China	0.88	4.78	0.45	-0.08
Denmark	0.94	4.92	0.47	0.25	Colombia	0.66	5.68	0.21	-0.00
Finland	1.14	5.92	0.53	0.50	Czech Republic	1.10	10.33	0.54	0.30
France	1.00	4.07	0.57	0.50	Egypt	1.75	5.83	0.59	-0.06
Germany	1.09	3.54	0.55	0.49	Greece	1.51	5.98	0.41	0.05
Hong Kong	0.78	3.71	0.52	0.22	Hungary	1.42	6.01	0.40	0.07
Ireland	1.51	6.51	0.67	0.20	India	1.18	4.22	0.48	0.30
Italy	0.70	3.21	0.47	0.31	Indonesia	0.61	5.21	0.34	-0.00
Japan	0.83	3.48	0.45	0.48	Israel	0.71	3.42	0.47	0.17
Netherlands	1.68	4.25	0.52	0.46	Malaysia	1.07	2.86	0.40	0.10
New Zealand	1.50	4.03	0.31	-0.01	Mexico	1.05	4.86	0.68	0.12
Norway	1.48	5.41	0.46	0.29	Morocco	0.41	5.06	0.30	0.05
Singapore	1.02	3.13	0.50	0.10	Pakistan	1.66	4.01	0.50	0.02
Spain	0.87	3.76	0.53	0.47	Peru	3.08	8.48	1.42	-0.17
Sweden	1.67	5.50	0.48	0.54	Philippines	0.69	4.52	0.31	0.05
Switzerland	0.85	3.43	0.45	0.35	Poland	1.35	4.25	0.39	0.25
United Kingdom	1.18	3.31	0.53	0.59	Portugal	1.19	6.09	0.51	0.19
United States	0.87	2.86	0.71	0.82	Romania	1.12	8.32	0.40	0.15
					Russia	2.20	9.04	0.66	0.17
					Slovenia	1.80	8.42	0.33	0.20
					South Africa	1.23	6.32	0.45	0.15
					South Korea	1.98	5.33	0.40	0.21
					Taiwan	0.50	3.91	0.44	0.32
					Thailand	1.69	4.35	0.67	0.14
					Turkey	0.64	4.58	0.29	0.06
Mean DM	1.11	4.10	0.51	0.36	Mean EM	1.18	5.61	0.48	0.11

Table A3. **CFB summary statistics:** The table presents summary statistics (mean, standard deviation, maximum and minimum) for the cross-border funding barrier (CFB) indicators constructed from BAB portfolios for each market for the period January 1978 to October 2014.

Country	Mean	St.Dev.	Max	Min	Country	Mean	St.Dev.	Max	Min
Australia	0.23	0.09	0.49	0.07	Argentina	0.32	0.13	0.67	0.09
Austria	0.27	0.12	0.72	0.09	Brazil	0.42	0.22	0.98	0.12
Belgium	0.25	0.07	0.47	0.12	Chile	0.47	0.17	0.81	0.14
Canada	0.61	0.21	1.46	0.24	China	0.56	0.21	1.26	0.22
Denmark	0.25	0.09	0.61	0.09	Colombia	0.59	0.16	1.11	0.28
Finland	0.24	0.08	0.45	0.11	Czech Republic	0.75	0.38	1.76	0.24
France	0.40	0.13	0.80	0.15	Egypt	0.24	0.11	0.48	0.08
Germany	0.22	0.07	0.44	0.10	Greece	1.00	0.75	4.00	0.25
Hong Kong	0.46	0.15	1.11	0.19	Hungary	0.26	0.12	0.62	0.08
Ireland	0.21	0.10	0.58	0.08	India	0.60	0.25	1.43	0.25
Italy	0.40	0.13	0.78	0.12	Indonesia	0.26	0.11	0.59	0.12
Japan	0.28	0.11	0.50	0.06	Israel	0.25	0.10	0.61	0.12
Netherlands	0.25	0.07	0.47	0.10	Malaysia	0.22	0.10	0.55	0.08
New Zealand	0.53	0.17	1.02	0.25	Mexico	0.38	0.13	0.70	0.13
Norway	0.36	0.10	0.68	0.15	Morocco	0.75	0.35	1.71	0.27
Singapore	0.25	0.10	0.51	0.09	Pakistan	0.49	0.22	1.18	0.16
Spain	0.22	0.07	0.41	0.11	Peru	0.24	0.12	0.55	0.07
Sweden	0.42	0.18	1.00	0.17	Philippines	0.45	0.21	1.00	0.13
Switzerland	0.38	0.10	0.71	0.14	Poland	0.24	0.12	0.58	0.09
United Kingdom	0.33	0.14	0.80	0.09	Portugal	0.85	0.33	2.12	0.34
United States	0.14	0.05	0.31	0.05	Romania	0.54	0.30	1.17	0.13
					Russian Federation	0.51	0.15	0.90	0.19
					Slovenia	0.19	0.05	0.34	0.10
					South Africa	1.01	0.50	3.45	0.32
					South Korea	0.53	0.24	1.37	0.22
					Taiwan	0.68	0.30	1.34	0.17
					Thailand	0.40	0.13	0.86	0.17
					Turkey	0.55	0.20	1.17	0.21
Mean DM	0.32	0.11	0.68	0.12	Mean EM	0.49	0.22	1.19	0.17

Table A4. Funding barriers and global funding conditions in subsamples: The table reports slope coefficients from regressions of the CFB indicators on the TED spread (TED) for U.S. only (US), for all the countries in our sample excluding the U.S. (Ex. US), for developed markets (DM), for emerging markets (EM), and for all countries excluding the 2007-2009 financial crisis period (Ex. 07-09). Other regressors include foreign investment barrier proxies (investment profile, capital account openness, local market capitalization to GDP), other local market characteristics (market liquidity, private credit, law and order), and global economic conditions (world market return, GDP growth, and GDP growth uncertainty). P-values are estimated using double clustered standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\mathrm{CFB}_t^j = \alpha \; + \delta \mathrm{TED}_t + \gamma \mathrm{X}_t^j + \varphi \mathrm{Y}_t + \varepsilon_t^j$$

	US	Ex. US	DM	EM	Ex. 07-09
TED	9.391***	6.709***	7.917***	8.116*	17.579***
	(2.204)	(1.975)	(1.499)	(4.167)	(4.617)
Investment Profile^j		1.375*	0.277	2.181	1.966**
		(0.794)	(0.421)	(1.531)	(0.885)
Capital Account Openness^j		−0.204	0.120	−0.141	−0.215
		(0.160)	(0.162)	(0.196)	(0.167)
Market Cap. to GDP^j		0.002	0.010	−0.010	0.006
		(0.012)	(0.007)	(0.104)	(0.013)
Market Liquidity^j		0.241	0.190	0.240	0.252
		(0.200)	(0.118)	(0.323)	(0.211)
Private Credit^j		−0.006	−0.038	0.071	−0.040
		(0.062)	(0.039)	(0.125)	(0.060)
Law and Order^j		−2.863	0.454	−0.318	−3.617
		(2.825)	(2.746)	(3.781)	(2.932)
World Market Return		−0.392**	−0.180	−0.566*	−0.368
		(0.187)	(0.141)	(0.312)	(0.229)
World GDP Growth		−0.894	−1.749***	0.718	−4.323***
		(0.776)	(0.471)	(1.269)	(1.322)
World Growth Uncertainty		4.757	−2.481	19.342	−1.665
		(9.757)	(3.809)	(16.416)	(8.221)
Observations	343	12,324	6,937	5,730	10,941
Adjusted R^2	0.116	0.038	0.025	0.025	0.056

Table A5. Funding barriers and global funding condition quantiles: The table reports the slope coefficients from panel regressions the CFB indicators on a dummy variable that takes the value of one when the funding liquidity proxy is in its 90th percentile (Panel A) or below its 50th percentile (Panel B). Funding liquidity proxies include the TED spread (TED), the VIX implied volatility index (VIX), the average of the three-month cross-currency basis for available currencies (CIP), the U.S. broker-dealer leverage (BD Lev.). $\sum 1$ indicates the sum of dummy variables for all the proxies. Regressions include country fixed effects and a time trend. P-values are estimated using double clustered, standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\text{Panel A: CFB}_t^j = \alpha^j + \theta t + \delta 1_{\text{FL}_t > 0.90^{th}} + \varepsilon_t^j$$

$$\text{Panel B: CFB}_t^j = \alpha^j + \theta t + \delta 1_{\text{FL}_t \in 0.50^{th}} + \varepsilon_t^j$$

Panel A	(1)	(2)	(3)	(4)	(5)
$1_{\text{TED}>90^{th}}$	5.221***				
	(1.388)				
$1_{\text{VIX}>90^{th}}$		9.558***			
		(1.655)			
$1_{\text{CIP}>90^{th}}$			10.030***		
			(1.514)		
$1_{\text{BD Lev.}\in 10^{th}}$				5.673***	
				(1.346)	
$\sum 1_{\text{FL}>90^{th}}$					4.105***
					(0.655)
Trend	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	12,921	12,025	8,412	14,494	14,543
Adjusted R^2	0.205	0.210	0.214	0.205	0.208

Panel B	(1)	(2)	(3)	(4)	(5)
$1_{\text{TED}\in 50^{th}}$	−3.071**				
	(1.484)				
$1_{\text{VIX}\in 50^{th}}$		−11.208***			
		(1.849)			
$1_{\text{CIP}\in 50^{th}}$			−7.927***		
			(2.019)		
$1_{\text{BD Lev.}^{BD}>50^{th}}$				−2.048***	
				(0.757)	
$\sum 1_{\text{FL}\in 50^{th}}$					−3.378***
					(0.625)
Trend	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Observations	12,921	12,025	8,412	14,494	14,543
Adjusted R^2	0.187	0.200	0.166	0.194	0.202

Table A6. Funding barriers and market segmentation: This table reports the slope coefficients from panel regressions of the Bekaert et al. (2011) segmentation index (SEG) on the cross-border funding barrier indicator (CFB). Regressions are over the full time sample (January 1978 to October 2014) except in the fourth and sixth column that exclude the year 2007 to 2009. Other regressors include foreign investment barrier proxies (investment profile, capital account openness, market capitalization to GDP), other local market characteristics (market liquidity, private credit, law and order), global economic conditions (world market return, GDP growth, and GDP growth uncertainty), and the TED spread (TED). P-values are estimated using double clustered, standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\mathrm{SEG}_t^j = \alpha + \delta \mathrm{CFB}_t^j + \gamma \mathrm{X}_t^j + \varphi \mathrm{TED}_t + \varepsilon_t^j$$

	All	DM	EM	Ex. 07-09	All	Ex. 07-09
CFB^j	0.775**	1.403***	0.474*	1.334***	0.641**	1.225***
	(0.325)	(0.440)	(0.261)	(0.316)	(0.306)	(0.273)
Investment $\mathrm{Profile}^j$	−0.294**	−0.069**	−0.598**	−0.316**	−0.294**	−0.302**
	(0.132)	(0.032)	(0.263)	(0.146)	(0.133)	(0.134)
Capital Account $\mathrm{Openness}^j$	0.013	−0.002	0.024	0.015	0.013	0.015
	(0.015)	(0.014)	(0.019)	(0.017)	(0.015)	(0.017)
Market Cap. to GDP^j	−0.009***	−0.006***	−0.008*	−0.010***	−0.009***	−0.011***
	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.002)
Market $\mathrm{Liquidity}_{-1}^j$	0.021*	0.006	0.033*	0.025**	0.021*	0.024**
	(0.011)	(0.008)	(0.017)	(0.013)	(0.011)	(0.012)
Private Credit^j	−0.001	−0.002	0.004	−0.001	−0.001	−0.0004
	(0.002)	(0.003)	(0.005)	(0.002)	(0.002)	(0.002)
Law and Order^j	−0.379	−0.032	0.020	−0.449	−0.387	−0.478
	(0.258)	(0.125)	(0.275)	(0.280)	(0.261)	(0.303)
World Market Return	−0.030***	−0.031***	−0.034**	−0.031**	−0.024***	−0.032**
	(0.010)	(0.011)	(0.017)	(0.012)	(0.009)	(0.013)
World GDP Growth	−0.296***	−0.243***	−0.310***	−0.241***	−0.298***	−0.287***
	(0.058)	(0.058)	(0.083)	(0.088)	(0.057)	(0.085)
World Growth Uncertainty	−1.789**	−0.009	−2.267**	−1.724**	−1.872**	−1.900**
	(0.725)	(0.331)	(0.976)	(0.735)	(0.749)	(0.882)
TED					0.369	0.668
					(0.226)	(0.724)
Observations	11,476	5,794	5,682	9,786	11,476	9,786
Adjusted R^2	0.142	0.218	0.136	0.151	0.144	0.152

Table A7. **Funding barriers and market integration reversals:** This table reports the coefficients from probit panel regressions of the integration reversals in the Bekaert et al. (2011) segmentation index (SEG) on the cross-border funding barrier indicator (CFB). Reversals are defined following Forbes and Warnock (2012) as periods of large increases in SEG. Regressions are over the full time sample (January 1978 to October 2014) except in the fourth and sixth column that exclude the year 2007 to 2009. Other regressors include foreign investment barrier proxies (investment profile, capital account openness, market capitalization to GDP), other local market characteristics (market liquidity, private credit, law and order), global economic conditions (world market return, GDP growth, and GDP growth uncertainty), and the TED spread (TED). P-values are estimated using double clustered, standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$1_{\text{Reversal}_t^j} = \alpha + \delta \text{CFB}_t^j + \gamma \text{X}_t^j + \varphi \text{TED}_t + \varepsilon_t^j$$

	All	DM	EM	Ex. 07-09	All	Ex. 07-09
CFB^j	0.196***	0.301***	0.144***	0.174***	0.169***	0.116**
	(0.044)	(0.103)	(0.050)	(0.047)	(0.045)	(0.048)
Investment Profile^j	−0.014	−0.015	−0.071***	−0.044***	−0.024**	−0.023*
	(0.011)	(0.015)	(0.016)	(0.012)	(0.011)	(0.012)
Capital Account Openness^j	−0.0001	−0.015***	0.001	0.001	0.0005	0.003*
	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Market Cap. to GDP^j	−0.002***	−0.001**	−0.004***	−0.002***	−0.002***	−0.002***
	(0.0005)	(0.001)	(0.001)	(0.001)	(0.0005)	(0.001)
Market Liquidity$^j_{-1}$	−0.001	0.002	0.003	0.001	0.0003	0.00003
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Private Credit^j	0.003***	0.001	0.006***	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Law and Order^j	−0.011	−0.195***	0.036	−0.061**	−0.022	−0.110***
	(0.023)	(0.058)	(0.031)	(0.024)	(0.023)	(0.025)
World Market Return	−0.013***	−0.023***	−0.007	−0.004	0.003	−0.008
	(0.004)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
World GDP Growth	−0.488***	−0.640***	−0.360***	−0.468***	−0.502***	−0.615***
	(0.018)	(0.029)	(0.024)	(0.029)	(0.018)	(0.033)
World Growth Uncertainty	−1.276***	−2.483***	0.134	−1.220***	−1.543***	−1.741***
	(0.111)	(0.166)	(0.159)	(0.115)	(0.116)	(0.126)
TED					0.861***	1.380***
					(0.060)	(0.109)
Observations	11,476	5,794	5,682	9,786	11,476	9,786
McFadden's Pseudo R^2	0.085	0.097	0.100	0.050	0.102	0.062

Table A8. **Funding barriers and ADR Parity Violations:** The table reports in the first through the third column OLS coefficients from time-series regressions of the ADR Parity violations (ADRP) on the global cross-border funding barrier indicator (CFB) computed as an equal-weighted average of the country indicators in each month. The fourth through the sixth column report slope coefficients from probit regressions of the ADRP reversals on the global CFB. ADRP series are from Pasquariello (2014). Reversals are defined following Forbes and Warnock (2012) as periods of large increases in ADRP. Regressions are over the full time sample (January 1978 to October 2014) except in the third and sixth column that exclude the year 2007 to 2009. Other regressors include global economic conditions (world market return, GDP growth, and GDP growth uncertainty). P-values are estimated using Newy West standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\text{OLS:} \quad \text{ADRP}_t = \alpha + \delta \text{CFB}_t + \gamma \text{X}_t + \varepsilon_t$$
$$\text{Probit:} \; 1_{\text{Reversal}_t} = \alpha + \delta \text{CFB}_t + \gamma \text{X}_t + \varepsilon_t$$

	OLS			Probit		
	All	All	Ex. 07-09	All	All	Ex. 07-09
CFB	0.538***	0.623***	0.411***	5.089***	5.769***	3.830**
	(0.187)	(0.139)	(0.082)	(1.078)	(1.302)	(1.767)
World Market Return		−0.009***	−0.005**		−0.105***	−0.085*
		(0.003)	(0.003)		(0.038)	(0.048)
World GDP Growth		0.014	0.004		0.177	0.645*
		(0.011)	(0.018)		(0.210)	(0.356)
World Growth Uncertainty		0.198**	0.143		1.638	2.687**
		(0.088)	(0.088)		(1.059)	(1.161)
Observations	360	360	324	360	360	324
Adjusted R^2	0.172	0.248	0.085			
McFadden's Pseudo R^2				0.105	0.147	0.086

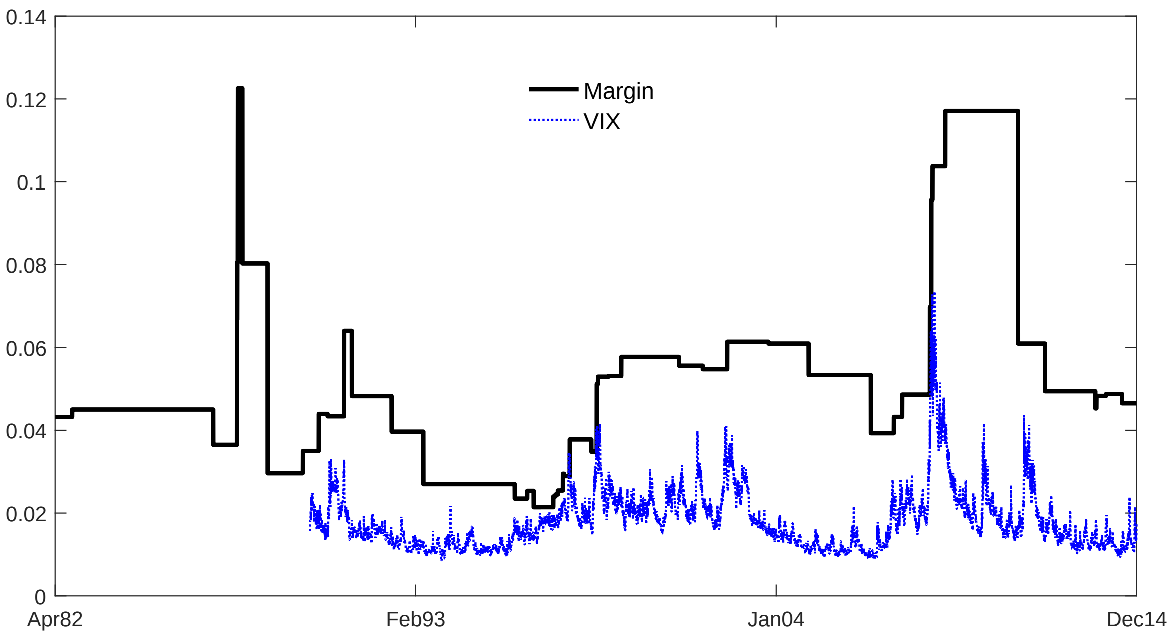


Figure A1. **S&P500 margins and volatility:** The figure plots the Chicago Mercantile Exchange members minimum performance bond requirement for S&P 500 stock index futures contracts (solid line) and the CBOE implied volatility (VIX) index (dotted line). The dollar value of the initial margin requirement is divided by the dollar value of the futures contract. Source: CME and CBOE.

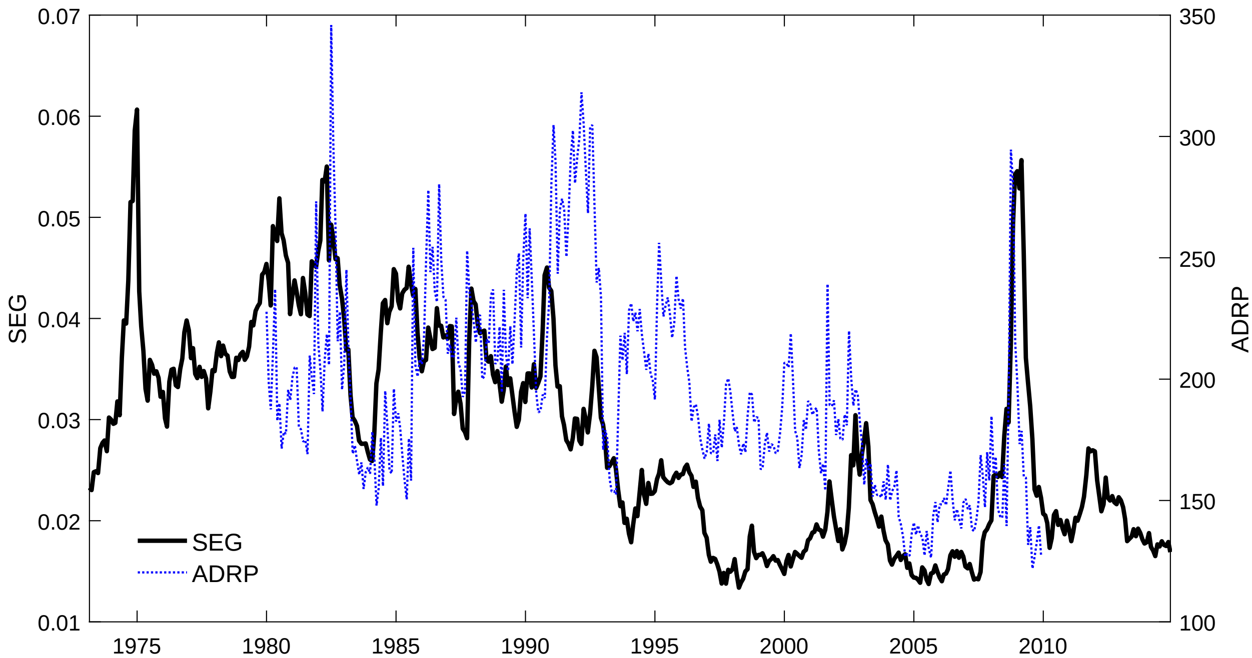


Figure A2. Reversals in international financial markets: The figure plots the average world segmentation measure (SEG) from Bekaert et al. (2011) and the ADR parity violations measure (ADRP) from Pasquariello (2014).