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 margin-CAPM, we use observed stock prices to infer the variation in the magnitude and the implicit cost of barriers that impede the funding of cross-border positions. Our measure helps explain the dynamics of global market integration, revealing periods when funding barriers become more severe. These periods coincide with reversals in market integration documented in the literature but not explained by other foreign investment barriers. We confirm the funding friction channel with alternative financial integration measures, institutional portfolio holdings, and international capital flows.

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1 Introduction

In the wake of the 2008 financial crisis, concerns over a potential reversal of global market integration trends came to dominate the academic and policy debates.[1] When they do materialize, such reversals can decrease international risk sharing and increase the cost of capital. Yet, even transitory reversals in integration are at odds with an apparent lack of new barriers to international capital flows. In this paper, we explore how funding frictions can act as an international investment barrier and, as a result, contribute to the dynamics of financial market integration. Our premise 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.[2] Such constraints arise for a variety of reasons, which we describe in a dedicated section of the paper. For instance, foreign collateral commands higher haircut relative to domestic collateral, access to foreign broker–dealers is often limited by regulation, positions denominated in foreign currency command higher regulatory capital requirements, and foreign currency funding or risk hedging involve additional costs that ultimately reflect the balance sheet constraints of financial intermediaries supplying them.

Our first contribution to the literature is to infer the importance of funding frictions impeding cross-border investing from the effect they have on asset prices. To this goal, we construct a novel measure that exploits 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. Next, we show that frictions captured by our measure matter in global markets. Specifically, we find that the difficulty to access funding for cross-border positions can help explain financial integration reversals (i.e., transitory increases in market segmentation) documented in the literature but not explained by

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

[2] 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.

the variation in other foreign investment barriers. We then we provide further evidence for the importance of cross-border funding frictions by relating the variation in our country-level measure to available funding liquidity proxies and to institutional features that correlate with the presence of cross-border funding constraints both on the demand side and the supply side.

Our analysis is guided by an international asset pricing model in which investors have to fund a fraction of their position in each security with their own capital, and these capital requirements are higher for cross-border positions. In an equilibrium where funding constraints bind for at least some investors, the expected excess return on any security depends not only on its beta to market risk, but also on the capital required to maintain the position in this security and on investors' shadow cost of funding constraints (i.e., their funding liquidity). In turn, additional capital requirements for cross-border positions make asset prices in each country more sensitive to the foreign investors' funding liquidity. Cross-country variation in these capital requirements and in overseas investors' funding liquidity lead to differences in expected returns across markets.

In order to measure this effect from observed asset prices, we construct BAB portfolios whose expected returns reflect the funding liquidity of the marginal investor in each respective country in our sample.[3] We use Bayesian methods to estimate the unobserved driver of the expected BAB portfolio returns in each country through the leverage applied to construct each portfolio and the respective market volatility. We then use our estimates as a proxy for the shadow price of funding constraints and compute the distance between each country's shadow price and that of the other countries. In our model, for a given country, this distance increases either when more capital is required to access its market or when the funding liquidity of overseas investors investing in this country decreases, making a given cross–border capital requirement more costly.

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 which

[3]The BAB portfolios are self–financing market–neutral portfolios which are long the low–beta assets and short the high–beta assets in their respective countries. Recent evidence in Frazzini and Pedersen (2014), Adrian, Etula, and Muir (2014), Boguth and Simutin (2015), Jylhä (2018), Asness, Frazzini, and Pedersen (2018), among others, points to a strong empirical link between BAB returns and investors' funding liquidity, confirming the original insight in Black (1972) that the low slope of the security market line, the driver of the BAB returns, reflects the effect of investors' financing constraints.

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 market segmentation facts documented in the literature. 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. In addition, the indicators reveal that large increases in the severity of funding barriers, albeit transitory, are a salient feature of both developed and emerging markets.

We show that frictions captured by CFB indicators are important in explaining the variation in international stock market integration across countries and over time. We find a statistically and economically significant relationship between the funding barrier indicator and the segmentation measure proposed by Bekaert, Harvey, Lundblad, and Siegel (2011, 2013) in a large panel of developed and emerging markets. Furthermore, this relationship is particularly strong during financial integration reversals: higher CFB significantly increases the likelihood of large temporary increases in the segmentation measure of the corresponding country. Our conclusions remain the same when we consider a range of alternative ways to measure financial integration.

While acknowledging financial integration reversals, previous literature has not directly explored possible explanations. Our empirical results point to a mechanism that can rationalize such reversals. Unlike with traditional international investment barriers, the shadow cost of funding barriers can change significantly when funding liquidity conditions, themselves highly time-varying, change. This makes the effect of funding barriers on asset prices vary over time and explains why we can observe global financial integration reversals even when the level of investment barriers is not markedly changing.

We provide further support for the importance of funding barriers to international investments. First, we show that CFB captures the effect of funding frictions and is different from the barriers already explored in the literature. We find a strong relationship between, on the one hand, the CFB indicators and on the other hand, available funding liquidity measures, the extent of U.S. investors' ability to trade foreign stocks on margin, and a proxy for the global reach of the network of U.S. and non-U.S. primary dealers. At the same time, we find no systematic association between the CFB indicators and a range of standard foreign investment barrier proxies, local market characteristics, and other controls, suggesting that differences in expected BAB returns captured by our measure are not driven by previously studied barriers, but rather reveal a separate channel. Second, we find support for the importance of funding barriers by studying institutional portfolio holdings and extreme capital flows at times of financial stress.

We perform additional robustness checks and find that our results remain unchanged if we exclude the U.S. or the 2007-2009 global financial crisis period from our panel. 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). Finally, we find that global and local market volatilities are not the drivers of the funding indicators.

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, Errunza, and Hogan (2007), Pukthuanthong and Roll (2009), Bekaert et al. (2011, 2013), Carrieri, Chaieb, and Errunza (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 them. 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. Our analysis of the integration reversal periods aligns with these general observations. We provide initial evidence that during these periods institutional investors adjust their holdings by decreasing the ownership of foreign stocks while tilting their portfolios toward high beta stocks. We also find that capital flow reversals as defined in Forbes and Warnock (2012) are associated with our cross-border funding indicators.

The rest of the paper is organized as follows. Section 2 presents the institutional foundations for the presence of cross-border funding constraints and lays out a stylized model that takes into account this kind of constraints for cross-border positions. Section 3 introduces the Cross-border Funding Barrier indicator together with the data and other variables. Our estimation results are presented in Section 4. Finally, Section 5 concludes.

2 Funding Barriers to International Investment

2.1 Institutional Perspective

Investors are often constrained in their ability to obtain funding for their investments, with such constraints arising in a variety of institutional settings. In this section we discuss how in each case these constraints impose an additional hurdle for cross-border positions.

A vast literature highlights the importance of margin constraints set by broker-dealers.[4] Regulatory restrictions and broker-dealers' own risk management rules can result in higher margin requirements for foreign stocks relative to domestic securities.[5] For instance, in the U.S. considerations related to the jurisdiction of the issuer, currency volatility, and country/currency concentration

[4]See Gârleanu and Pedersen (2011), Frazzini and Pedersen (2014), and Jylhä (2018), among others.

[5]The restrictions on foreign asset eligibility as collateral for central bank refinancing can be seen as a limiting case of this type of constraints. See also Corradin and Rodriguez-Moreno (2016).

enter parts of SEA rule 15c3-1 and FINRA rule 4210 pertaining to foreign securities, making access to funding for non-U.S. securities more restrictive compared to funding for U.S. securities.[6] On the funding supply side, regulation also limits U.S. investors' access to funding through a broker-dealer outside the U.S. jurisdiction. SEC rules require foreign broker-dealers who are members of a foreign securities exchange to register with the SEC when effecting securities with U.S. institutional investors. Furthermore, regulations explicitly prohibit foreign broker-dealers to solicit business of U.S. institutional investors and require any direct contacts involving the execution of transactions through a U.S. registered broker-dealer intermediary. Rules concerning activity with U.S. investors call for such foreign broker-dealers to strike an agreement such an omnibus agreement with a U.S.-registered broker-dealer. Appendix A describes the relevant regulation provisions in more detail.

Mutual funds face constraints similar in nature to the ones described above. For instance, in the U.S. funds face borrowing restrictions established by the Investment Company Act of 1940 and often self-impose stringent zero-leverage constraints. Moreover, the unpredictable nature of both fund outflows and investment opportunities creates an incentive for precautionary cash holdings, resulting in an effective negative leverage constraint.[7] These constraints have an international dimension if mutual funds, in addition to the leverage constraint, are also restricted by their mandate or regulation to hold no more than a certain fraction of their portfolio in foreign stocks. In this context we note that mutual funds, in particular U.S. mutual funds, invest in a broad range of foreign stocks beyond those included in main benchmark indices. Thus, they play an important role in international financial market integration. Summary statistics for the number of foreign securities in open end mutual fund portfolios from FactSet database are presented in Table A1 of

[6]In particular, both rules explicitly consider inclusion in the FTSE World Index as the eligibility criterion for margin trading of a foreign stock. Later in the paper we use this provision to construct a simple proxy for U.S. investors' ability to trade stocks on margin in a given country. We note that the composition of the FTSE World Index differs from that of the FTSE All World Index. For instance, stocks from China, India, and several other markets are excluded from the FTSE World Index and are therefore not eligible for trading on margin according to the regulations. Stocks from these countries enter the FTSE All World Index which serves as an investment benchmark but is not used for regulatory purposes.

[7]See Almazan, Brown, Carlson, and Chapman (2004), Alankar, Blaustein, and Scholes (2014), Simutin (2014), Frazzini and Pedersen (2014), Boguth and Simutin (2018).

the Appendix.

Finally, investors subject to banking regulation are required to hold more regulatory capital for foreign positions and their foreign currency denomination.[8] The regulatory perimeter expanded significantly in the aftermath of the 2007-2009 global financial crisis, with more institutions falling under banking regulation. Thus, we expect banking constraints to matter more in the future. Banks are also important as suppliers of foreign currency funding or hedging to other investors who are looking to invest in foreign assets. Both FX funding and hedging involve costs over and above those implied by no arbitrage which ultimately reflect the capital constraints of financial intermediaries supplying them.[9]

We have focused our discussion primarily on constraints of the U.S. investors, who arguably play an important role in global financial markets. However, similar regulations are in place in other countries. For instance, in Appendix A we also discuss the case of Canada. Ultimately, the difficulty to directly measure funding barriers across all investors and markets motivates us to measure them indirectly, from the effect they have on asset prices, as discussed in the next section.

2.2 Model

In this section we present a version of the Frazzini and Pedersen (2014) margin-CAPM which allows us to examine the effect of funding barriers to international investments on asset prices.

There are two countries $j = d, f$, each with a set $\mathcal{K}_j$ of stocks indexed by k and, at every date t, a set $\mathcal{I}_j$ of n_j competitive investors indexed by i.[10] We denote $\mathcal{K} = \bigcup_j \mathcal{K}_j$, $\mathcal{I} = \bigcup_j \mathcal{I}_j$, and $n = n_d + n_f$.

Each stock k is in fixed supply normalized to 1. At every date t it pays a dividend D_t^k; its price at that date is denoted by P_t^k. Investors also have access to a risk-free asset with exogenous gross return R. Finally, the purchasing power parity holds and all prices are expressed in U.S. dollars.[11]

[8] See CPSS (2006) and BCBS (2016)

[9] See Cenedese, Della Corte, and Wang (2016) and Du, Tepper, and Verdelhan (2018).

[10] We can think about country f as the rest of the world.

[11] See, e.g., Bekaert et al. (2007) who make a similar assumption.

At every date t a new generation of investors $i \in \mathcal{I}$ is born with wealth $W_{i,t}$. Investors live for two periods and maximize

$$\max_{\left\{x_{i,t}^{k}\right\}_{k\in\mathcal{K}}} \mathrm{E}_t\left[\sum_{k\in\mathcal{K}}\left(D_{t+1}^{k}+P_{t+1}^{k}-RP_{t}^{k}\right)x_{i,t}^{k}\right]-\frac{\alpha}{2}\mathrm{Var}_t\left[\sum_{k\in\mathcal{K}}\left(D_{t+1}^{k}+P_{t+1}^{k}\right)x_{i,t}^{k}\right] \tag{1}$$

subject to a funding constraint which requires agent i to commit the amount of her own capital equal to the multiple m_i^k of her position

$$\sum_{k\in\mathcal{K}} m_i^k x_{i,t}^k P_t^k \leq W_{i,t}. \tag{2}$$

The capital requirement m_i^k captures the combined effect of regulatory and market discipline constraints discussed in Section 2.1.[12] In particular, country-f investors have to commit more capital for positions in country d relative to their home positions

$$m_i^k = \begin{cases} m+\kappa, & \text{if } i \in \mathcal{I}_f \text{ and } k \in \mathcal{K}_d \\ m, & \text{otherwise,} \end{cases} \tag{3}$$

with $\kappa > 0$. Finally, we assume all random variables i.i.d. over time, and $W_{i,t}$ i.i.d across investors and independent from dividends D_t^k.

Similarly to the one-country asset pricing models with funding frictions, when funding constraints bind for at least some investors, the expected excess return on any stock depends not only on its risk, but also on the compensation for the capital that needs to be committed to the position in this stock. Indeed, investor i's first order condition is given by

$$\mathrm{E}_t\left[D_{t+1}^k+P_{t+1}^k-RP_t^k\right]-\alpha\mathrm{Cov}_t\left[D_{t+1}^k+P_{t+1}^k,\sum_{s\in\mathcal{K}}\left(D_{t+1}^s+P_{t+1}^s\right)x_{i,t}^s\right]-\psi_{i,t}m_i^kP_t^k=0, \tag{4}$$

where $\psi_{i,t}$ is investor i's Lagrange multiplier associated with (2). Aggregating across all i, imposing

[12]For instance, Frazzini and Pedersen (2014), Jylhä (2018), and Boguth and Simutin (2018) model margin constraints and mutual fund leverage constraints with a version of (2).

market clearing $\sum_{i\in\mathcal{I}} x^s_{i,t} = 1$ for all s, and denoting $R^k_{t+1} = \frac{D^k_{t+1}+P^k_{t+1}}{P^k_t}$, we obtain the equilibrium expected excess return on stock k:

$$\mathrm{E}_t\left[R^k_{t+1} - R\right] = \frac{\alpha}{n}\mathrm{Cov}_t\left[R^k_{t+1}, \sum_{s\in\mathcal{K}}\left(D^s_{t+1} + P^s_{t+1}\right)\right] + \sum_{i\in\mathcal{I}}\frac{\psi_{i,t}}{n}m^k_i. \tag{5}$$

The betting-against-beta (BAB) portfolios are constructed to have zero exposure to market risk and to capture only the funding-related term in (5). As shown in Appendix B, for self-financing market-neutral portfolios that is long in low-beta stocks and short in high-beta stocks of respective countries, expected returns are given by

$$\mathrm{E}_t\left[R^{bab,f}_{t+1}\right] = \left(1/\beta^{l,f}_t - 1/\beta^{h,f}_t\right)m\psi_t \tag{6}$$

and

$$\mathrm{E}_t\left[R^{bab,d}_{t+1}\right] = \left(1/\beta^{l,d}_t - 1/\beta^{h,d}_t\right)\left(m\psi_t + \kappa\psi_{f,t}\right), \tag{7}$$

where $\psi_t = \sum_{i\in\mathcal{I}}\frac{\psi_{i,t}}{n}$, $\psi_{f,t} = \sum_{i\in\mathcal{I}_f}\frac{\psi_{i,t}}{n}$, and $\beta^{l,j}$ and $\beta^{h,j}$ are global market betas of the long and short leg of the country j BAB portfolio, respectively.

The following proposition helps us measure the effect that funding barriers have on asset prices.

Proposition 1. *The distance between the expected returns of BAB portfolios across countries, adjusted for differences in leverage applied to construct the portfolios, is increasing in the level of funding barrier and the funding liquidity of investors facing this barrier.*

Proposition 1 stems from the fact that higher capital required from investor f to access market d leads to a differences in expected BAB returns between the countries. Combining (6) and (7)

$$\left|\frac{\mathrm{E}_t\left[R^{bab,d}_{t+1}\right]}{1/\beta^{l,d}_t - 1/\beta^{h,d}_t} - \frac{\mathrm{E}_t\left[R^{bab,f}_{t+1}\right]}{1/\beta^{l,f}_t - 1/\beta^{h,f}_t}\right| = \kappa\psi_{f,t}. \tag{8}$$

Thus, the distance between the expected returns of country BAB portfolios, adjusted for the $1/\beta^{l,j}_t - 1/\beta^{h,j}_t$ term, is increasing in the level of the funding barrier κ and the shadow price of capital for country-f investors who are subject to this barrier.[13]

In addition to expected BAB returns, funding barriers also have an effect on the BAB return correlation between the two countries.

Proposition 2. *Everything else being equal, the correlation between the country BAB portfolio returns is decreasing in the level of the cross-border funding barrier.*

Consider the discount rate shock component of BAB returns.[14] As can be seen from equations (6) and (7), expected BAB returns are a function of how binding are investors' funding constraints as measured by $\psi_{i,t}$. In the model, this is determined by the realisation of wealth $W_{i,t}$ for each investor i in a new generation born at date t. The funding liquidity shocks introduce commonality in the BAB returns, even when $W_{i,t}$ are uncorrelated across investors. Indeed, when $\kappa = 0$, expected BAB returns in both countries depend on the representative global investor's shadow price of capital ψ_t and are perfectly correlated. In contrast, when $\kappa > 0$, the degree to which funding constraints are binding for investors subject to the barrier, $\psi_{f,t}$, matters for country d stocks. This results in a lower correlation between the discount rate components of BAB returns across counries, and as a result in an altogether lower BAB returns correlation. Appendix B formalizes this argument.

The result on equilibrium expected returns in (5) has its corollary for investors' portfolios:

Proposition 3. *Constrained investors facing funding barriers tilt their portfolio away from foreign stocks and towards high-beta stocks relative to the global market portfolio benchmark.*

Formally, Proposition 3 results from evaluating country-f investor's first order condition (4) at equilibrium expected stock returns given by (5), as shown in Appendix B.

The last proposition highlights the difference between the funding barriers and the barriers arising from direct costs associated with access to foreign assets.[15]

[13]We measure the effect of funding barriers relative to country f, which can be interpreted as the rest of the world. For parsimony, we assume no funding barriers for country-d investors to access the global market as these investors would have only a small impact on the rest of the world, provided country d size measured by n_d is small relative to n.

[14]In addition to the discount rate shocks, BAB returns depend on the dividends paid by the stocks in the BAB portfolio, i.e. the cash flow shocks. The exact correlation of the cash flow shocks components of country BAB returns depends on the dividend correlation structure in particular BAB portfolios. In practice, this correlation is likely to be small as BAB portfolios in each country, by construction, have a zero exposure to the global market factor.

[15]These access costs can result from taxes, transaction costs, information collection costs, or other frictions that are

Proposition 4. *The effect of barriers to international investments, other than funding barriers, on asset prices does not depend on investors' funding liquidity.*

To show this, we assume that, in addition to cross-border capital requirements, country-f investors are subject to a tax proportional to their position in country d. Investors' objective (1) becomes

$$\max_{\{x_{i,t}^k\}_{k\in\mathcal{K}}} \mathrm{E}_t\left[\sum_{k\in\mathcal{K}}\left(D_{t+1}^k + P_{t+1}^k - RP_t^k - T_i^k P_t^k\right)x_{i,t}^k\right] - \frac{\alpha}{2}\mathrm{Var}_t\left[\sum_{k\in\mathcal{K}}\left(D_{t+1}^k + P_{t+1}^k\right)x_{i,t}^k\right] \tag{9}$$

where

$$T_i^k = \begin{cases} T, & \text{if } i \in \mathcal{I}_f \text{ and } k \in \mathcal{K}_d \\ 0, & \text{otherwise,} \end{cases}$$

Unlike the capital requirements which enter into investors' funding constraint (2), the tax enters directly into investors' budget constraint. As a result, the shadow costs of the two frictions impeding international investment are not the same as they depend on multipliers associated with two different constraints. Consider, for instance, the BAB portfolio in country d. As shown in Appendix B, its expected return is given by

$$\mathrm{E}_t\left[R_{t+1}^{bab,d}\right] = \left(1/\beta_t^{l,d} - 1/\beta_t^{h,d}\right)\left(m\psi_t + \kappa\psi_{f,t} + \frac{n_f T}{n}\right). \tag{10}$$

From (10), the tax T has an effect on expected BAB return, but this effect does not depend on investors' funding liquidity measured by investors' multipliers $\psi_{i,t}$, unlike the effect of the funding barrier κ.

3 Data and Variable Construction

Stock market data. We collect the dollar-denominated total return index and the market cap-

isomorphic to a tax. Barriers are assumed to be of this form in Black As assumed, for instance, in Black (1974), Stulz (1981), Martin and Rey (2000, 2004), Heathcote and Perri (2004), and Bhamra, Coeurdacier, and Guibaud (2014), among others.

italization for individual stocks at the daily frequency from January 1973 to October 2014 from DataStream and WorldScope databases. Excluding the countries with short or incomplete data history, which together represent 1.3% of the DataStream world total market index capitalization, we have data for 21 developed and 28 emerging markets according to the FTSE classification of each country prevailing through the sample history. Applying data filters as in Karolyi, Lee, and van Dijk (2012) gives us a sample of 58,405 securities. In addition, we use DataStream market indices as country and global market portfolios, and the one-month T-bill rates from Kenneth French's website as the risk-free rate. See Appendix C for further details.

BAB portfolios and CFB indicators. We follow Frazzini and Pedersen (2014) to construct the BAB portfolios. In each month and in each country, all stocks are grouped according to their beta with respect to the global market into high- and low-beta portfolios. In each portfolio, securities are weighted by the corresponding portfolio beta. The BAB portfolio for a given country is then formed by going long in the low-beta portfolio, leveraged to a beta of one, and shorting the high-beta portfolio, de-leveraged to a beta of one. The summary statistics for BAB portfolios are reported in Table 1. In particular, the average BAB returns are positive and statistically significant for all countries but one, as predicted by funding constraint-based theories.[16] See Appendix D for additional details.

[Place Table 1 about here]

Next, we follow Proposition 1 and construct cross-border funding barrier (CFB) indicators from the cross-country differences in estimated expected BAB returns. To this end, we posit the

[16]The properties of our BAB portfolios are in line with the results in Asness et al. (2018). The authors show that the BAB performance is to large degree explained by betting against the market correlation component of stock betas rather than by betting against the idiosyncratic volatility component of their betas. These results support the funding constraint explanation of BAB returns to the extent that alternative explanations (for instance, Bali, Brown, Murray, and Tang, 2017) rely on idiosyncratic volatility.

following dynamics for the monthly BAB returns in each country j

$$R_{t+1}^{bab,j} = \Psi_t^j Z_t^j + \varepsilon_{t+1}^j, \tag{11}$$

$$Z_t^j = \left(1/\beta_t^{l,j} - 1/\beta_t^{h,j}\right)\sigma_t^j, \tag{12}$$

$$\Psi_{t+1}^j = \phi_0 + \phi_1 \Psi_t^j + \epsilon_{t+1}, \tag{13}$$

where $\Psi_t^j Z_t^j$ and ε_{t+1}^j are the expected and unexpected components of BAB returns, respectively, and the term Z_t^j controls for the effect that the variation in the leverage applied to construct the BAB portfolios and in market volatility has on BAB returns over time and across countries.[17] We estimate (11)-(13) with Markov Chain Monte Carlo and Gibbs Sampling, using directly estimated betas and volatilities in (12).[18,19] See Appendix E for additional estimation methodology details.

Given the estimated $\hat{\Psi}_t^h$ in each country h, we define our cross-border funding barrier (CFB) indicator for country j at date t as

$$\mathrm{CFB}_t^j = \left|\sum_{h\in\mathcal{J}} w_t^h\, \hat{\Psi}_t^h - \hat{\Psi}_t^j\right|,$$

where w_t^h is the weight of country h in the world market portfolio. 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, the indicator aims to capture both the level of the funding barriers (κ in our model) and their shadow cost. Table A2 in the online appendix

[17]We follow Fostel and Geanakoplos (2008) and Brunnermeier and Pedersen (2009), and assume that capital requirements in each country are proportional to that country market volatility: $m_t^j = m\sigma_t^j$ and $\kappa_t^j = \kappa\sigma_t^j$. For this reason, we include σ_t^j in Z_t^j. Jurek and Stafford (2010) and Gorton and Metrick (2010) provide further motivation for the link between volatility and funding constraints. In practice, this link is built into Basel Committe 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 for an illustration.

[18]Jostova and Philipov (2005) and Ang and Chen (2007) implement a similar methodology to estimate time-varying betas and use simulations to show that this approach generates precise estimates for the latent process. Our results are robust to using a simple rolling-window estimate, similar to Lewellen and Nagel (2006).

[19]Because of the underlying averaging, Gibbs Sampler reduces the concerns over the "error-in-variable" problem resulting from noisy estimates for of betas and volatility.

reports the summary statistics for the CFB indicators.

Market segmentation. We consider a range of international market segmentation measures. As our benchmark, we use the measure proposed by Bekaert et al. (2011, 2013), referred to as the SEG index. The SEG index is based on cross-country differences in the valuation ratios of industry portfolios and can be constructed for the entire history of each country in our sample. In addition, we consider the Carrieri et al. (2007) measure based on the squared correlations of returns of emerging market indices, conditional on cross-listed securities that are eligible for global investments, the Pukthuanthong and Roll (2009) measure based on the explanatory power of international factor models for expected stock returns in different countries and an index of parity violations in the American Depositary Receipt market (ADRP) aggregated across a sample of foreign stocks cross-listed in the United States from Pasquariello (2014).[20,21]

We define financial integration reversals – large temporary increases in market segmentation – by the criterion that Forbes and Warnock (2012) use to identify extreme capital flows. For each segmentation measure, we identify a reversal in a given month if the measure is either (i) more than two standard deviations higher than its average over the previous 12 months or (ii) more than one standard deviation higher than this average during three consecutive months.

Foreign investment barriers. We collect data on the variables emphasized in the international financial integration literature. See, for instance, Bekaert et al. (2011). Country investment profile (expropriation, contract viability, profits repatriation, and payment delay risks), and law and order measures (legal system strength and impartiality, and law observance) are from the International Country Risk Guide by Political Risk Services. The capital account openness is from Dennis Quinn's website based on the International Monetary Fund data and Quinn and Toyoda (2008). 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 are from the World Bank World Development

[20]The latter measure represents deviations from the Law of One Price for assets with identical payoff traded in different countries, which can be informative about market segmentation. See, for instance, Chen and Knez (1995). For an exhaustive review of ADRs see Karolyi (2006) and Gagnon and Karolyi (2010).

[21]We thank Paolo Pasquariello for sharing the data.

Indicators. The world growth uncertainty is the log of the cross-sectional standard deviation of real GDP growth rate of countries from the International Monetary Fund World Economic Outlook data. See Table A3 in the Appendix for additional description of the variables.

Funding barriers. In addition to foreign investment barriers previously considered in the literature, we construct two new proxies for the level of funding barriers (κ in our model), which reflect the demand and the supply of funding for international investments, respectively.

First, we construct measures of U.S. investors' ability to trade stocks on margin in a given country and month. Marginability is defined as the market capitalization of a given country's firms included in the FTSE World Index over the total market capitalization of that country.[22] This definition stems from regulations discussed in Section 2.1 and Appendix A, which consider inclusion in the index as the eligibility criterion for margin trading. FTSE Russell periodically revises the composition of the index with respect to both country and stock constituents, resulting in considerable variation in marginability measures over time and across countries. On average, developed markets have higher marginability (67.6 percent) compared to emerging markets (15.7 percent), with stocks from India or China and several other markets not eligible for funding under current rules. Summary statistics of marginability measures are tabulated in Table A4 in the Appendix.[23]

Second, as a way to capture the level of barriers from the funding supply perspective, we rely on the list of U.S. and non-U.S. financial institutions that are part of the Federal Reserve Bank of New York network of primary dealers.[24] Our premise is that such network of global dealers is associated with a more internationally connected financial intermediary sector, resulting in a less

[22]Total market capitalization is DataStream Total Market index capitalization. While factors such as liquidity or public float are ignored in the selection and composition of the Datastream universe and broad total market indices, a security in the FTSE World Index must pass a liquidity screen and its market capitalization is then adjusted for free float and foreign ownership limit, both contributing to the investibility weight. Detailed description of the FTSE World Index is available from FTSE Russell on `www.ftserussell.com`.

[23]We obtain very similar marginability measures with the total market capitalization from the World Bank WDI database. Only in the case of South Africa the marginability ratio is sensitive to the choice of the denominator. The discrepancy is due to this market's limited coverage by the Datastream index.

[24]See He, Kelly, and Manela (2017), who use data on the Federal Reserve Bank of New York primary dealers to compute an intermediary equity capital ratio measure. Correa and DeMarco (2019) find that the leverage of non-U.S. primary dealers, but not that of U.S. primary dealers, predicts USD exchange rates, pointing to an important role of intermediaries' global connections.

restricted supply of funding for international investments. The chronology of the Federal Reserve Bank of New York trading counterparties is available from 1960 with monthly updates.[25] The set of primary dealers consisted exclusively of U.S. intermediaries in the 70s, with 36 dealers at the beginning of our sample, but became progressively more international in the 80s and 90s, and by the end of our time period, 15 of the 22 accredited dealers are non-U.S. institutions.[26] We collect the market capitalization at each month of the U.S. and non-U.S. financial firms and define Global Dealers as the size of the U.S. institutions, augmented with the non-U.S. ones, for those countries with a primary dealer in the U.S..[27] We interpret the size of these global firms as a proxy for the ease of access to cross-border funding. Appendix A provides more information and some statistics on the cross-border role of foreign intermediaries in U.S. financial markets and of U.S intermediaries around the world.

Funding liquidity. Motivated by a vast literature, we consider a range of funding liquidity proxies. In particular, the spread between the three-month U.S. dollar LIBOR and the three-month Treasury Bill rate – the TED spread – has been used to measure funding liquidity in different contexts, including as an explanatory factor for BAB returns. See Gârleanu and Pedersen (2011) and Frazzini and Pedersen (2014), or Fratzscher (2012) for an international finance example. As alternative proxies, we consider the deviations of government bond yields from a fitted yield curve (term structure noise) from Hu, Pan, and Wang (2013a) and Malkhozov, Mueller, Vedolin, and Venter (2019); the mutual fund leverage constraint measure from Boguth and Simutin (2018); the CBOE S&P 500 implied volatility (VIX) index; the leverage of U.S. broker-dealers from the Federal

[25] These data are available at https://www.newyorkfed.org/markets/primarydealers. Over our sample period, Canada, France, Germany, Japan, the Netherlands, Switzerland and the United Kingdom have primary dealers, besides the U.S.. Comparable information on a network of global banks could also be gathered from the list of global systemically important banks (G-SIBs), but only for a very short history.

[26] 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.

[27] In computing our proxy, for each country in the eurozone we combine the market capitalization of all Euro area primary dealers after January 1999. Given the increased integration of repo markets after the creation of the single currency and of the European Central Bank, the presence of French, German and Dutch primary dealers is expected to ease funding constraints not only in their respective headquarter country but also throughout the Euro area. For the U.S., we use the market capitalization of all primary dealers, domestic and foreign.

Reserve Flow of Funds data; and as foreign currency funding proxies, the 3-month cross-currency basis for widely traded currencies against the USD from Du et al. (2018);[28] the trade weighted U.S. Dollar exchange rate index from the Federal Reserve Bank of St. Louis together with the nominal bilateral exchange rate from Datastream. All proxies feature considerable co-movement, but are not uniformly available across countries, frequencies and time periods. See Table A3 in the Appendix for additional description of the variables.

4 Empirical Results

In this section we examine the contribution of funding frictions captured by our CFB indicators to the dynamics of international stock market integration, and in particular to financial integration reversals. After presenting our main results, we provide additional evidence and robustness tests. In all the panel regressions, p-values are calculated based on standard errors double clustered by time and country, to account for heteroskedasticity, serial autocorrelation, and cross-correlation in error terms, following Petersen (2009), except when noted otherwise.

4.1 Funding Constraints and Financial Integration

Preliminary results. To begin, we present first pass evidence for the mechanisms outlined in Section 2. Untabulated regressions of market segmentation measures on funding liquidity proxies reveal a tight association between the two, in line with the presence of foreign investment barriers whose effect on market integration is conditional on the shadow cost of funding, see Propositions 1 and 4. For instance, we find that one standard deviation increase in the TED spread is associated with a 48 basis point increase in the earning yield differences across developed markets that underlie the Bekaert et al. (2011) SEG index, with a t-statistic of 3.97; the correlation between the SEG index and the TED spread is 0.53 over the entire sample for which TED data are available.

If funding barriers (κ in our model) themselves were to vary over time, we would see a weaker

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

relationship between segmentation measures and funding liquidity in periods when funding barriers are low. While funding barriers are challenging to measure directly using available data, Proposition 2 of our model predicts that, when these barriers are low, we should observe a higher correlation among country BAB portfolio returns. As shown on Figure 1, the correlation between the developed market SEG index and the TED spread is strong and about stable over our sample, except from the late 1990s to 2006, suggesting that in this period funding frictions did not play a key role for international investments. [29,30]

[Place Figure 1 about here]

Overall, first pass evidence points to a continuing importance of funding barriers in the 1990s and in the aftermath of the global financial crisis of 2007-2009, despite a temporary decrease in their level in the late 1990s and early 2000s. The time variation in the effect that such barriers have on asset prices appears to be primarily due to the highly time-varying shadow cost of funding.

Financial integration dynamics. The CFB indicators allow us to assess the relationship between funding barriers and the dynamics of financial integration more comprehensively. First, as outlined in Proposition 1, these indicators aim to measure both the level of the funding barriers and their shadow cost. Second, we can construct country-specific indicators using readily available stock return data, which enables us to exploit the entire cross section of countries and a long time series.

Figure 2 plots the time-series of the CFB indicators averaged for presentation across developed and emerging markets, respectively. The indicators are on average higher for emerging markets compared to developed markets. They also exhibit a long-run downward trend which is more

[29] Interestingly, BAB portfolio correlations tend to decrease during financial crisis episodes 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 collapse in September 1998, and the subprime crisis in September 2008. This is in stark contrast to market correlations that tend to spike during financial stress periods; see, for instance, Longin and Solnik (2001). This observation is confirmed by formal (untabulated) regressions. In our model, lower BAB correlations during financial crisis episodes can be explained by higher cross-border funding barriers in these periods.

[30] TED spread volatility was considerable in the late 1990s and early 2000s. However, sizeable funding shocks during this period are not associated with increases in market segmentation measures. In other words, the time-varying relationship between segmentation and market liquidity is not due to time-varying volatility of liquidity shocks. Similarly, higher correlations among BAB portfolio returns is not explained by lower idiosyncratic volatility of stock returns.

pronounced in emerging markets. Finally, we observe several large but transitory increases in the indicators for developed and emerging markets alike. Under the null of no cross-border funding barriers, expected BAB returns adjusted for relevant controls should be the same across countries, resulting in zero CFB indicators. Conversely, non-zero CFB indicators capture the effect of funding barriers, and we expect higher CFB indicators to be associated with higher market segmentation.

[Place Figure 2 about here]

We find a strong positive relationship between CFB^j indicators and the SEG^j indices in our country panel (we use superscript j to highlight the country-specific nature of measures) controlling for those barriers to foreign investment found to be significant in Bekaert et al. (2011), which suggests that larger funding barriers are associated with higher market segmentation.[31] As reported in Table 2, this relationship is significant in the sample of all countries and is stronger in the developed market sub-sample. Specifically, in the panel of all countries, a one standard deviation increase in CFB^j is associated with a 54 basis point average increase in the SEG^j (implied by the panel regression coefficient of 0.562 and the average annual volatility of CFB^j of 0.956). To gauge its economic magnitude, this estimate can be compared to the average cross-country earning yield differences underlying the SEG^j of approximately 300 basis points. For the developed and emerging market subsamples, one standard deviation increases in CFB^j are associated with a 54 and 43 basis point average increases in the SEG^j, respectively.

Importantly, the relationship between the SEG^j and CFB^j indicators remains significant in the sub-sample that excludes the global financial crisis of 2007–2009. In other words, our results are not driven by an episode in which funding constraints were uniquely tight and instead point to a broader relevance of the frictions captured by CFB throughout our sample. Moreover, the relationship remains significant when we control for the TED spread. This suggests that the information contained in the CFB^j indicators constructed for each country is not subsumed by a single global funding liquidity factor.

[31] CFB^j indicators are generated regressors biased downwards, which leads to a conservative estimate of funding barriers to foreign investments. Furthermore, in testing all our hypotheses we use robust standard errors.

While statistically and economically significant for financial integration dynamics, the CFB^j indicators do not drive out other explanatory variables: the country investment profile, the capital account openness, the ratio of market capitalization to GDP, and the past local market performance are significant across most specifications, in line with the results in Bekaert et al. (2011) that we confirm in our sample. This highlights the independent role of the funding barriers relative to foreign investment barriers previously considered in the the literature, a point we discuss further in Section 4.2. Finally, Table A5 in the Appendix confirms the robustness of the above results to a range of additional control variables, beyond those found to be significant in Bekaert et al. (2011).

[Place Table 2 about here]

Financial integration reversals. 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 average world SEG index, plotted for reference on Figure A2 in the Appendix, exhibits several such large transitory increases. Using the criteria outlined in Section 3, on aggregate we identify eight reversal episodes for developed markets and six for emerging markets. These episodes last in total 142 months for developed markets and 94 months for emerging markets.

Looking at each country's SEG^j individually, we identify a total of 273 reversal episodes. We also note that the reversal episodes often coincide with periods of financial market turmoil, such as the Black Monday (1987), the Russian default and the 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 3. The relationship between the CFB^j 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. Note that past market returns can themselves capture variation in funding liquidity as pointed out by Hameed, Kang, and Viswanathan (2010). Table A6 in the Appendix confirms the robustness of the above results to a range of additional control variables, beyond those found to be significant in Bekaert et al. (2011).

[Place Table 3 about here]

We illustrate the contribution of funding barriers to reversals at the aggregate level using the receiver operating characteristic (ROC) curve. We borrow this tool from Schularick and Taylor (2012) who use it 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 considered classifier on average fails to identify reversals better than a random classifier. In the case of CFB, the area under ROC curve in Figure 3 is equal to 0.71, similar to Schularick and Taylor (2012) predictive variables.

Alternative financial integration measures. Finally, we consider alternative ways to quantify financial integration from its effect on asset prices, namely the Carrieri et al. (2007) and the Pukthuanthong and Roll (2009) measures as well as the index of ADR parity violations aggregated from a sample of foreign stocks cross-listed in the United States from Pasquariello (2014).[32] We find that an increase in CFB^j indicators significantly increases the likelihood of financial integration reversals identified using these alternative measures, as reported in Table 4.

[Place Table 4 about here]

We conclude that funding frictions captured by the CFB^j indicators contribute to the dynamics of international stock market integration. In particular, the nature of funding barriers can help understand their explanatory power for integration reversals. Previously studied barriers, such as capital controls or taxes on repatriation, typically vary slowly over time and help explain the

[32] 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.

long-run trends in international market segmentation but not its medium-run dynamics. Unlike these previously studied investment barriers, the effect of funding barriers on asset prices depends both on the level of cross-border capital requirements and their shadow cost. The latter is a function of funding conditions across countries, which 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 can explain why we can observe global financial integration reversals even at times when other investment barriers are not markedly changing.

4.2 What Drives the Constraints and How They Bind

In this section we present additional evidence for the mechanism outlined in Section 2. Relative to Section 4.1, the scope of the analysis is limited by data availability. Nevertheless, the results strongly support the importance of frictions captured by CFB indicators.

Table 5 examines the drivers of CFB^j indicators over time and across countries. First, we find a strong relationship between the CFB^j indicators and funding liquidity. This result supports the key premise of our analysis, namely that CFB^j indicators measure a special type of international investment barriers whose effect on asset prices is conditional on international investors' shadow cost of funding. Indeed, our model predicts a non-zero regression coefficient of CFB^j on funding liquidity proxies only under funding barriers to foreign investment, see Proposition 4. Absent such barriers, funding liquidity shocks have the same effect (adjusting for differences in portfolio leverage and volatility) on BAB portfolios across all countries, resulting in no effect on CFB^j. In contrast, the effect that direct foreign investment barriers, such as taxes on repatriations, have on investors' portfolio decisions is not conditional on investors' funding constraints being binding. Thus, such barriers do not result in CFB^j dependence on funding liquidity.

As shown in Table 5, higher TED spread, which can be interpreted as lower funding liquidity of the global investors who rely on U.S. markets to fund international investments, is associated with higher CFB^j in all regression specifications. Specifically, in the panel of all countries, a one standard deviation increase in the TED spread is associated with a 0.101 average increase in CFB^j

(implied by the panel regression coefficient of 6.643 and TED annual volatility of 1.48%), which can be compared to the 0.403 average level of CFB^j in the panel. Table A7 in the Appendix reports the results with available alternative funding liquidity measures, leading to a similar conclusion. In particular, we find that one standard deviation shocks to either the TED spread, the VIX implied volatility index, or the Hu et al. (2013a) term structure noise measure (the three variables with the highest statistical significance) have approximately the same effect on the level of CFB^j. Our indicators are also significantly associated with CIP deviations, a measure of global USD funding cost which Du et al. (2018) link to dealers' financial constraints, and with the trade-weighted USD exchange rate index, which Avdjiev, Du, Koch, and Shin (2018) argue to be associated with contractions of cross-border bank lending in dollars.

Second, we find an equally strong relationship with our proposed proxies of the level of funding barriers across countries. Table 5 shows a positive and significant association between the CFB^j indicators and a measure of U.S. investors' ability to trade stocks on margin in a given country at a given time.[33] For the subset of developed markets this table also reports a similarly strong relationship between CFB^j and the size of global dealers within the Federal Reserve Bank of New York trading counterparty network, an additional measure for the barriers derived from the funding supply perspective.[34] Marginability and Global Dealers have similar coefficients and statistical significance in untabulated regressions that include country fixed effects instead of controls.

In specifications that include the TED spread together with either Marginability or Global Dealers, all variables are strongly significant. Marginability, Global Dealers, and the TED spread may not capture the entire variation in the level and the shadow cost of funding barriers across all investors and countries. Indeed, this is the reason that motivates us to construct the CFB indicators. Yet, the significance of these three variables, which is in line with the theory, supports

[33]In regression specifications similar to those in Table 5 we verify that the CFB indicators are not associated with an investibility measure. For all countries of the FTSE All World Index we construct this measure from the investible weight factor and the market capitalization provided by FTSE for each firm at every month.

[34]We confirm the sign and statistical significance of these findings within a smaller cross-section that only includes the eight countries with primary dealers with the Federal Reserve Bank of New York. The evidence is also robust to an alternative proxy constructed by counting primary dealers, a measure that is immune from the variation in market valuations.

our interpretation of the CFB measure.

At the same time, in Tables 5 we find no systematic association between the CFB indicators and the standard foreign investment barrier proxies and local market characteristics. In other words, the explanatory power of our indicators in Tables 2, 3, and 4 is unlikely to come from them capturing previously studied foreign investment barriers. Had the opposite been true, we would interpret the CFB indicators as a proxy for market segmentation in general, rather than a measure of cross-border funding barriers.

Furthermore, we do not find a significant relationship between CFB^j and the corresponding local market liquidity, measured by the proportion of zero-return days. Previous work points to an important role of market liquidity for international investments; see, for instance, Lee (2011). However, our results suggest that it is not a primary driver of the expected BAB return differences among countries. Similarly, we do not find a significant relationship between CFB^j and either global market volatility or the respective local market volatility.

[Place Table 5 about here]

An important question is whether the effect of funding frictions is also directly observed in investors' behavior. We address this question by looking at portfolio holdings of institutional investors and at cross-border capital flows.

Table 6 examines the patterns in portfolio holdings during financial integration reversals. Proposition 3 of our model predicts that constrained investors hold less foreign stocks and, at the same time, hold more high beta stocks. On aggregate, global market clears and we only observe the adjustments in the foreign holdings: they decrease, but less so for high beta stocks. To test this prediction in the data, we match a large sample of international stocks to their ownership by funds in the FactSet database. We then compute the ownership ratios of each fund in each stock in our sample and aggregate them at the stock level to construct the institutional ownership ratios (IORs). We look at the patterns in IOR changes during the months that coincide with the SEG reversals identified through the methodology explained in Section 4.1.[35] Because our data cover a subsample

[35] See Bennett, Sias, and Starks (2003), Sias, Starks, and Titman (2006), Hendershott, Livdan, and Schurhoff (2015)

of investors, we can only interpret the effect on foreign holdings relative to all stocks in the sample. As shown in Table 6, the ownership of stocks by foreign funds drops significantly during these periods. At the same time, the reduction in foreign stock ownership by open-end and U.S. funds is mitigated for high beta stocks. Interestingly, we do not observe the same beta effect for index funds, which do not actively manage their portfolios. The reduction in index fund ownership of foreign stocks is also less pronounced. Overall, the patterns in portfolio holdings during financial integration reversals provide further support for the mechanism outlined in Section 2. The importance of funding barriers is thus consistent with the literature that relates home bias dynamics to market conditions and finds that investors increase their local holdings following funding shocks.[36]

[Place Table 6 about here]

Table 7 illustrates that the importance of funding barriers is also consistent with Forbes and Warnock (2012), who find that factors related to investors' risk taking capacity are more important in explaining extreme capital flows than, for instance, capital controls. Without providing an explicit theory of capital flows, we include our indicators as an additional explanatory variable in the Forbes and Warnock (2012) regressions.[37] We find that higher CFB^j is significantly positively associated with sharp decreases in gross capital inflows (sudden stops) and significantly negatively associated with sharp increases in gross capital outflows (flights), controlling for the explanatory variables proposed by the authors. In particular, we control for the VXO implied volatility index, which itself is often viewed as a measure of global funding liquidity. The sign of the coefficients on CFB^j in each regression is in line with the signs conjectured by the authors for risk factors.

[Place Table 7 about here]

among others, for examples of IOR use in the analysis of mutual fund trading.

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

[37]Because of data availability, our sample is somewhat smaller compared to the authors' sample, both in the cross section and in the time series.

4.3 Robustness

The literature has proposed several alternative explanations for the flatness of the security market line.[38] To verify our results without relying on BAB portfolios, we repeat our main analysis after constructing the funding barrier indicators through a different approach. Instead of expected BAB returns, we measure the effect of funding conditions with the deviations of government bond yields from a fitted yield curve (term structure noise), taken from Malkhozov et al. (2019). Due to data availability of the international government bonds, this measure is only available for a cross-section of six highly developed markets.[39] The alternative funding barrier indicator, referred to as ΔNoise, is constructed similarly to the CFB indicator:

$$\Delta\text{Noise}_t^j = \left| \sum_{h \in \mathcal{J}} w_t^h \; Illiq_t^h - Illiq_t^j \right|,$$

where w_t^h is the weight of country h in the world market portfolio and $Illiq_t^h$ is the measure of funding liquidity in each country h at at date t.

As shown in Table 8, we find a strong positive relationship between the alternative indicator and the SEG index in the panel of six developed markets for which yield curve noise measures are available. This relationship remains significant in the sub-sample that excludes the global financial crisis of 2007–2009 and also when we control for the TED spread. These results further support the role of funding frictions for market segmentation.

[Place Table 8 about here]

[38]These explanations include, but are not limited to, 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 et al., 2017), trading activity of arbitrageurs (Huang, Lou, and Polk, 2018) and money illusion (Cohen, Polk, and Vuolteenaho, 2005).

[39]The dataset includes Canada, Germany, Japan, Switzerland, United Kingdom, and United States.

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 show that funding barriers are an important driver of international financial integration and, importantly, of the financial integration reversals documented in the literature. Moreover, we find support for the importance of funding barriers to international investments by studying institutional portfolio holdings and extreme capital flows at times of financial stress.

We show that international investment barriers that stem from funding frictions are different from the barriers already explored in the literature, such as financial development and credit. Indeed, funding frictions identified in our paper help explain the transitory increases in market segmentation that are not related to the previously studied determinants of market integration. Focusing on funding frictions is important going forward, as most of other impediments affecting international investments have been reduced and in some cases eliminated.

In the wake of the global financial crisis, a vast literature has highlighted the considerable role played by funding constraints for asset prices. Our evidence shows that it is also critical to take this dimension into account when studying international stock market integration. From a policy standpoint, the importance of cross-border funding barriers stems in part from the regulatory treatment of cross-border positions relevant for banks, broker-dealers, investment funds, and ultimately the whole financial intermediary sector. In this regard, our work provides a new element for consideration in the cost-benefit analysis of financial regulation. To explicitly consider the role of global intermediaries in shaping financial integration is thus an interesting avenue for future research.

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Table 1. **BAB portfolios:** The table reports the number of firms (Firms), the number of observations (Obs.), the average monthly return in percent (Mean), the monthly return volatility (Vol.), the 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 28 emerging markets (EM). The last column reports the correlations of each country BAB portfolio returns with the global BAB portfolio returns (ρ_{BAB}). The global BAB portfolio is the value-weighted average of country BAB portfolios. Data are from DataStream and run from January 1973 to October 2014.

Country	Firms	Obs.	Mean	Vol.	β Sprd.	ρ_{BAB}	Country	Firms	Obs.	Mean	Vol.	β Sprd.	ρ_{BAB}
Australia	2,525	438	1.53	4.35	0.79	0.28	Argentina	107	191	0.45	5.81	0.37	0.14
Austria	161	432	1.08	5.26	0.44	0.20	Brazil	258	179	1.16	4.89	0.38	0.01
Belgium	243	438	0.91	3.80	0.52	0.39	Chile	258	240	0.42	5.23	0.70	0.08
Canada	3,815	438	1.25	5.37	0.78	0.39	China	2,578	192	1.28	11.05	1.00	0.01
Denmark	312	437	1.01	5.39	0.47	0.32	Colombia	81	186	-0.29	10.24	0.24	0.03
Finland	203	256	0.83	4.63	0.58	0.44	Czech Republic	85	188	2.33	15.11	0.92	0.13
France	1,599	438	0.97	3.94	0.53	0.53	Egypt	128	153	2.12	8.85	0.77	0.01
Germany	1,390	438	0.91	3.31	0.59	0.53	Greece	374	234	1.07	8.12	0.50	0.05
Hong Kong	1,078	438	0.68	4.45	0.55	0.21	Hungary	62	205	1.07	6.29	0.43	0.15
Ireland	104	438	1.07	6.67	0.72	0.23	India	2,672	234	0.07	10.72	0.88	0.12
Italy	506	438	0.80	3.29	0.50	0.38	Indonesia	538	225	0.59	6.13	0.43	0.09
Japan	4,823	438	0.80	3.47	0.53	0.55	Israel	487	198	1.39	3.85	0.56	0.30
Netherlands	293	438	1.47	4.01	0.52	0.52	Malaysia	1,178	282	1.30	3.59	0.55	0.19
New Zealand	200	255	1.68	5.38	0.47	0.16	Mexico	207	242	1.13	4.93	0.85	0.11
Norway	437	354	1.34	4.84	0.51	0.33	Morocco	79	168	1.84	11.29	0.57	0.10
Singapore	811	438	1.07	3.64	0.54	0.19	Pakistan	210	204	2.04	10.22	0.83	0.04
Spain	270	268	0.99	3.63	0.58	0.52	Peru	168	186	3.67	10.87	1.53	-0.08
Sweden	703	330	1.21	4.50	0.48	0.52	Philippines	241	259	1.18	7.17	0.46	0.14
Switzerland	372	438	0.98	3.68	0.60	0.44	Poland	541	184	1.13	3.84	0.38	0.30
United Kingdom	3,916	438	1.14	3.55	0.56	0.62	Portugal	132	234	1.73	8.40	0.77	0.21
United States	16,406	438	0.95	2.46	0.69	0.82	Romania	142	151	3.76	12.92	0.53	0.22
							Russian Federation	500	138	1.63	8.05	0.64	0.18
							Slovenia	58	125	0.70	9.88	0.41	0.16
							South Africa	681	438	1.34	9.24	0.65	0.17
							South Korea	2,116	262	1.44	6.43	0.56	0.15
							Taiwan	1,914	254	0.01	6.11	0.56	0.26
							Thailand	698	270	1.07	5.47	0.77	0.18
							Turkey	386	257	1.10	10.37	0.43	0.02
Mean DM	1,912	403	1.08	4.27	0.57	0.41	Mean EM	602	217	1.31	8.04	0.63	0.12

Table 2. **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.

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

	All	DM	EM	Ex. 07-09	All	Ex. 07-09
CFB^j	0.562**	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 3. **Funding barriers and market integration reversals:** This table reports the coefficients of the probit panel regressions of the reversals in the Bekaert et al. (2011) segmentation index (SEG) on the cross-border funding barrier indicator (CFB). Reversals are defined 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 years 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.

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

	All	DM	EM	Ex. 07-09	All	Ex. 07-09
CFB^j	0.115**	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

Table 4. Funding barriers and market integration reversals with alternative measures: This table reports the coefficients of the probit panel regressions of reversals in the Pukthuanthong and Roll (2009) integration measure, Carrieri et al. (2013) integration measure, and ADR parity violations index (ADRP) on the cross-border funding barrier indicator (CFB). Reversals are defined as periods of large decreases in integration measures. Regressions in the first, third and fifth columns are over the full time sample (January 1978 to October 2014); regressions in the second, fourth and sixth columns exclude the years 2007 to 2009. Other regressors include foreign investment barrier proxies (investment profile, capital account openness, market capitalization to GDP), and lagged local market index return (Market Return$^j_{-1}$). P-values are estimated using double clustered standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

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

	Pukthuanthong and Roll (2009)		Carrieri et al. (2013)		ADRP	
	All	Ex. 07-09	All	Ex. 07-09	All	Ex. 07-09
CFB^j	0.090**	0.129***	0.424***	0.425***		
	(0.044)	(0.047)	(0.134)	(0.140)		
CFB^{avg}					5.769***	3.830**
					(1.302)	(1.767)
Investment Profile^j	−0.043***	−0.083***	−0.055***	−0.053***		
	(0.008)	(0.008)	(0.014)	(0.015)		
Capital Account Openness^j	0.859	−1.321	3.124**	5.652***		
	(0.896)	(0.981)	(1.458)	(1.605)		
Market Cap. to GDP^j	0.222	0.170	−0.360	−2.409***		
	(0.186)	(0.237)	(0.381)	(0.466)		
Market Return$^j_{-1}$	−1.292***	−0.960***	0.482***	0.350***		
	(0.077)	(0.083)	(0.091)	(0.096)		
World Market Return					−0.105***	−0.085*
					(0.038)	(0.048)
World GDP Growth					0.177	0.645*
					(0.210)	(0.356)
World Growth Uncertainty					1.638	2.687**
					(1.059)	(1.161)
Observations	14,289	12,563	4,788	4,216	360	324
McFadden's Pseudo R^2	0.046	0.036	0.043	0.049	0.147	0.086

Table 5. Determinants of cross-border funding barrier indicators: The table reports slope coefficients from panel regressions of the CFB indicators on the TED spread (TED) and two proxies of funding barrier level κ: the share of a country's market capitalization that cannot be traded on margin by U.S. investors (1-Marginability^{j}) and the market capitalization of U.S. and non-U.S. primary dealers in the Federal Reserve Bank of New York counterparty network (Global Dealers^{j}). Regression (1) includes country fixed effects. Other 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). Regression (3) also includes local stock market return volatility and world market return volatility. Regression (4) excludes the 2007 to 2009 period, regression (5) excludes the U.S. from the sample while regressions (8) and (9) use the subsample of developed markets. P-values are estimated using double clustered standard errors (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\mathrm{CFB}_t^j = \alpha^{(j)} + \delta_1 \mathrm{TED}_t + \delta_2 \left(1 - \mathrm{Marginability}_t^j\right) + \delta_3 \left(\mathrm{Global\ Dealers}_t^j \times -1\right) + \gamma \mathrm{X}_t^j + \varphi \mathrm{Y}_t + \varepsilon_t^j$$

				Ex. 07-09	Ex. U.S.				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
TED	7.771***	6.643***	9.766***	17.579***	6.709***		5.425***		6.133***
	(1.903)	(1.905)	(2.761)	(4.617)	(1.975)		(1.954)		(1.475)
1 - Marginability^{j}						0.101***	0.110***		
						(0.027)	(0.028)		
Global Dealers^{j} $\times -1$								5.806***	4.672**
								(1.931)	(2.012)
Investment Profile^{j}		1.329*	1.620**	1.966**	1.375*	1.373*	1.340*	0.972**	0.797*
		(0.780)	(0.796)	(0.885)	(0.794)	(0.767)	(0.759)	(0.416)	(0.413)
Cap. Account Openness^{j}		−0.218	−0.190	−0.215	−0.204	−0.251	−0.245	0.145	0.166
		(0.161)	(0.170)	(0.167)	(0.160)	(0.175)	(0.175)	(0.164)	(0.161)
Market Cap. to GDP^{j}		0.004	0.005	0.006	0.002	0.005	0.005	0.010	0.010
		(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)	(0.007)	(0.007)
Market Liquidity^{j}		0.241	0.255	0.252	0.241	0.263	0.266	0.157	0.179
		(0.200)	(0.193)	(0.211)	(0.200)	(0.222)	(0.222)	(0.115)	(0.114)
Private Credit^{j}		−0.026	−0.018	−0.040	−0.006	−0.045	−0.043	−0.016	−0.019
		(0.061)	(0.058)	(0.060)	(0.062)	(0.058)	(0.058)	(0.038)	(0.039)
Law and Order^{j}		−2.661	−2.481	−3.617	−2.863	−2.413	−2.513	0.921	0.846
		(2.828)	(2.993)	(2.932)	(2.825)	(3.073)	(3.083)	(2.713)	(2.740)
Market Volatility^{j}			0.829						
			(0.747)						
World Market Return		−0.386**	−0.518**	−0.368	−0.392**	−0.545***	−0.445**	−0.269**	−0.179
		(0.181)	(0.205)	(0.229)	(0.187)	(0.178)	(0.181)	(0.136)	(0.144)
World GDP Growth		−0.974	−1.327**	−4.323***	−0.894	−1.261*	−1.395**	−1.715***	−2.051***
		(0.754)	(0.634)	(1.322)	(0.776)	(0.675)	(0.629)	(0.435)	(0.417)
World Growth Uncertainty		4.047	3.719	−1.665	4.757	2.724	0.738	−11.557**	−12.349**
		(9.619)	(9.400)	(8.221)	(9.757)	(7.168)	(6.899)	(5.504)	(5.393)
World Market Volatility			−0.049						
			(0.031)						
Country FE	Yes								
Observations	12,921	12,667	12,667	10,941	12,324	12,131	12,131	6,937	6,937
Adjusted R^2	0.191	0.041	0.043	0.056	0.038	0.040	0.042	0.026	0.032

Table 6. Foreign Institutional Ownership and market integration reversals: This table reports the coefficients of the panel regressions of the changes in institutional ownership ratios (IOR) of fund^i in stock$_k$ during integration reversal periods. Fund holdings are from FactSet Lion Share database. β_k is the beta of asset k with respect to the global market portfolio. 1_{Reversal_t} is a dummy that identifies the reversal periods. Reversal months are those identified for the Bekaert et al. (2011) segmentation index (SEG) for the developed markets as in Section 4.1. $1_{\text{Foreign}^i_k}$ is a dummy that takes a value of one, if fund^i and stock$_k$ do not reside in the same country. The first column reports the results for all open-end funds (All Funds), the second column – for U.S. open-end funds (U.S. Funds), the third column – for index funds. Data are from January 2003 to October 2014. P-values are estimated using double clustered standard errors (reported in parenthesis) by stock-fund type and time. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$\begin{aligned}\Delta\text{IOR}^i_{k,t} &= \delta_1\beta_k + \delta_2 1_{\text{Reversal}_t} + \delta_3 1_{\text{Foreign}^i_k} \\ &\quad + \phi_1\beta_k \times 1_{\text{Reversal}_t} + \phi_2\beta_k \times 1_{\text{Foreign}^i_k} + \phi_3 1_{\text{Reversal}_t} \times 1_{\text{Foreign}^i_k} \\ &\quad + \gamma\,\beta_k \times 1_{\text{Reversal}_t} \times 1_{\text{Foreign}^i_k} + \varepsilon^i_{k,t}\end{aligned}$$

	All Funds	U.S. Funds	Index Funds
β_k	0.034	0.181**	−0.024**
	(0.066)	(0.092)	(0.012)
1_{Reversal_t}	0.807***	0.923***	0.057*
	(0.215)	(0.175)	(0.032)
$1_{\text{Foreign}^i_k}$	0.081	0.033	−0.114***
	(0.067)	(0.154)	(0.025)
$\beta_k \times 1_{\text{Reversal}_t}$	−0.831***	−1.118***	0.013
	(0.200)	(0.195)	(0.025)
$\beta_k \times 1_{\text{Foreign}^i_k}$	−0.073	−0.054	0.003
	(0.050)	(0.083)	(0.019)
$1_{\text{Reversal}_t} \times 1_{\text{Foreign}^i_k}$	−0.578***	−0.685***	−0.098***
	(0.158)	(0.155)	(0.033)
$\beta_k \times 1_{\text{Reversal}_t} \times 1_{\text{Foreign}^i_k}$	0.440***	0.879***	0.001
	(0.130)	(0.167)	(0.028)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	3,100,039	1,479,566	1,564,698
Adjusted R^2	0.012	0.010	0.015

Table 7. Funding barriers and extreme capital flows: This table reports the coefficients of the probit panel regressions of the episodes of extreme global capital flows identified in Forbes and Warnock (2012): surges are periods of sharp increases in gross capital inflows, stops are periods of sharp decreases in gross capital inflows, flights are periods of sharp increases in gross capital outflows, and retrenchments are periods of sharp decreases in gross capital outflows. Data on these episodes are from Kristin J. Forbes website for the period of 1985 to 2009 at the quarterly frequency. Explanatory variables, with the exception of CFB, are defined in Section 3.2 of Forbes and Warnock (2012). For variables that are available at monthly frequency, including CFB, we use quarterly averages. Variables that are available at the annual frequency are interpolated linearly to obtain their quarterly values. Estimates are obtained using the complementary logarithmic (cloglog) framework with robust standard errors clustered by country (reported in parenthesis). ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

$$1_{\text{Episode}_t^j} = \Phi_{j,t-1}^{\text{CFB}} B_{CFB} + \Phi_{t-1}^{\text{Global}} B_G + \Phi_{t-1}^{\text{Contagion}} B_C + \Phi_{j,t-1}^{\text{Domestic}} B_D$$

	Surges	Stops	Flights	Retrenchments
CFB^j	−0.346	1.111***	−1.034**	0.477
	(0.364)	(0.355)	(0.521)	(0.378)
Global factors:				
Risk	−0.065***	0.025***	−0.039***	0.024***
	(0.013)	(0.008)	(0.014)	(0.008)
Liquidity	2.206	−1.754**	0.919	0.267
	(1.384)	(0.775)	(1.368)	(1.046)
Interest Rate	0.110	−0.090	0.065	−0.071
	(0.076)	(0.064)	(0.088)	(0.048)
Growth	−0.037	0.044**	−0.030	0.041***
	(0.023)	(0.018)	(0.022)	(0.013)
Contagion:				
Region	0.549***	0.551**	0.368*	0.245
	(0.210)	(0.230)	(0.215)	(0.169)
Trade	0.014	0.014***	0.024***	0.023***
	(0.010)	(0.004)	(0.006)	(0.005)
Domestic factors:				
Financial System	−0.002	0.000	−0.003*	−0.001
	(0.002)	(0.001)	(0.002)	(0.001)
Capital Controls	0.130	−0.056	−0.108	−0.010
	(0.083)	(0.059)	(0.083)	(0.071)
Debt GDP	0.001	−0.002	−0.003	−0.004
	(0.002)	(0.003)	(0.002)	(0.003)
Growth Shock	0.108*	−0.055**	0.055	−0.054*
	(0.058)	(0.023)	(0.034)	(0.031)
GDP Capita	−0.201**	0.205***	−0.058	0.237**
	(0.085)	(0.047)	(0.071)	(0.094)
Observations	2665	2665	2665	2665

Table 8. Alternative cross-border funding barrier indicator and market segmentation: This table reports the slope coefficients from panel regressions of the Bekaert et al. (2011) segmentation index (SEG) on the alternative cross-border funding barrier indicator (ΔNoise). ΔNoise is constructed using the local funding liquidity measures proposed in Malkhozov et al. (2019). Data are from January 1978 to October 2014. Columns two and four exclude the years 2007 to 2009 (Ex. 07-09). 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.

$$\text{SEG}^{j}_{t} = \alpha + \delta\Delta\text{Noise}^{j}_{t} + \gamma\text{X}^{j}_{t} + \varphi\text{TED}_{t} + \varepsilon^{j}_{t}$$

	All	Ex. 07-09	All	Ex. 07-09
ΔNoise^{j}	0.071***	0.071***	0.061***	0.056***
	(0.017)	(0.017)	(0.016)	(0.017)
Investment Profile^{j}	0.042	0.053	0.045	0.077*
	(0.039)	(0.044)	(0.037)	(0.041)
Capital Account Openness^{j}	−0.030***	−0.030***	−0.027***	−0.023***
	(0.006)	(0.006)	(0.007)	(0.007)
Market Cap. to GDP^{j}	−0.007***	−0.008***	−0.007***	−0.007***
	(0.002)	(0.002)	(0.001)	(0.002)
Market Return$^{j}_{-1}$	−0.607**	−0.629**	−0.536***	−0.718***
	(0.256)	(0.289)	(0.205)	(0.220)
TED			0.416***	0.816***
			(0.149)	(0.195)
Observations	1,986	1,770	1,986	1,770
Adjusted R^2	0.397	0.402	0.429	0.481

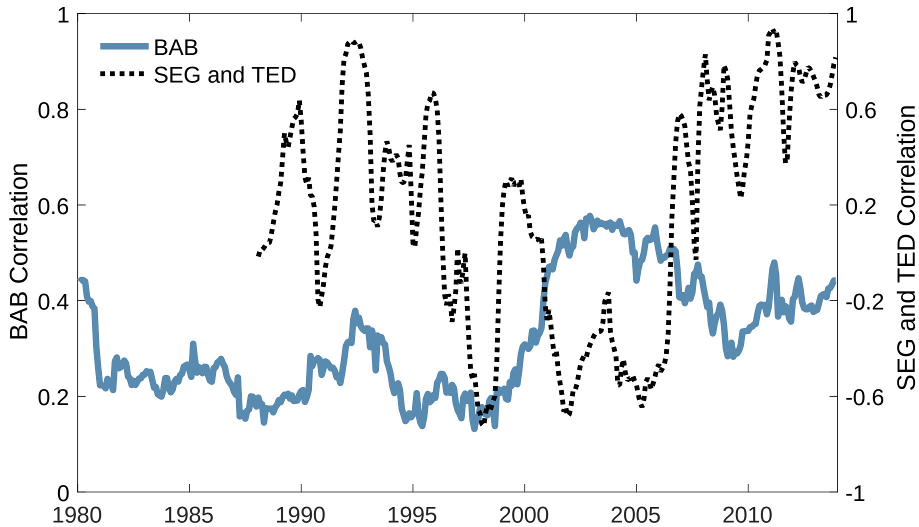

Figure 1. Correlation between market segmentation and the TED spread, and BAB return correlations: This figure shows the equally weighted average of the correlations between developed market BAB portfolio returns and the global BAB returns (solid line), and the correlation between the Bekaert et al. (2011) segmentation measure (SEG) for developed markets and the TED spread (dotted line). Global BAB returns are the value-weighted average of all country BAB portfolio returns. Correlations are computed over a two-year rolling window.

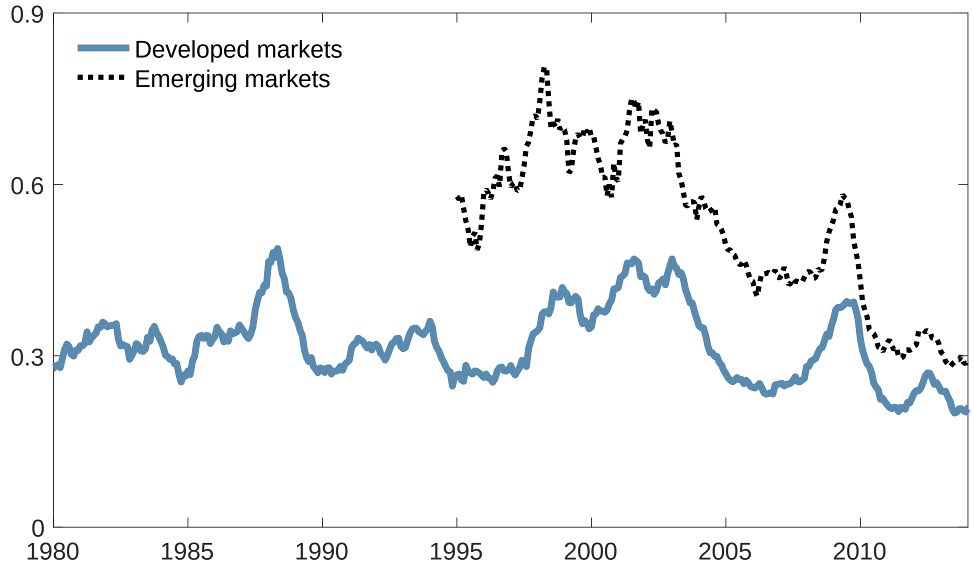

Figure 2. **The cross-border funding barrier indicators:** This figure plots the monthly equal-weighted averages of the cross-border funding barrier (CFB) indicators for developed markets (solid line) and emerging markets (dotted line). The y-axis units are those of BAB returns divided by the beta spread and market volatility.

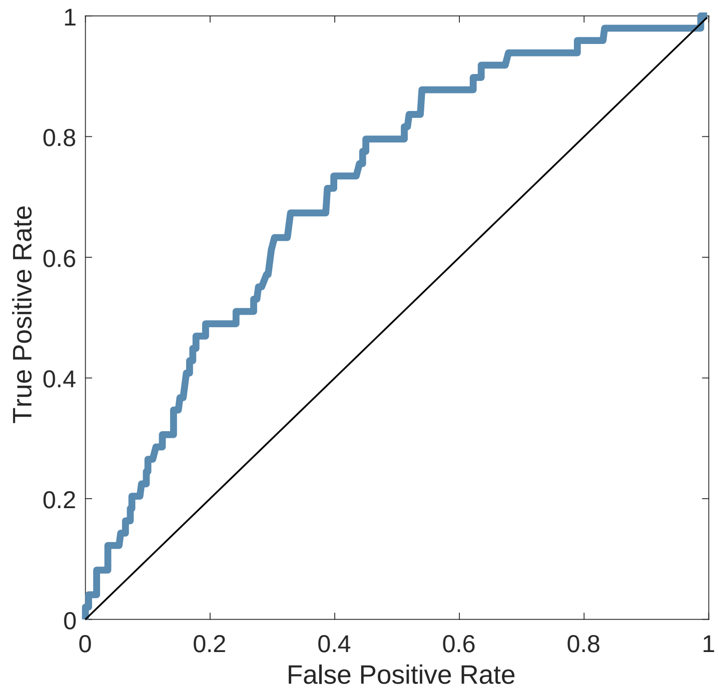

Figure 3. **Receiver operating characteristic curve:** The figure plots the receiver operating characteristic curve for reversals in market integration as implied by the SEG Index of Bekaert et al. (2011) detected using the cross-border funding barrier (CFB) measure (solid line). Reversals are defined 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.

Appendix

A Additional Institutional Perspective

Regulations regarding the conduct of broker-dealers and their relationship with institutional investors provide support for the existence of cross-border funding constraints. Such regulations highlight how restrictions to access funding in global markets exist with respect to both the demand side and the supply side.

On the demand side, the general principle of SEA rule 15c3-1 is that a security can be included in the computation of regulatory net capital of broker-dealers if it has a ready market. With respect to cross-border securities, two fundamental aspects come into play: the jurisdiction of the issuers and the currency of the security. With respect to the first, the rule considers highly rated foreign government debt security, money market securities of all the major developed markets and Mexico and certain foreign equity securities as securities that meet the criteria for readily marketable securities and are subject to the same haircut charges as domestic securities. More specifically for equity securities of a foreign issuer, the rule explicitly considers those that are listed on the FTSE World Index as eligible for haircut purposes in the amount of 15 percent. Haircut charges are then applied on net foreign currency balances in the amount of 6 percent for any of the five major foreign currencies (Euro, British pound, Swiss franc, Canadian dollar and Japanese yen) and 20 percent in all other foreign currencies. Both aspects further contribute to additional charges in the amount of 7 and 0.5 percent due to country concentration. The rule also contemplates multiples of the haircut charges for readily marketable securities in case of fails to deliver of foreign issued, foreign settled securities.

All these attributes, jurisdiction of the issuer, currency volatility and country/currency concentration are also at play in the rules of self-regulatory organizations. Inspired by the same rationale, in FINRA rule 4210 foreign products are eligible to be effected in a portfolio margin account of a customer on the same basis as domestic securities, thus following regulation T or other FINRA rules, provided they fall into the ready market criteria of the above mentioned SEA rule. The Federal Reserve Board then provides a list of Foreign Margin Stocks (`https://www.federalreserve.gov/boarddocs/foreignmargin/`) that have met the criteria under regulation T and since 1993 all stocks in the FTSE World Index Series have qualified for margin treatment. The SEC has very recently further expanded this list to include for those same countries of the FTSE Index some other securities that qualify based on additional criteria of market capitalization, volume and availability of price information to U.S. broker-dealers from the foreign securities exchange on which the security is traded. The Options Clearing Corporation publishes this list daily (`https://www.theocc.com/risk-management/rbh/documentation.jsp`). When extending credit secured by foreign securities, broker-dealers could consider imposing higher house maintenance requirements as warranted by risk management needs linked to concentrations, volatility, and liquidity. Based on private conversations with a major broker-dealer, it is clear that in practice for their customers purchasing foreign securities through a margin account is effectively blocked outside developed markets while opportunities for synthetic leverage is offered on the broader set of marginable foreign securities. Taken together, the total of these regulations indicates that on the demand side, access to funding for foreign (non-U.S.) securities is more expensive (requires more cash) than dealing in U.S. securities, for a portfolio manager and upstream at the broker-dealer level.

Access to funding for foreign securities is also highly regulated on the supply side of financial markets where existing regulations basically hinder opportunities for a U.S. investor to rely on funding through a foreign broker-dealer outside the US jurisdiction. In this respect, SEC rules require foreign broker-dealers who are members of a foreign securities exchange to register with the SEC when effecting securities with U.S. institutional investors. Furthermore, SEA rule 15a-6 explicitly prohibits foreign broker-dealers to solicit business of US institutional investors and requires any direct contacts involving the execution of transactions through a U.S. registered broker-dealer intermediary. Rules concerning activity with U.S. investors call for such foreign broker-dealers to strike an agreement such an omnibus agreement with a US registered broker-dealer. According to statistics compiled by the SEC Office of Economic Analysis, in 1973 there were approximately 28 non-Canadian broker-dealers affiliated with foreign broker-dealers or foreign banks registered in the U.S. In 2014, our own analysis estimates 72 foreign broker-dealers, in addition to 40 Canadians, registered with the SEC. However a large majority of these has introducing arrangements and operates in limited lines of business, relying on a carrying broker-dealer's infrastructure to handle customers accounts, funds or securities. Only the largest foreign brokerage firms under US jurisdiction are full service broker-dealers and have the infrastructure to provide global asset financing. The global expansion of non-US banks in the US has paralleled the expansion of U.S. banks abroad. In fact the banks part of the network of primary dealers in the U.S. also have a similar role in other major financial centers outside their own country of incorporation. For example, currently HSBC is a primary dealer in Canada, Deutsche Bank in Japan, while Goldman Sachs and JP Morgan operate as primary dealers in Japan (more specifically 12 out of 21 dealers with the MoF are foreign companies as of 2016) and Europe (14 non European institutions as of 2017).

We have focused on regulations in place in US financial markets, which ultimately affect global investors, and for US investors, which arguably represent the largest share of investing activities around the world. However the same general regulatory principles are at play in smaller financial markets, like for example Canada. On the demand side, rule DMR 100 explicitly allows as eligible for margin only those foreign securities that are constituents of major stock indices in developed markets, such as for example the CAC 40. As a result, the set of marginable securities for Canadian residents is substantially smaller than the one available to U.S. investors. The rule also requires margining foreign exchange positions in different currency groups based on a number of criteria, including volatility, and contemplates a currency concentration charge. On the supply side, jurisdictional registration requirements generally restrict a broker registered only in a foreign jurisdiction from dealing with Canadian resident investors.

In all, these rules highlight that funding constraints matter in a global setting. Furthermore, they show how being able to access funding for a foreign security (funding liquidity) is different from both the investibility and the market-wide liquidity of such foreign security. The latter (bid-ask spread) is a characteristic that does not affect a foreign investor differently from a domestic investor, at least in terms of regulations. Investibility pertains to requirements such as foreign ownership restrictions at the security level coupled with market capitalization and liquidity screens. As a result, investible securities from countries such as India or China can be purchased in a cash account but are not eligible for a margin account.

B Proofs

Equilibrium expected returns. Investor i's first order condition:

$$\mathrm{E}_t\left[D_{t+1}^k + P_{t+1}^k - RP_t^k\right] - \alpha \mathrm{Cov}_t\left[D_{t+1}^k + P_{t+1}^k, \sum_{s\in\mathcal{K}}\left(D_{t+1}^s + P_{t+1}^s\right)x_{i,t}^s\right] - \psi_{i,t}m_i^k P_t^k = 0. \tag{14}$$

Summing (14) across i, we obtain

$$\sum_{i\in\mathcal{I}}\mathrm{E}_t\left[D_{t+1}^k + P_{t+1}^k - RP_t^k\right] - \alpha\sum_{i\in\mathcal{I}}\mathrm{Cov}_t\left[D_{t+1}^k + P_{t+1}^k, \sum_{s\in\mathcal{K}}\left(D_{t+1}^s + P_{t+1}^s\right)x_{i,t}^s\right] - \sum_{i\in\mathcal{I}}\psi_{i,t}m_i^k P_t^k = 0.$$

Next, imposing market clearing $\sum\limits_{i\in\mathcal{I}} x_{i,t}^s = 1$ for all s and dividing by n, we obtain

$$\mathrm{E}_t\left[D_{t+1}^k + P_{t+1}^k - RP_t^k\right] - \frac{\alpha}{n}\mathrm{Cov}_t\left[D_{t+1}^k + P_{t+1}^k, \sum_{s\in\mathcal{K}}\left(D_{t+1}^s + P_{t+1}^s\right)\right] - \sum_{i\in\mathcal{I}}\frac{\psi_{i,t}}{n}m_i^k P_t^k = 0. \tag{15}$$

Finally, denoting $R_{t+1}^k = \frac{D_{t+1}^k + P_{t+1}^k}{P_t^k}$ and dividing by P_t^k, we obtain (5):

$$\mathrm{E}_t\left[R_{t+1}^k - R\right] = \frac{\alpha}{n}\mathrm{Cov}_t\left[R_{t+1}^k, \sum_{s\in\mathcal{K}}\left(D_{t+1}^s + P_{t+1}^s\right)\right] + \sum_{i\in\mathcal{I}}\frac{\psi_{i,t}}{n}m_i^k.$$

Expected returns also have a CAPM representation. Denoting $R_{t+1}^m = \frac{\sum_{s\in\mathcal{K}}\left(D_{t+1}^s + P_{t+1}^s\right)}{\sum_{s\in\mathcal{K}} P_t^s}$, equation (5) can be written as

$$\mathrm{E}_t\left[R_{t+1}^k - R\right] - \frac{\alpha\sum_{s\in\mathcal{K}}P_t^s}{n}\mathrm{Cov}_t\left[R_{t+1}^k, R_{t+1}^m\right] - \sum_{i\in\mathcal{I}}\frac{\psi_{i,t}}{n}m_i^k = 0. \tag{16}$$

In addition, summing (15) across s

$$\sum_{s\in\mathcal{K}}\mathrm{E}_t\left[D_{t+1}^k + P_{t+1}^k - RP_t^k\right] - \sum_{s\in\mathcal{K}}\frac{\alpha}{n}\mathrm{Cov}_t\left[D_{t+1}^k + P_{t+1}^k, \sum_{s\in\mathcal{K}}\left(D_{t+1}^s + P_{t+1}^s\right)\right] - \sum_{s\in\mathcal{K}}\sum_{i\in\mathcal{I}}\frac{\psi_{i,t}}{n}m_i^k P_t^k = 0,$$

and then dividing by $\sum\limits_{s\in\mathcal{K}} P_t^s$ gives us

$$\mathrm{E}_t\left[R_{t+1}^m - R\right] - \frac{\alpha\sum_{s\in\mathcal{K}}P_t^s}{n}\mathrm{Var}_t\left[R_{t+1}^m\right] - \sum_{s\in\mathcal{K}}\frac{P_t^k}{\sum_{s\in\mathcal{K}}P_t^s}\sum_{i\in\mathcal{I}}\frac{\psi_{i,t}}{n}m_i^k = 0 \tag{17}$$

Combining (16) and (17), we obtain the margin-CAPM:

$$\mathrm{E}_t\left[R_{t+1}^k - R\right] = \beta_t^k \mathrm{E}_t\left[R_{t+1}^m - R_t\right] + \sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k - \beta_t^k \sum_{s\in\mathcal{K}} \theta_t^k \sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k, \tag{18}$$

where $\beta_t^k = \frac{\mathrm{Cov}_t\left[R_{t+1}^k, R_{t+1}^m\right]}{\mathrm{Var}_t\left[R_{t+1}^m\right]}$ and $\theta_t^k = \frac{P_t^k}{\sum_{s\in\mathcal{K}} P_t^s}$.

The country-j BAB portfolio return is defined as

$$R_{t+1}^{bab,j} = 1/\beta_t^{l,j}\left(R_{t+1}^{l,j} - R\right) - 1/\beta_t^{h,j}\left(R_{t+1}^{h,j} - R\right). \tag{19}$$

where h and l index portfolios with high high and low beta stocks, respectively. From (18) and (19), we obtain the expected return on the BAB portfolio:

$$\mathrm{E}_t\left[R_{t+1}^{bab,j}\right] = \left(1/\beta_t^{l,j} - 1/\beta_t^{h,j}\right)\sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k. \tag{20}$$

Combining (20) and (3), we obtain (6) and (7), from which Proposition 1 directly follows.

BAB return correlation. From (15), the price of any stock k is

$$P_t^k = \frac{\mathrm{E}_t\left[D_{t+1}^k + P_{t+1}^k\right] - \frac{\alpha}{n}\mathrm{Cov}_t\left[D_{t+1}^k + P_{t+1}^k, \sum_{s\in\mathcal{K}}\left(D_{t+1}^s + P_{t+1}^s\right)\right]}{R + \sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k},$$

which can be written as

$$P_t^k = \left(R + \sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k\right)^{-1} \Pi^k, \tag{21}$$

where $\Pi^k = \mathrm{E}_t\left[D_{t+1}^k + P_{t+1}^k\right] - \frac{\alpha}{n}\mathrm{Cov}_t\left[D_{t+1}^k + P_{t+1}^k, \sum_{s\in\mathcal{K}}\left(D_{t+1}^s + P_{t+1}^s\right)\right]$ is constant with i.i.d. shocks. Using (21), the realized return of stock k

$$R_{t+1}^k = \frac{D_{t+1}^k + P_{t+1}^k}{P_t^k} = \frac{D_{t+1}^k\left(R + \sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k\right)}{\Pi^k} + \frac{R + \sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k}{R + \sum_{i\in\mathcal{I}} \frac{\psi_{i,t+1}}{n} m_i^k}. \tag{22}$$

Approximating (22), for illustration, around $\psi_{i,t} = 0$, $\forall i, t$, and $D_{t+1}^k = \mathrm{E}_t\left[D_{t+1}^k\right]$

$$R_{t+1}^k - 1 \approx A_1 D_{t+1}^k + A_2 \sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k + A_3\left(\sum_{i\in\mathcal{I}} \frac{\psi_{i,t+1}}{n} m_i^k - \sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k\right), \tag{23}$$

where $A_1 = \frac{R}{\Pi^k}$, $A_2 = \frac{\mathrm{E}_t\left[D_{t+1}^k\right]}{\Pi^k}$, and $A_3 = -\frac{1}{R}$. From (22) and (23), realized returns depend on the realization of dividend D_{t+1}^k, the shadow cost of date-t constraint $\sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k$ which determines the expected return, and the change in expected return due to $\sum_{i\in\mathcal{I}} \frac{\psi_{i,t+1}}{n} m_i^k - \sum_{i\in\mathcal{I}} \frac{\psi_{i,t}}{n} m_i^k$.

For two BAB portfolios composed of stocks from two respective countries, consider the correlation between the discount rate component of their returns given by (6) and (7):

$$\operatorname{Corr}\left[m\psi_t + \kappa\psi_{f,t}, m\psi_t\right] = \sqrt{\frac{1}{1 + \frac{1-\operatorname{Corr}^2\left[\psi_t,\psi_{f,t}\right]}{\left(\frac{m}{\kappa}\sqrt{\frac{\operatorname{Var}_t[\psi_t]}{\operatorname{Var}_t\left[\psi_{f,t}\right]}}+\operatorname{Corr}\left[\psi_t,\psi_{f,t}\right]\right)^2}}},$$

which is increasing in κ, everything else being equal.

Portfolio tilt. Combining (14) and (15), we obtain

$$\alpha \operatorname{Cov}_t\left[R_{t+1}^k, \sum_{s\in\mathcal{K}} \left(D_{t+1}^s + P_{t+1}^s\right)\left(x_{i,t}^s - \frac{1}{n}\right)\right] = \sum_{u\in\mathcal{I}} \frac{\psi_{u,t}}{n} m_u^k - \psi_{i,t} m_i^k. \tag{24}$$

Using (24) and the decomposition of stock-k return into the systematic and the idiosyncratic components $R_{t+1}^k = \beta_t^k R_{t+1}^m + \eta_{t+1}^k$:

$$\alpha \operatorname{Cov}_t\left[\eta_{t+1}^k, \sum_{s\in\mathcal{K}} \left(D_{t+1}^s + P_{t+1}^s\right) x_{i,t}^s\right] = \sum_{u\in\mathcal{I}} \frac{\psi_{u,t}}{n} m_u^k - \psi_{i,t} m_i^k - \beta_t^k \sum_{s\in\mathcal{K}} \left(\sum_{u\in\mathcal{I}} \frac{\psi_{u,t}}{n} m_u^s - \psi_{i,t} m_i^s\right)\theta_t^s. \tag{25}$$

For investor $i \in \mathcal{I}_f$ and stock $k \in \mathcal{K}_d$, (25) becomes

$$\alpha \operatorname{Cov}_t\left[\eta_{t+1}^k, \sum_{s\in\mathcal{K}} \left(D_{t+1}^s + P_{t+1}^s\right) x_{i,t}^s\right] = \left(1 - \beta_t^k\right)\left(\psi_t - \psi_{i,t}\right) m + \left(1 - \beta_t^k \theta_t^d\right)\left(\psi_{f,t} - \psi_{i,t}\right)\kappa, \tag{26}$$

where $\theta_t^d = \frac{\sum_{s\in\mathcal{K}_d} P_t^s}{\sum_{s\in\mathcal{K}} P_t^s}$. Equation shows (26) shows the covariance of investors' portfolio pay-off with the idiosyncratic risk of stock k, providing a measure of portfolio tilt towards stock k relative to the marker portfolio. The term $\left(1 - \beta_t^k\right)\left(\psi_t - \psi_{i,t}\right) m$ represents the portfolio tilt towards high beta stocks arising from funding constraints that apply to all stocks. The term $\left(1 - \beta_t^k \theta_t^d\right)\left(\psi_{f,t} - \psi_{i,t}\right)\kappa$ represents the effect of funding barriers that apply to country-f investor's positions in country-d stocks and accounts for Proposition 3. Note that $\psi_{f,t} = \sum_{i\in\mathcal{I}_f} \frac{\psi_{i,t}}{n}$ is smaller than the average Lagrange multiplier of country-f investors and, hence, we have $\psi_{f,t} - \psi_{i,t} < 0$ for a large number of country-f investors.

Other investment barriers. With objective (9), investor i's first order condition:

$$\operatorname{E}_t\left[D_{t+1}^k + P_{t+1}^k - RP_t^k\right] - \alpha \operatorname{Cov}_t\left[D_{t+1}^k + P_{t+1}^k, \sum_{s\in\mathcal{K}} \left(D_{t+1}^s + P_{t+1}^s\right) x_{i,t}^s\right] - T_i^k P_t^k - \psi_{i,t} m_i^k P_t^k = 0. \tag{27}$$

Using (27) and following the same steps as above, we obtain:

$$\mathrm{E}_t\left[R^k_{t+1} - R\right] = \frac{\alpha}{n}\mathrm{Cov}_t\left[R^k_{t+1}, \sum_{s\in\mathcal{K}}\left(D^s_{t+1} + P^s_{t+1}\right)\right] + \sum_{i\in\mathcal{I}}\frac{\psi_{i,t}}{n}m^k_i + \sum_{i\in\mathcal{I}}\frac{T^k_i}{n}$$

and

$$\mathrm{E}_t\left[R^{bab,j}_{t+1}\right] = \left(1/\beta^{l,j}_t - 1/\beta^{h,j}_t\right)\left(\sum_{i\in\mathcal{I}}\frac{\psi_{i,t}}{n}m^k_i + \sum_{i\in\mathcal{I}}\frac{T^k_i}{n}\right),$$

which results in (10) and Proposition 4.

C Stock Market Data

We use 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 filters to these data, similar to Karolyi et al. (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.

We collect dollar-denominated total return index, the market capitalization, and the price-to-earnings ratios of country and global market indices at the monthly frequency from January 1973 to October 2014 from DataStream.

D 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:

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

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. $R_{t+1}^H = \boldsymbol{R}_{\boldsymbol{t+1}}^\top \boldsymbol{w}_{\boldsymbol{t}}^{\boldsymbol{H}}$, and $R_{t+1}^L = \boldsymbol{R}_{\boldsymbol{t+1}}^\top \boldsymbol{w}_{\boldsymbol{t}}^{\boldsymbol{L}}$
2. $\beta_{t+1}^H = \boldsymbol{\beta}_{\boldsymbol{t+1}}^\top \boldsymbol{w}_{\boldsymbol{t}}^{\boldsymbol{H}}$, and $\beta_{t+1}^L = \boldsymbol{\beta}_{\boldsymbol{t+1}}^\top \boldsymbol{w}_{\boldsymbol{t}}^{\boldsymbol{L}}$
3. $R_{t+1}^{BAB} = \frac{1}{\beta_t^L}\left(R_{t+1}^L - R^f\right) - \frac{1}{\beta_t^H}\left(R_{t+1}^H - R^f\right)$.

To gauge the range in the correlations and the differences among 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.

E MCMC and Gibbs Sampler Estimation

In the model defined by (11)-(13) we are looking to estimate the parameters ϕ_0, ψ_1, and the variances σ_ε^2 and σ_ϵ^2 of the normal shocks $\varepsilon_{j,t}$ and ϵ_{t+1}, respectively. Estimated betas and volatility in (12) are available from the BAB portfolio construction.

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 (11). 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_ε^2 and σ_ϵ^2, we posit inverse gamma priors with shape and scale parameters equal to 0.001.

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

$$\begin{aligned} \Psi_t | \Psi_{t-1} &\sim \mathcal{N}\Big(\phi_0 + \phi_1(\Psi_{t-1} - \phi_0), \sigma_\epsilon^2\Big) \\ R_t^{BAB} | \Psi_t, Z_t &\sim \mathcal{N}\Big(\Psi_t Z_t, \sigma_\varepsilon^2\Big), \end{aligned}$$

and the likelihood function is given by:

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

where, $\boldsymbol{\Psi} = [\Psi_1, \ldots, \Psi_T]$, $\mathbf{R^{BAB}} = [R_1^{BAB}, \ldots, R_T^{BAB}]$, 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 $(\boldsymbol{\Psi}, \phi_0, \phi_1, \sigma_\epsilon, \sigma_\varepsilon)^\top$ and $\boldsymbol{y}$ is the vector of $(\mathbf{R}^{\mathbf{BAB}}, \mathbf{Z})^\top$. 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.

F Additional Tables and Figures

Table A1. **Summary statistics (foreign investments):** The table reports for each of the 21 developed markets (DM) and 28 emerging markets (EM) the average number of securities (unique ISIN) in the portfolios of Open-End foreign funds, Non-US and US (excluding Index Funds) at any month over the period January 2003 to December 2015. The holding data are from FactSet Lion Share database. In addition, the table reports the number of constituent firms in the MSCI All Country World Index (ACWI) and DataStream Total Market Index in December 2018.

Country	Foreign Holdings		MSCI	DataStream	Country	Foreign Holdings		MSCI	DataStream
	Non-US Funds	US Funds	ACWI	Index		Non-US Funds	US Funds	ACWI	Index
Australia	102	586	69	159	Argentina	3	18		50
Austria	20	48	6	49	Brazil	80	276	53	101
Belgium	25	84	10	91	Chile	18	74	17	50
Canada	115	1087	91	249	China	79	143	463	76
Denmark	21	85	17	49	Colombia	12	31	9	50
Finland	23	87	12	50	Czech Republic	4	7	3	12
France	106	357	79	249	Egypt	11	41	3	50
Germany	137	406	64	251	Greece	16	57	6	50
Hong Kong	214	1063	47	130	Hungary	4	9	3	41
Ireland	85	156	5	38	India	131	642	78	200
Italy	51	185	23	158	Indonesia	53	204	28	50
Japan	394	2152	322	999	Israel	13	110	13	49
Netherlands	31	88	19	116	Malaysia	70	350	44	90
New Zealand	18	78	7	50	Mexico	37	105	26	90
Norway	30	129	10	50	Morocco	5	29		49
Singapore	61	319	26	100	Pakistan	16	43	3	50
Spain	34	112	22	120	Peru	6	28	3	50
Sweden	48	218	32	68	Philippines	33	104	22	49
Switzerland	52	191	38	150	Poland	30	113	20	50
United Kingdom	188	1,074	98	537	Portugal	10	28	3	49
United States	731		623	1,015	Romania	10	16		50
					Russian Federation	23	63	23	50
					Slovenia	4	9		34
					South Africa	56	190	49	70
					South Korea	148	933	114	100
					Taiwan	156	880	86	70
					Thailand	97	553	36	50
					Turkey	42	164	18	50
Mean DM	118	425	77	223	Mean EM	42	186	47	62

Table A2. **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 A3. **Variable description**

Variable	Description
Country Variables	
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.
Market Volatility	Standard deviation (monthly) of local stock market index return, 5-year rolling window. Source: Datastream.
Global Variables	
World Market Return	Global stock market index return. Source: Datastream.
World Market Volatility	Standard deviation (monthly) of global stock market index return, 5-year rolling window. Source: Datastream.
World GDP Growth	Source: World Bank World Development Indicators.
World Growth Uncertainty	The log of the cross-sectional standard deviation of real GDP growth across countries. Source: International Monetary Fund World Economic Outlook.
Funding Barrier Proxies	
Marginability	The market capitalization of firms included in the FTSE World Index over the broad market capitalization of Datastream Total Market index. Source: FTSE Russell and DataStream.
Global Dealers	The log of the market capitalization of US and non-US primary dealers counterparty of the Federal Reserve Bank of New York. Source: Federal Reserve Bank of NY and DataStream.
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.
BD Lev.	The leverage ratio of U.S. broker-dealers defined as their asset to equity values. Source: Federal Reserve Flow of Funds.
LCT	The mutual funds' leverage constraint tightness measure from Boguth and Simutin (2018). Source: Mikhail Simutin's personal website.
Noise	The deviations of government bond yields from a fitted yield curve from Hu et al. (2013a) for the U.S. and Malkhozov et al. (2019) for the U.S., the U.K., Germany, Canada, Switzerland and Japan. Source: Jun Pan's personal website and authors' data, respectively.
Foreign Currency Funding Proxies	
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).
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.
Institutional Ownership	
ΔIOR	The monthly change in the institutional ownership ratio of each asset, aggregated over foreign and domestic open-end funds. Source: FactSet Ownership.

Table A4. Marginability ratio: The table reports average, minimum and maximum of the marginability ratio constructed from the FTSE World Index for each of the 21 developed markets (DM) and 28 emerging markets (EM). The marginability ratio is defined as the market capitalization of companies listed in the FTSE World Index over the broad market capitalization of the DataStream Total Market index for that country. The column Mean_{WDI} reports the average of marginability computed instead over the total market capitalization reported in the World Bank's WDI database. Data run from June 1988 to October 2014.

Country	Mean	Min	Max	Mean_{WDI}	Country	Mean	Min	Max	Mean_{WDI}
Australia	72.54	63.97	85.32	66.14	Argentina	0	0	0	0
Austria	50.68	25.23	72.23	47.43	Brazil	45.29	0	56.12	38.66
Belgium	57.41	36.84	75.11	51.53	Chile	0	0	0	0
Canada	74.55	59.72	87.07	60.10	China	0	0	0	0
Denmark	69.26	45.88	81.65	57.08	Colombia	0	0	0	0
Finland	74.74	55.57	87.94	68.58	Czech Republic	4.83	0	35.01	4.83
France	72.68	59.05	80.84	65.96	Egypt	0	0	0	0
Germany	65.74	54.08	74.83	58.86	Greece	31.76	0	91.67	27.11
Hong Kong	44.00	24.70	54.44	36.13	Hungary	37.67	0	70.47	37.59
Ireland	65.80	25.09	87.25	61.58	India	0	0	0	0
Italy	63.28	48.94	72.38	60.68	Indonesia	0	0	0	0
Japan	68.09	53.33	78.42	67.43	Israel	35.97	0	72.54	26.48
Netherlands	73.55	51.19	80.48	67.94	Malaysia	12.19	0	46.77	9.61
New Zealand	56.57	36.12	72.39	54.25	Mexico	64.70	36.51	76.58	59.35
Norway	55.18	36.75	68.57	47.53	Morocco	0	0	0	0
Singapore	52.49	36.64	69.72	44.40	Pakistan	0	0	0	0
Spain	70.02	52.65	80.11	45.48	Peru	0	0	0	0
Sweden	80.96	63.91	91.22	58.82	Philippines	0	0	0	0
Switzerland	79.33	74.13	82.97	77.79	Poland	9.93	0	39.49	7.97
United Kingdom	85.45	75.83	88.36	82.06	Portugal	32.91	0	72.00	32.26
United States	86.86	82.44	91.86	73.16	Romania	0	0	0	0
					Russian Federation	0	0	0	0
					Slovenia	0	0	0	0
					South Africa	82.82	66.96	92.36	41.81
					South Korea	36.22	0	77.23	28.49
					Taiwan	40.38	0	87.54	40.38
					Thailand	2.90	0	32.05	2.18
					Turkey	3.36	0	30.87	3.04
Mean DM	67.58	50.57	79.20	59.66	Mean EM	15.75	3.70	31.45	12.85

Table A5. 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.

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

	All	DM	EM	Ex. 07-09	All	Ex. 07-09
CFB^j	0.775**	1.403***	0.474*	1.334***	0.641**	1.225***
	(0.325)	(0.440)	(0.261)	(0.316)	(0.306)	(0.273)
Investment 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 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 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 A6. **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 A7. CFB indicators and funding conditions: The table reports slope coefficients from panel regressions of the CFB indicators on funding liquidity proxies such as the TED spread (TED), the VIX implied volatility index (VIX), the U.S. broker-dealer leverage (BD Lev.), the Boguth and Simutin (2018) leverage constraint tightness (LCT), the Hu et al. (2013b) deviations of U.S Treasury yields from a fitted yield curve (Noise), the three-month cross-currency basis of ten currencies with available data against the U.S. dollar (CIP^j), the change in the value of the U.S. dollar against the ten currencies (ΔFX^j), and the change in the trade-weighted U.S. dollar exchange rate index (ΔTWUSD). Funding liquidity measures in columns (1)-(5) are standardized to have a mean of zero and a standard deviation of one. CIP and FX data starts in January 2000. 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). 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)	(2)	(3)	(4)	(5)	(6)	(7)
TED (standardized)	2.859***						
	(0.820)						
VIX (standardized)		3.603***					
		(1.347)					
BD Lev.× − 1 (standardized)			0.713**				
			(0.303)				
LCT (standardized)				−0.837			
				(0.564)			
Noise (standardized)					3.551***		
					(0.925)		
CIP^j						0.311***	
						(0.098)	
ΔFX^j							−0.508
							(0.522)
ΔTWUSD							2.118**
							(1.018)
Investment Profile^j	1.329*	1.151	1.258	1.268	1.268	0.895*	0.487
	(0.780)	(0.856)	(0.830)	(0.817)	(0.788)	(0.535)	(0.404)
Cap. Account Openness^j	−0.218	−0.228	−0.226	−0.226	−0.221	0.079	0.157
	(0.161)	(0.164)	(0.169)	(0.166)	(0.160)	(0.121)	(0.102)
Market Cap. to GDP^j	0.004	0.005	0.004	0.004	0.005	0.003	−0.023
	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.025)	(0.028)
Market Liquidity^j	0.241	0.259	0.219	0.219	0.245	21.120**	18.149***
	(0.200)	(0.226)	(0.190)	(0.187)	(0.213)	(8.704)	(6.972)
Private Credit^j	−0.026	−0.032	−0.023	−0.023	−0.029	−0.070**	−0.050*
	(0.061)	(0.063)	(0.063)	(0.062)	(0.062)	(0.035)	(0.029)
Law and Order^j	−2.661	−1.880	−2.761	−2.719	−2.389	−0.311	0.132
	(2.828)	(2.837)	(2.977)	(2.922)	(2.801)	(1.210)	(1.008)
World Market Return	−0.386**	−0.260	−0.497***	−0.496***	−0.339*	−0.423**	−0.539*
	(0.181)	(0.202)	(0.183)	(0.183)	(0.180)	(0.213)	(0.282)
World GDP Growth	−0.974	−0.122	−0.655	−0.604	0.094	−2.046***	−1.707**
	(0.754)	(0.890)	(0.910)	(0.906)	(0.838)	(0.729)	(0.723)
World Growth Uncertainty	4.047	4.285	6.867	8.074	4.185	−20.266**	3.143
	(9.619)	(10.596)	(11.113)	(10.961)	(9.911)	(9.583)	(5.525)
Observations	12,667	11,771	13,038	13,086	12,452	1,818	3,450
Adjusted R^2	0.041	0.042	0.039	0.039	0.042	0.535	0.105

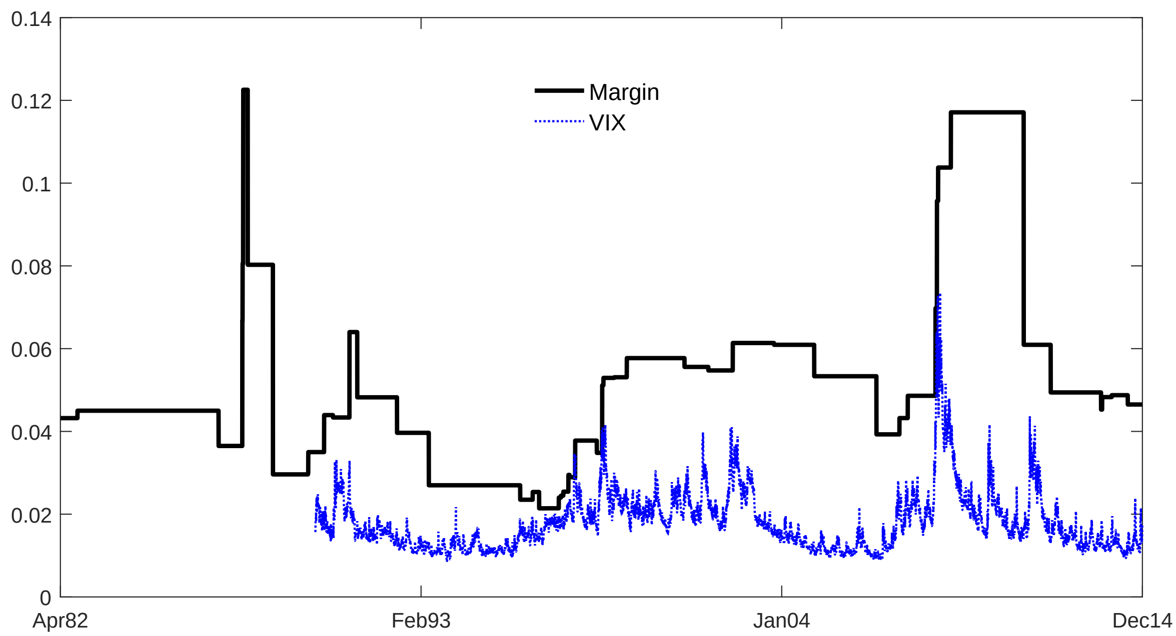

Figure A1. **S&P500 margins and volatility:** The figure plots the Chicago Mercantile Exchange members minimum performance bond requirement for S&P 500 stock index futures contracts (solid line) and the CBOE implied volatility (VIX) index (dotted line). The dollar value of the initial margin requirement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

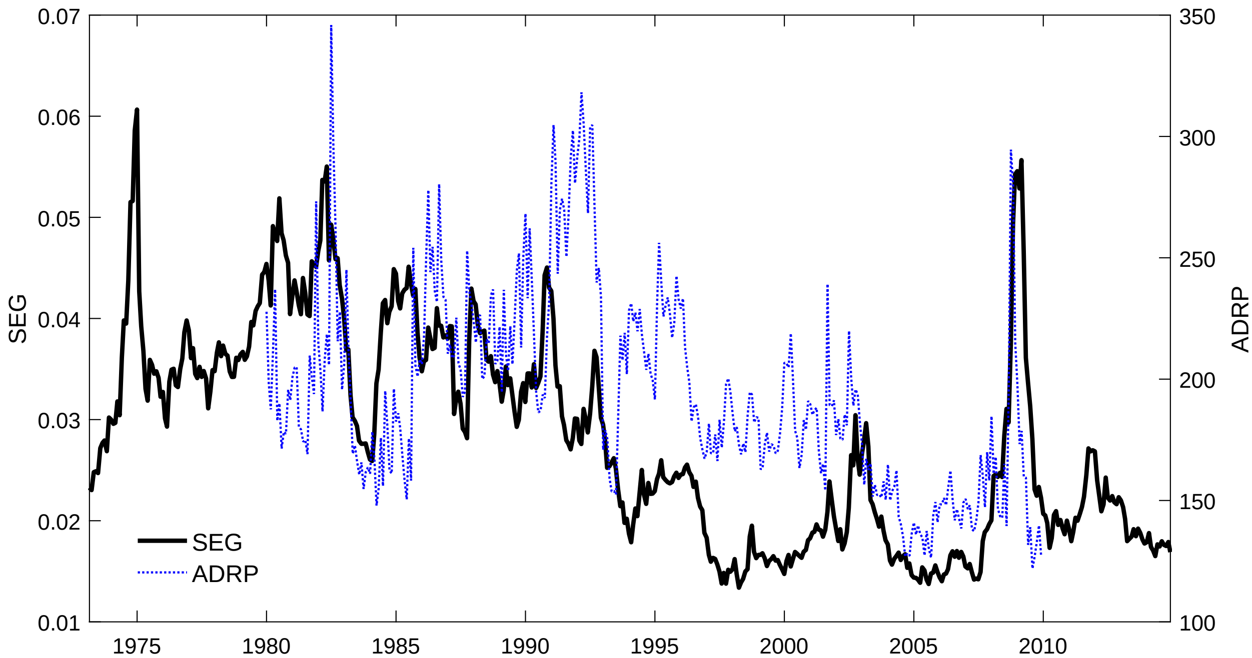

Figure A2. Reversals in international financial markets: The figure plots the average world segmentation measure (SEG) from Bekaert et al. (2011) and the ADR parity violations measure (ADRP) from Pasquariello (2014).