Boom-Bust Capital Flow Cycles: Global or Regional?

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Abstract

With a novel database, we examine the evolution of capital flows to the periphery since the collapse of the Bretton Woods System in the early 1970s. We decompose capital flows into global, regional, and idiosyncratic factors. In contrast to previous findings, which mostly use data from the 2000s, we find that booms and busts in capital flows are mainly explained by regional factors and not the global factor. We then ask, what drives these regional factors. Is it the leverage cycle in the financial center? What triggers the leverage cycle in the financial center? Is it a change in global investors' risk appetite? Or, is it a change in the demand for capital in the periphery? Our estimations indicate that regional capital flows are driven in large part by supply shocks. Interestingly, we find that the leverage in the financial center has a time-varying behavior, with a movement away from lending to the emerging periphery in the 1970s to the 1990s towards lending to the advanced periphery in the 2000s.

Keywords: boom-bust capital flow cycles, global, regional, and idiosyncratic factors.

JEL Codes: F30, F34, F65

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I. Introduction

About four decades after barriers to capital flows were erected around the world in the aftermath of the Great Depression, the collapse of the Bretton Woods System in 1973 launched a new era of financial globalization. With floating exchange rates, countries can follow independent monetary policies even in the presence of capital mobility. Thus, as currencies started to float in 1973, countries began removing restrictions to capital mobility. United States and Germany were the first to eliminate capital controls. Japan and the United Kingdom followed later in the 1970s. Latin American countries also deregulated capital flows in the late 1970s, with European countries relaxing controls in their path to the monetary union. Since then, capital flows have dramatically increased and have played an important role on economic growth, the business cycle, and financial crises.

Naturally, the research on capital flows has flourished. One of the areas of research that has grown the most is that of understanding what triggers boom-bust cycles in international capital flows. One theme of this research is the distinction between global "push" factors and country-specific "pull" factors. Still initially, most of the emphasis was on the recipient countries' economic and financial characteristics, including indicators of financial development, economic activity, terms of trade, and institutions. Most recently, amid the 2007-2009 global crisis, the focus of attention of the literature drastically changed to the role of the financial center. The emphasis on the global financial cycle became so strong that the trilemma was declared dead and the dilemma was born: "Independent monetary policies are possible if and only if the capital account is managed."[1] While early on, the focus of attention was just on the role of monetary policy in the financial center,[2] the eruption of the global crisis led researchers to focus on other manifestations of the global financial cycle. The role of leverage of international global banks[3] and risk appetite in amplifying capital flow cycles became the new focal point.[4]

Most of the empirical evidence on the role of the global factor on capital flows focuses on the years around the global crisis. This is because the data on capital flows for earlier decades is unavailable for many countries.[5] In this paper, we construct a new database on capital flows starting with the collapse of the Bretton Woods System, allowing us to study the importance of the "global cycle" using almost 50 years of data. Our focus is on those countries in the periphery (both advanced and emerging) that heavily tap international capital markets. For these countries, we estimate a dynamic latent factors model,

[1] See Rey (2015) and Miranda-Agrippino and Rey (2015) and Rey (2015).
[2] See for example, Calvo, Leiderman, and Reinhart (1993, 1996).
[3] See for example, Acharya and Schnabl (2010), Borio and Disyatat, and Bruno and Shin (2015a and 2015b).
[4] See also, Forbes and Warnock (2012), Ghosh, Qureshi, Kim, and Zalduendo (2014), and Rey (2015).
[5] See, for example, Cerutti, Claessens, and Puy (2017), and Cerutti and Hong (2018).

allowing for the possibility of not just a global cycle but also regional cycles. Our results indicate that regional cycles and not the global cycle are at the core of the booms and busts in international capital flows around the world. Overall, regional cycles can explain on average about 45 percent of the variance of capital flows around the world. In contrast, the global factor explains about 15 percent of the variance of capital flows worldwide.

We then ask what drives these regional factors. Is it fluctuations in the demand for capital in the periphery? Or is it a change in global investors' behavior? To answer these questions, we first estimate the links between leverage in the financial center and the regional factors using Jordà (2005) local projections methodology and find that shocks to leverage in the financial center spread to the whole periphery—but with a twist: they only affect the boom-bust cycles in the emerging periphery in the earlier period (the 1970s to 1990s) and the boom-bust cycles in the advanced periphery in the most recent period (the 2000s). To quantify the role of supply and demand shocks on the regional factors and the leverage in the financial center, we then estimate a structural VAR also allowing and testing for the possibility of time-varying parameters. Our estimations indicate that fluctuations in the financial center leverage cycles are only affected by supply shocks both in the earlier and the most recent period. We also find that the supply shocks identified in the structural VAR are the main drivers of regional capital flows to the emerging periphery in the 1970s to the 1990s and to the advanced periphery during the 2000s. We confirm our analysis indicating the driving role of supply shocks on capital flows to the emerging periphery in the earlier period and to the advanced periphery in the most recent period by examining the evolution of the costs of credit in international capital markets.

The rest of the paper is organized as follows. Section II reviews the empirical literature on "push" and "pull" factors. Section III presents our database on capital flows. Section IV presents the estimated dynamic factor model and reports the results. Section V estimates the role of the financial center on regional cycles using Jordà (2005) local projections. Section VI presents the estimation of a structural VAR to identify supply shocks and demand shocks to regional capital flows to the periphery and the financial center leverage cycle. This section also reports event studies of costs of borrowing in international capital markets during episodes of capital flow bonanzas and busts. Section VII present the conclusion and discusses future areas of research.

II. Literature Review

Starting in the 1970s capital flows to every corner of the world rapidly increased. Naturally, the research on capital flows surged. One of the areas of research that has flourished the most is that of

understanding what triggers boom-bust cycles in international capital flows. With developing countries suffering a variety of currency, banking, and sovereign debt crises in the 1980s and 1990s in the aftermath of capital flow bonanzas, the focus during the earlier phase of financial globalization is on these countries. One theme of this research is the distinction between global "push" factors and country-specific "pull" factors.[6] The questions most frequently asked are about the role of idiosyncratic factors, such as the recipient-country economic activity, terms-of-trade, quality of institutions, fiscal and monetary policies, and openness of the real economy. Starting in the 1990s various researchers brought to center of attention the role of the push-factors. Calvo, Leiderman, and Reinhart (1993, 1996) are the first to emphasize the importance of external push factors in explaining capital flows to emerging economies. They isolate fluctuations in the U.S. interest rate as one of the main culprits in fueling capital-flow booms and busts to the emerging periphery.

The U.S. Subprime crisis in 2007-2009 and the EMU crisis in 2010-2012 changed the center of attention to the advanced economies and to the role of international banks on cross border capital flows. For example, Bruno and Shin (2015a, 2015b) pay attention to the amplifying role of global bank leverage and the dollar exchange rate on cross-border capital flows. In their research, an expansionary shock to U.S. monetary policy increases cross-border bank capital flows through higher leverage of international banks. Such an increase in cross-border flows is associated with a depreciation of the U.S. dollar. The global banks finance cross-border lending to regional banks by tapping U.S. dollar money market funds in the financial center. The transmission channel in this model is via fluctuations in the effective credit risk faced by banks who lend to local borrowers that have a currency mismatch. When the local currency appreciates vis-à-vis the U.S. dollar, local borrowers' balance sheets become stronger, resulting in lower credit risk and hence expanding bank lending capacity. Thus, in this model, currency appreciation leads to greater risk-taking by banks. In this literature, the push factors do not just include monetary policy in the financial center but also include fragilities in the global banking sector, such as global leverage and equity growth of major global banks.

In the aftermath of the global crisis, the "push-pull" literature took also another turn. Now the focus is not on the overall behavior of capital flows during booms and busts but on extreme events of capital flow. These new studies focus on "surges" and "stops" (sharp increases and decreases of gross inflows) as well as "flight" and "retrenchment" (sharp increases and decreases of gross outflows). See for example, Forbes and Warnock (2012) and Gosh, Kim, Qureshi, and Zalduendo (2014). These studies

[6] See, for example, Fernandez-Arias (1996) and Fostel and Kaminsky (2008).

as well as the earlier literature indicate that waves of capital flows are primarily associated with global factors, which now also include global risk, which incorporates both risk aversion and economic uncertainty

The boom and bust in capital flows around the global crisis of 2007-2009 also motivated a new area of research, that of capturing the "global factor." Since the global financial cycle is unobservable, a new branch of the literature has captured this factor indirectly using dynamic common factors extracted from actual capital flows or by overall movements in asset prices. One of the earliest papers is this area is that of Rey (2013). In her Jackson Hole paper, Rey examines capital flow booms and busts and documents a positive correlation in capital gross inflows as well as outflows across mostly all regions in the world. She finds particularly strong positive correlations between all the major flows into North America and Western Europe. This evidence prompts Rey to examine the characteristics of this global cycle. She examines the correlations between capital flows and the VIX (Chicago Board Options Exchange's CBOE Volatility Index) and finds negative correlations between various types of capital flows and the VIX, both globally and for various sub-regions averaging around -0.23. She then documents, using a common factor obtained from a large number of asset prices for various regions of the world, that this factor shows a relatively high negative correlation with the VIX, suggesting that there is a global financial cycle in capital flows, asset prices and in credit growth. Rey also reports a VAR estimation indicating that one of the determinants of the global financial cycle is monetary policy in the center country, which in turn affects the leverage of global banks, capital flows, and credit growth in the international financial system. She concludes that whenever capital is freely mobile, the global financial cycle constrains national monetary policies regardless of the exchange rate regime, invalidating the "trilemma," which postulates that in a world of free capital mobility, independent monetary policies are feasible if and only is exchange rates are floating.

Naturally, this provoking conclusion that "*cross-border flows and leverage of global institutions transmit monetary conditions globally, even under floating exchange-rate regimes"* has stimulated further research in this area. Cerutti, Claessens, and Puy (2017) scrutinize these results using data on gross capital inflows across 34 emerging markets for the period 2001-2013. In the spirit of the literature in common factors, the authors examine whether aggregate inflows to EMs co-move using latent factors. They do not just examine whether total flows co-move together around the world and regionally but also study the co-movement across different types of capital flows. They find that the global factor explains about 21% of total capital flows and the regional factors explain about 25%, but they find that not all components co-move across emerging markets, just portfolio equity flows, portfolio bond flows, and bank flows are

highly integrated. Importantly, they also find that the sensitivity to common dynamics varies significantly across borrower countries. They find that financial market characteristics, such as liquidity in the recipient country and the composition of the foreign investor bases, rather than macroeconomic or institutional fundamentals, explain better countries' sensitivities. They find that the countries most affected by push factors are those countries relying more on international funds, such as mutual funds and ETFs, and global banks.

Starting in 2003, the IMF Balance of Payments data on capital flows provides information not just about type of instruments but also by type of borrowers. While this database only includes 14 years, it includes the bonanza preceding the global crisis and the retrenchment in its aftermath and can help us to understand not just the behavior of bank, bond, and equity flows but also the behavior of banks, corporates, and sovereigns. Cerutti and Hong (2018) use this disaggregation to examine the behavior of borrowers in 43 advanced and emerging economies. To examine the behavior across borrowers and instruments, they decompose each capital inflow series into a global factor, borrower-type sub-factors, and a country-specific component. Their estimations indicate that gross capital flows do not move in tandem across countries regardless of borrower characteristics: Different borrowing sectors have different sensitivity to the global financial cycle. For example, advanced economy corporates borrowing before the crisis show a complementary behavior with both an increase in their borrowing through both debt securities and loans. This changed since the crisis, with advanced economies corporates borrowing showing an increase in borrowing through debt securities replacing international bank loans but emerging market corporates show both an increase in bond and loan financing.

Finally, Cerutti, Claessens, and Rose (2017) intensively scrutinize the extent of the comovement of capital flows, using a variety of methods and variables to capture the global factor. The estimations are not limited to total gross inflows and outflows, they also include different type of flows. They estimate the global factor using observable indicators, such as the VIX and the interest rate in the financial center, and unobservable indicators extracted from capital flows using dynamic factor models. In total they estimate about 600 regressions using different combinations of observable variables from different financial centers for both panels of countries and individual countries. They find that on average the R^2 from all these regressions is just about 0.25, indicating that the global factor can only explain a small fraction of the variance of capital flows.

III. The Data

The empirical research on "push" and "pull" factors examines mostly the boom-bust cycles starting in the mid-1990s and even later starting in the 2000s because of limitations with data on capital flows as collected by the IMF for the Balance of Payments Statistics. In this paper we examine capital flows since the collapse of the Bretton Woods System in the 1970s using data on international primary issuance we collected from the archives of the World Bank (for the 1970s), which we combined with data from Dealogic[7] that collects data on issuance since 1980 to have a database spanning almost fifty years of capital flow cycles. The database so compiled includes sovereign and private issuance of syndicated loans and bonds, as well as equities. The measure of capital flows we collect is what is known as international gross primary issuance. This measure of capital flows captures gross capital inflows and is defined as purchases of domestic assets by foreign residents. This database allows us to capture the boom-bust cycles of the mid-1970s-beginning of the 1980s that mostly affected developing countries in Africa, East Asia, Eastern Europe, and Latin America; the boom-bust cycles of the mid-1990s that affected Latin America, Asia, and Europe; and the boom-bust cycles of the mid-2000s that affected most dramatically advanced countries in Europe. The database is granular. It contains information on each single issue. For bonds and syndicated loans, the data includes the date of the issue, the name of the borrower, the purpose of the issue, the type of business of the borrower, the amount issued, the currency of issue, the interest rate, the maturity, the banks participating in the syndicates for loans, and the markets where the bonds are issued.[8] For shares, the data includes the date of the floating, the name of the company issuing the shares, the price of the shares, the currency of issue, and the markets where the shares are issued. This database includes all the countries that participated at least once in international capital markets.

In this paper, we study capital flows to advanced and emerging periphery countries that heavily tap international capital markets. We focus on issuance of 28 countries in three regions: Latin America, Asia, and Europe. The countries in Latin America are: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Uruguay; the countries in Asia are: China, Indonesia, Malaysia, Philippines, South Korea, Thailand, and Vietnam; the countries in Europe are: Austria, Belgium, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Spain, and Sweden. For each country, we construct a measure of total gross capital inflows which include primary issuance of bonds, syndicated loans, and

[7] We complement the data on issuance from Dealogic with Bloomberg data.

[8] We identify bonds as international when they are issued in the euro market, foreign market, or global market, including both private placements and public issues. We follow the BIS in the identification of international syndicated loans (See, Gadanecz, 2004) and identify international loans as those loans in which the nationality of at least one of the senior syndicate banks differs from that of the borrower.

equities. To have a measure of participation in international capital markets relative to the size of the economy, we study total issuance as a share of exports. Exports are quite volatile. For the issuance/export ratio to capture the volatility of capital flows only, we use trend exports as the scale variable. Trend exports are estimated by applying the Hodrick-Prescott filter to the series of nominal exports.

Figure 1 shows the evolution of capital flows since the collapse of the Bretton Woods System in 1973. Note that all the emerging economies in Asia and Latin America experienced pronounced boom-bust cycles in the late 1970s beginning of the 1980s and in the mid-1990s. Only 20 percent of those countries experienced large bonanzas in the 2000s. In contrast to the evidence from emerging markets, basically all advanced economies in Europe experienced dramatic bonanzas and busts only in the 2000s.

IV. Global and Regional Factors

In this section we first present the model estimated and then we discuss the results.

IV.1 The Model

We estimate global and regional factors using the methodology developed by Kose, Otrok, and Whiteman (2003).[9] We estimate the following latent factor model:

$$y_{i,t} = \alpha_i + \beta_i^{global} f_t^{global} + \beta_i^{region} f_{r,t}^{region} + \varepsilon_{i,t} \quad (1)$$

$$E\varepsilon_{i,t}\varepsilon_{j,t-s} = 0 \text{ for } i \neq j$$

where:

$y_{i,t}$ is the (normalized) international gross primary issuance (share of exports) of country i in year t.

f_t^{global} is the unobserved global factor affecting all the countries in the sample in year t.

$f_{r,t}^{region}$ is the unobserved regional factor affecting all the countries in region r in year t.

β_i^{global} is the country-specific factor loading measuring the response of county i to the global factor.

β_i^{region} is the country-specific factor loading measuring the response of country i to the regional factor.

$\varepsilon_{i,t}$ is the unobserved country-specific residual factor.

As in Kose, Otrok, and Whiteman (2003), we estimate a dynamic latent factor model where all factors follow AR processes.

We assume that the idiosyncratic factors follow an AR(p) process:

[9] See also, Jackson, Kose, Otrok, and Owyang (2016), Kose, Otrok, and Prasad (2012).

$$\varepsilon_{i,t} = \rho_{i,1}\varepsilon_{i,t-1} + \rho_{i,2}\varepsilon_{i,t-2} + \cdots + \rho_{i,p}\varepsilon_{i,t-p} + u_{i,t} \quad (2)$$

where:

$u_{i,t} \sim N(O, \sigma_i^2)$ and $E(u_{i,t}u_{i,t-s}) = 0$ for $s \neq 0$.

We also assume that the global and regional factors follow AR(q) processes:

$$f_t^{global} = \rho_1^{global} f_{t-1}^{global} + \rho_2^{global} f_{t-2}^{global} + \cdots + \rho_q^{global} f_{t-q}^{global} + u_t^{global} \quad (3)$$

$$f_{t,r}^{region} = \rho_{1,r}^{region} f_{r,t-1}^{region} + \rho_{2,r}^{region} f_{r,t-2}^{region} + \cdots + \rho_{q,r}^{region} f_{r,t-q}^{region} + u_{r,t}^{region} \quad (4)$$

where:

$u_t^{global} \sim N(0, \sigma_{global}^2)$, $u_{r,t}^{region} \sim N(0, \sigma_{region\,r}^2)$,

and

$E(u_t^{global} u_{t-k}^{global}) = 0$, $E(u_{r,t}^{region} u_{r,t-k}^{region}) = 0$ for $k \neq 0$.

It is difficult to estimate dynamic factor models when the factors are unobservable, which calls for alternative methods. To estimate the model above, we rely on the Otrok-Whiteman Bayesian approach with multi-level extension which has been employed in Kose et al. (2003, 2008, 2012). The essential idea is to determine posterior distributions for all unknown parameters conditional on the latent factor and then determine the conditional distribution of the latent factor given the observables and the other parameters. The joint posterior distribution for the unknown parameters and the unobserved factors can be sampled by a Markov Chain Monte Carlo (MCMC) procedure on the full set of conditional distribution. Kose et al. (2003) indicate that there are two related identification problems in the model shown in equations (1)-(4): neither the signs nor the scales of the factors and the factor loadings are separately identified. Therefore, we follow the strategy in Kose et al. (2003) to restrict the loadings on the global factor for the first country in the sample to be positive and restrict the loadings on the regional factor for one country in each regional factor to be positive. Then, we assume that each of the factor variances are equal to a constant to solve the normalization problem. As it is usual in these estimations, we standardize the capital flow data (as a share of trend exports) to a mean zero and variance equal to one indicator.

To implement the Bayesian techniques, we use the following conjugate priors to estimate the model:

$$(\beta_i^{global}, \beta_{i,r}^{region})' \sim N(0, I) \quad (5)$$

$$(\rho_{i,1}, \rho_{i,2}, \cdots, \rho_{i,p})' \sim N[0, diag(1, 0.5, \ldots, 0.5^{p-1})] \quad (6)$$

$$\left(\rho_1^{global}, \rho_2^{global}, \cdots, \rho_q^{global}\right)' \sim N[0, diag(1, 0.5, \ldots, 0.5^{q-1})] \quad (7)$$

$$\left(\rho_{1,r}^{region}, \rho_{2,r}^{region}, \cdots, \rho_{q,r}^{region}\right)' \sim N[0, diag(1, 0.5, \ldots, 0.5^{q-1})] \quad (8)$$

$$(\sigma_i^2)' \sim IG(6, 0.001) \quad (9)$$

We set the length of both the idiosyncratic and factor autoregressive polynomials at 2 ($p = 2$ and $q = 2$), and we assume the AR processes are stationary. The prior on all the factor loading coefficients is $N(0,1)$. For the autoregressive polynomial parameters, the prior is $N(0, \sum)$, where the $\sum = \begin{bmatrix} 1 & 0 \\ 0 & .5 \end{bmatrix}$.

As in Otrok and Whiteman (1998), the prior on the innovation variances in the observable equations is the Inverted Gamma distribution $IG(6, 0.001)$. The number of Monte Carlo draws is 10,000 and the number of initial draws to discard (burn-in replication) is 5000.

In order to measure the relative contributions of global and regional factors to the variations in capital flows of each country, we decompose the variance of observable into the fraction that is due to each of the two factors and the idiosyncratic component. With orthogonal factors that variance of observable i can be written as:

$$var\left(y_{i,t}\right) = \left(\beta_i^{global}\right)^2 var\left(f_t^{global}\right) + (\beta_{i,r}^{region})^2 var\left(f_{t,r}^{region}\right) + var(\varepsilon_{i,t}) \quad (10)$$

With the fraction of volatility due to the global factor equal to:

$$\frac{(\beta_i^{global})^2 var\left(f_t^{global}\right)}{var\left(y_{i,t}\right)}$$

the fraction of volatility due to the regional factor *j* equal to:

$$\frac{(\beta_{i,j}^{region})^2 var\left(f_{t,j}^{region}\right)}{var\left(y_{i,t}\right)}$$

and the fraction of volatility due to the idiosyncratic factor for each country i equal to

$$\frac{var\left(\varepsilon_{i,t}\right)}{var\left(y_{i,t}\right)}$$

These measures are calculated at each pass of the Markov chain; the dispersion in their posterior distributions reflects uncertainty regarding their magnitudes.

IV.2 Estimations

Figure 2 shows the evolution of the global factor and the regional factors for Asia, Europe, and Latin America. Interestingly, the global factor captures two highly protracted episodes of the expansion

of financial globalization and their demise. The first episode starts in the 1970s with the collapse of the Bretton Woods system and ends in the aftermath of the Debt crisis. The second one starts in the early 1990s and ends in the aftermath of the Global Crisis.

In contrast, the regional factors capture less prolonged cycles, some of them around regional crises, such as the Asian crisis in 1997. The regional factor for Asia captures two episodes of highly pronounced bonanzas, one peaking in 1981 and the other in 1995. Both bonanzas end with crises in the region. The other boom-bust cycles in Asia in the 2000s are far less pronounced. These cycles peak in 2005 and 2011. The regional factor for Europe also captures the pronounced booms that preceded systemic crises in Europe: The EMS crisis in 1992-1993 and the European crisis in 2010-2012. Finally, the regional factor for Latin America captures two highly pronounced boom-bust cycles, one starting in the mid-1970s and the other starting in the early 1990s. Both cycles end with banking, currency, and sovereign debt crises. As in Asia, the boom-bust cycles in Latin America are far less pronounced in the 2000s.

Figure 3 shows the average variance decomposition of capital flows over the period 1973 to 2017 across all countries. Importantly, when we extend the sample to include capital flows data since the collapse of the Bretton Woods System, the global factor only explains 16 percent of the variance of capital flows across all countries. In contrast, the regional factors explain 42 percent of the variance of capital flows across all countries. Finally, the idiosyncratic factors explain the remaining 42 percent of the variance of capital flows across all countries.

Figure 4 shows the evolution of the (normalized) measure of capital flows together with its decomposition into global, regional, and idiosyncratic components for all the countries in our sample. As shown in this figure, all the most dramatic boom-bust cycles in emerging markets starting in the mid-1970s and in the 1990s as well as those cycles in the advanced economies in Europe starting in the early 2000s are not explained by the global factor, all these cycles are mostly explained by the regional factors. This evidence suggests how important is to construct databases that span longer episodes of capital flows to assess the scope the degree of globalization of boom-bust capital flow cycles over time.

V. The Role of the Financial Center

The focus of attention in the capital flow literature since the onset of the global crisis has been on the role of the financial center. Most of the attention has been on the creation of liquidity in the financial center and its spillovers on booms and busts around the world.[10] In this section, we do a preliminary

[10] See for example, Acharya and Schnabl (2010), Borio and Disyatat, and Bruno and Shin (2015a and 2015b).

analysis of the links between global liquidity and regional boom-bust cycles. We use the Jordà (2005) Local Projections methodology together with the Ramey and Zubairy (2018) modifications to examine the effect of shocks to leverage in the financial center on the regional factors of Asia, Europe, and Latin America allowing for time-varying effects. Since most of the empirical research on the role of leverage in the financial center on capital flows to the periphery focuses on the boom-bust cycles in the 2000s, we want to examine whether there is a difference between these more recent capital flow cycles and the capital flow cycles in the earlier years of financial globalization. Since the allocation of capital in the 2000s may have been affected by the creation of the European Monetary Union in 1999, we estimate the effects of shocks to leverage in the financial center on capital flows to each of the three regions for two different periods: the earlier period starting in 1973 and ending in the year prior to the creation of the European Monetary Union, and the recent period from 1999 to 2017.

We estimate the following model separately for each regional factor at different horizons: h = 0, 1, 2, 3, and 4 (years).

$$f^R_{t+h} = I^e[\alpha^e_h + \beta^e_h(L) \cdot f^R_{t-1} + \gamma^e_h \cdot fc_t] + I^r[\alpha^r_h + \beta^r_h(L) \cdot f^R_{t-1} + \gamma^r_h \cdot fc_t] + \varepsilon_{t+h} \qquad (11)$$

f^R is the regional factor, $\beta_h(L)$ is a polynomial in the lag operator, and fc is the financial center leverage cycle. The coefficient γ_h gives the response of the regional factor at time $t+h$ to a shock to leverage in the financial center at time t. We allow all the coefficients of the model to vary between our two periods (the earlier (e) and the recent (r) periods). I^e (I^r) is a dummy variable that indicates the state of the economy when the shock hits and it is equal to 1 during the earlier (recent) period. We follow Bruno and Shin (2015) and capture the leverage in the financial center with the U.S. Broker-Dealer Leverage.[11]

Our results are shown in Figure 5. This Figure shows the local projections in the earlier period (shown in blue) and the local projections in the recent period (shown in red). Interestingly, when we allow for different responses in the earlier and recent periods, we find that, although shocks to leverage in the financial center affect all three regional factors, they affect the emerging and advanced periphery in different periods. Leverage shocks in the financial center only affect the regional factors in the emerging periphery during the earlier period but only affect the regional factor in the advanced periphery during the recent period. The results are not only statistically significant but also economically significant. For example, a one-standard deviation shock to the leverage cycle in the financial center in the early period leads to an immediate increase in Asia's regional factor from zero to one (equivalent to about 70 percent

[11] The leverage of the U.S. broker dealer sector is from the U.S. Flow of Funds series published by the Federal Reserve. We obtain the Financial Center Leverage Cycle by detrending the series using the Hodrick-Prescott filter.

of the standard deviation of Asia's regional factor during the earlier period) which then declines over the next 4 years. A one-standard deviation shock to the leverage cycle in the financial center in the early period also leads to a persistent increase in Latin America's regional factor from zero to 0.6 (equivalent to about 45 percent of the standard deviation of Latin America's regional factor during the earlier period). Similarly, a one-standard deviation shock to the leverage cycle in the financial center in the recent period leads to an initial increase in Europe's regional factor which subsequently keeps increasing and peaks at 0.6 (equivalent to about 50 percent of the standard deviation of Europe's regional factor during the recent period) in the second year after the shock.

VI. Supply Shocks or Demand Shocks?

Our analysis in the previous section (using Jordà (2005) Local Projections methodology together with the Ramey and Zubairy (2018) modifications) allowed us to capture the time-varying dynamic multipliers of leverage shocks on regional boom-busts cycles. These estimations do not allow us to identify what fuels shocks to the financial center leverage cycle since we only examine reduced-form shocks to leverage on the regional factors. Importantly, shocks to leverage in the financial center can be driven by supply shocks, like risk appetite of foreign investors, or can be driven by demand shocks, such as borrowings needs in countries in the periphery to finance new real investment opportunities. To assess the origins of the shocks to the financial center leverage cycle and the regional factors, we need to estimate a multivariate model, such as a structural VAR.

In this section, we also complement the Structural VAR estimations with event studies that capture the evolution of the costs of borrowing in international capital markets. If capital flow bonanzas are driven by an increase in the demand for capital, borrowing costs would increase as the level of capital inflows increases. On the other hand, borrowing costs would decline as capital inflows increase if they are fueled by an increase of global investors' risk appetite (a supply shock). Naturally, in times of collapse in capital flows, costs of borrowing will increase if there is an adverse shock to supply but they will decline when demand for capital in the periphery declines.

VI.1 Identifying Demand and Supply Shocks with a Structural Vector Autoregressive Model

We estimate a K-dimensional VAR model of order p.

$$y_t = \alpha + \sum_{n=1}^{p} A_n \, y_{t-n} + \mu_t \qquad t = 1, \dots, T \qquad (12)$$

which we can rewrite as

$$y_t = \alpha + \sum_{n=1}^{p} A_n\, y_{t-n} + B\varepsilon_t \tag{13}$$

where $y_t = [fc_t, F_t^A, F_t^E, F_t^L]^{\mathrm{T}}$, fc is the financial center leverage cycle, F^A is the Asia Regional Factor, F^E is the Europe Regional Factor, and F^L is the Latin America Regional Factor. $A_i, i = 1, \dots, p$ are $(K \times K)$ coefficient matrices, α is a vector of intercept parameters for the financial center leverage cycle and the three regional factors, and the vector μ_t consists of reduced form residuals, which are serially uncorrelated with $E(\mu_t) = 0$ and $Cov(\mu_t) = \Sigma_\mu$, and the structural shocks are $\varepsilon_t = B^{-1}\mu_t$, B captures the instantaneous effect of the structural shocks, and $Cov(\varepsilon_t) = \Sigma_\varepsilon$ is a diagonal matrix. We can also link the covariance matrix of the reduced residuals to that of the structural shocks.

$$Cov(\mu_t) = B\Sigma_\varepsilon B^{\mathrm{T}} \tag{14}$$

To identify the structural shocks, we follow the typical "pull" and "push" factors identification: We allow for shocks to the financial center leverage cycle (the "push" factor or "supply" shocks) to affect instantaneously the financial center leverage cycle as well as all regional factors. We also allow shocks to region i (the "pull" factor or "demand" shocks) to affect instantaneously region i, but not the other regions. That is, there is no financial contagion from one region to the other. So, matrix B can be written as follows:

$$B = \begin{bmatrix} b_{11} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ b_{31} & 0 & b_{33} & 0 \\ b_{41} & 0 & 0 & b_{44} \end{bmatrix} \tag{15}$$

As with the Local Projection estimations in the previous section, we also allow for time-varying estimations for the VAR system as shown in equation (14)

$$y_t = I_e \left[\alpha^e + \sum_{n=1}^{p} A_n^e\, y_{t-n} + \mu_t \right] + I_r \left[\alpha^r + \sum_{n=1}^{p} A_n^r\, y_{t-n} + \mu_t \right] \tag{16}$$

We allow all the coefficients of the model to vary between our two periods (the earlier (e) and the recent (r) periods). I^e (I^r) is a dummy variable that indicates the state of the economy when the shock hits and it is equal to 1 during the earlier (recent) period. As with the local projection estimations, we examine the role of the creation of the European Monetary System in 1999 in our VAR estimations. Again, the earlier period starts in 1973 and ends in the year prior to the creation of the European Monetary Union and the recent period spans the 1999-2017 episode.

We summarize the results of the structural VAR by showing impulses responses and variance decompositions of the financial center leverage cycle, the Asia, Europe, and Latin America regional factors to supply shocks reflecting the behavior of international investors, and demand shocks originating in the three regions of the periphery countries. Both impulse responses and variance decompositions are estimated at different horizons: h = 0, 1, 2, 3, and 4 (years). Figure 6 A and Figure 6 B report respectively, the impulse responses in the earlier period and in the recent period. Similarly, Table 1 A and Table 1 B show respectively, the variance-decomposition in the earlier period and in the recent period.

We first discuss the results in the earlier period. As shown in the top row in Figure 6 A and Table 1 A, the leverage cycles in the financial center are only driven by supply shocks: none of the demand shocks originating in the periphery have any effect on the financial center leverage cycle at any horizon (none of the impulse responses to demand shocks originating in the periphery are statistically different from zero). As shown in Table 1 A, the supply shock explains between 75 and 90 percent of the variance of the financial center leverage cycle at different horizons. The next three rows in Figure 6 A show the effects of supply and demand shocks on the Asia, Latin America, and Europe regional factors. Both Asia and Latin America Region factors respond significantly to supply shocks (with these shocks explaining about 40 and 50 percent of the variance of the regional factors). The rest is explained by shocks to demand in the same region. Overall, there are no spillovers from shocks to demand in one region to another region. Finally, in contrast with the evidence for the emerging periphery, the Europe regional factor (which only includes advanced economies) is only explained by demand shocks to the region.

The evidence from the recent period shown in Figure 6 B and Table 1 B also indicates that the financial center leverage cycle is only driven by supply shocks, with these shocks explaining between 65 and 90 percent of the variance of the financial center leverage cycle. As suggested in our preliminary estimates using Local Projections, supply shocks do not affect the boom-bust cycle in the emerging periphery since 1999, in both cases the impulse responses of both regions to supply shocks are not statistically different from zero at all relevant confidence levels. In contrast, supply shocks matter for the Europe regional factor, with supply shocks having an increasing effect on the variance of the Europe Region boom-bust cycles.

VI.2 Costs of Borrowing in International Capital Markets

In this section, we complement our Structural VAR estimations by studying the evolution of the costs of borrowing in international capital markets during the boom-bust cycles starting in the mid-1970s, the early 1990s, and the early 2000s. If capital flow bonanzas are driven by an increase in the demand for

capital, borrowing costs would increase as the level of capital inflows increases. On the other hand, borrowing costs would decline as capital inflows increase if they are fueled by an increase of global investors' risk appetite (a supply shock). To assess the origin of the boom-bust cycles, we examine the evolution of borrowing costs around the regional factor peaks in 1981, 1997, and 2007. Since we are studying the allocation of capital from the financial center to the periphery, we capture borrowing costs by calculating the spreads between the yield of bonds and syndicated loans of each country in the periphery and the corresponding yield in the financial center.

Syndicated loans were basically the only instrument used in international capital markets in the 1970s and 1980s. Thus, for these earlier years, we construct country spreads using data on syndicated loans from both the primary and the secondary markets. For the years of the bonanza, we use information from the primary market and construct the country spread as the average spread of all syndicated loans for each country relative to the base interest rate (mostly the Libor rate). The spreads are from the World Bank and Dealogic. The syndicated loan market collapsed with the defaults in the emerging periphery countries in the early 1980s, with basically no issuance. Thus, for the years of the bust, we construct the spreads as the ratio of the face value of syndicated loans relative to their value in the secondary market. The prices in the secondary market are from Boehmer and Megginson (1990). Unfortunately, for Asia, there is only data on market prices for the Philippines. Since international bond issuance surged in the 1990s, we capture borrowing costs using bond spreads for the later years starting in 1990. For the emerging periphery, we use the J.P. Morgan EMBIG Spreads and for the advanced periphery, we use the 10-Year Bond Spreads, which we construct as the difference between each European country's 10-Year Bond Yield and Germany's 10-Year Bond Yield. These yields are from the OECD Database.

To shed light on whether regional capital flow cycles may have different triggers in the earlier and most recent episodes, we examine these episodes separately.[12] Figure 7 shows the borrowing costs for a 10-year interval around the year of the peak in capital flows in each region. In each panel, the solid line represents the average borrowing costs across countries within a region (Asia, Europe, and Latin America) and the dotted lines denote the one-standard-error bands around the average.[13] The evidence in Figure 7 indicates that the regional bonanzas in the emerging periphery in the earlier period and the regional

[12] Since shocks to leverage cycles in the financial center only affect the boom-bust cycles in the emerging periphery in the earlier period and only affect the boom-bust cycles in the advanced periphery during the recent period, we only examine the evolution of the borrowing costs during the cycles of the 1970s-1980s and 1990s for the emerging periphery, and during the cycles of the 2000s for the advanced periphery.

[13] The syndicated loan spreads until 1981 are in basis points while the syndicated loan spreads from 1985 to 1988, captured as the ratio of the face and market values of the loans, are in percent. The EMBIG and the 10-year bond spreads are in basis points.

bonanza in the advanced periphery in the recent period are fueled by a supply shock. As shown in Panels A and B, spreads for the emerging periphery during the bonanzas with peaks in 1981 and 1997 declined substantially: from a minimum of 35 percent (for Asian countries in the run-up to the 1997 crisis) to a maximum of 70 percent (for Latin American countries from the Tequila Crisis to the end of the capital flow bonanza in the region in 1997). The evidence from the advanced periphery in the recent period is quite similar to that of the emerging periphery during the earlier episode, with the average 10-year bond yield in the advanced periphery continuously decreasing and becoming indistinguishable from the 10-year bond yield in Germany before the eruption of the U.S. Subprime Crisis in 2007.

Importantly, the evolution of borrowing costs in the aftermath of the bonanzas in these three regions, both during the earlier and the recent periods, also suggests the presence of supply shocks. In all these episodes, global investors withdrew from international capital markets and the cost of borrowing sharply increased amid a collapse in international capital flows.

VII. Conclusions

We have examined whether capital flow cycles to the periphery share a common pattern possible capturing the monetary cycle in the financial center as suggested by Rey (2015). Our results indicate that episodes of booms and busts in the financial center leverage cycles are not transmitted equally around the world, suggesting that the monetary cycle in the financial center is reinforced in different episodes by a variety of other shocks, such as the OPEC shocks in the 1970s and the creation of the Euro zone in 1999. The creation of the European Monetary Union starting in 1999 which brought financial deregulation across all countries in the Euro zone may have contributed to the explosion in capital flows to the region. In contrast, the transmission of the monetary cycle in the financial center to the emerging world was far more pronounced in the mid-1970s to mid-1980s. It is important to study possible reinforcing shocks in this episode triggered not just by cyclical monetary policy in the United States but exacerbated by the OPEC shocks in the early 1970s. It is in this episode that the high savings of OPEC countries were channeled through the Eurodollar market to emerging economies amplifying the bonanzas of the late 1970s beginning of the 1980s. Our challenge is to uncover the time-varying shocks fueling appetite for risk of global investors.

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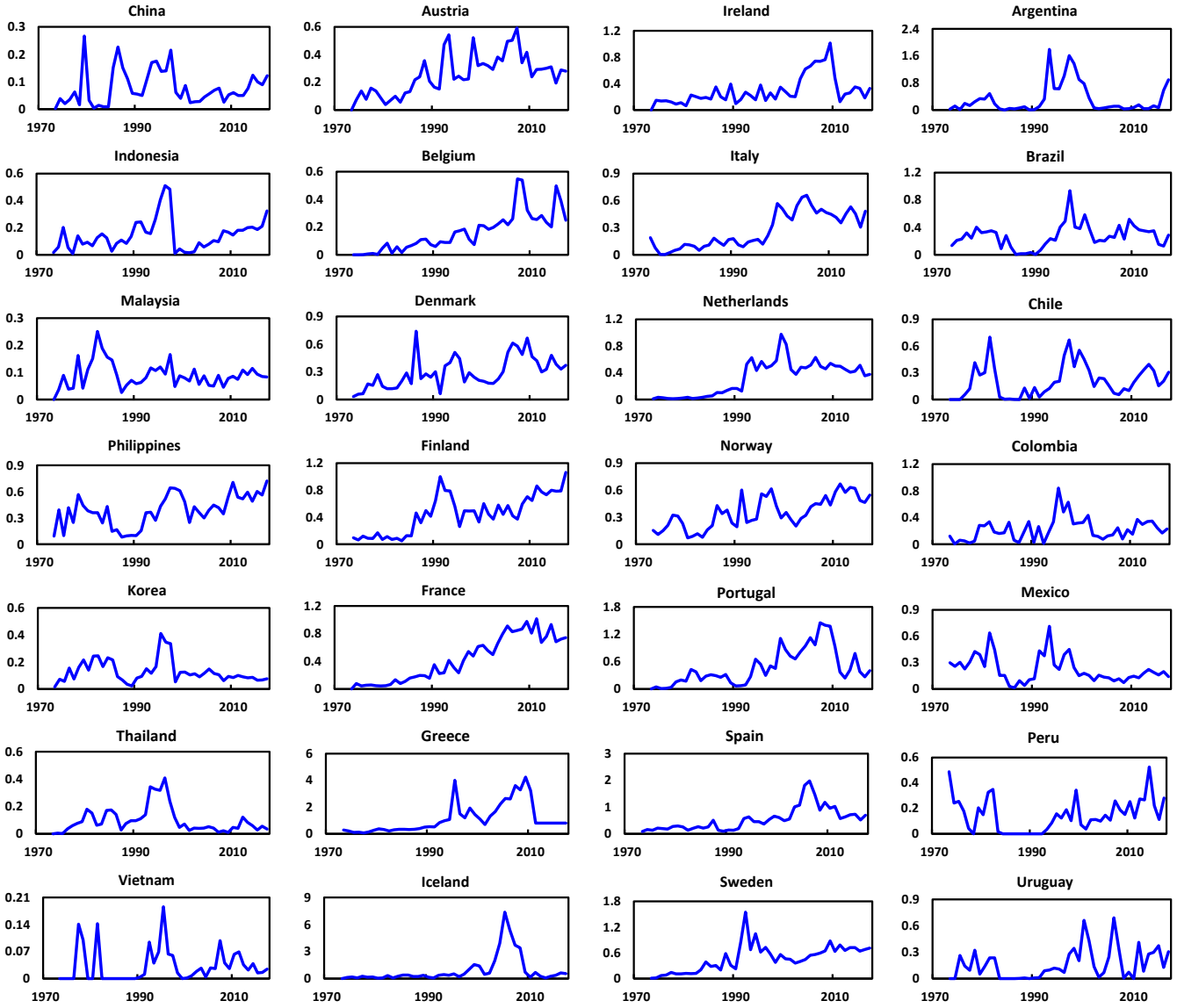
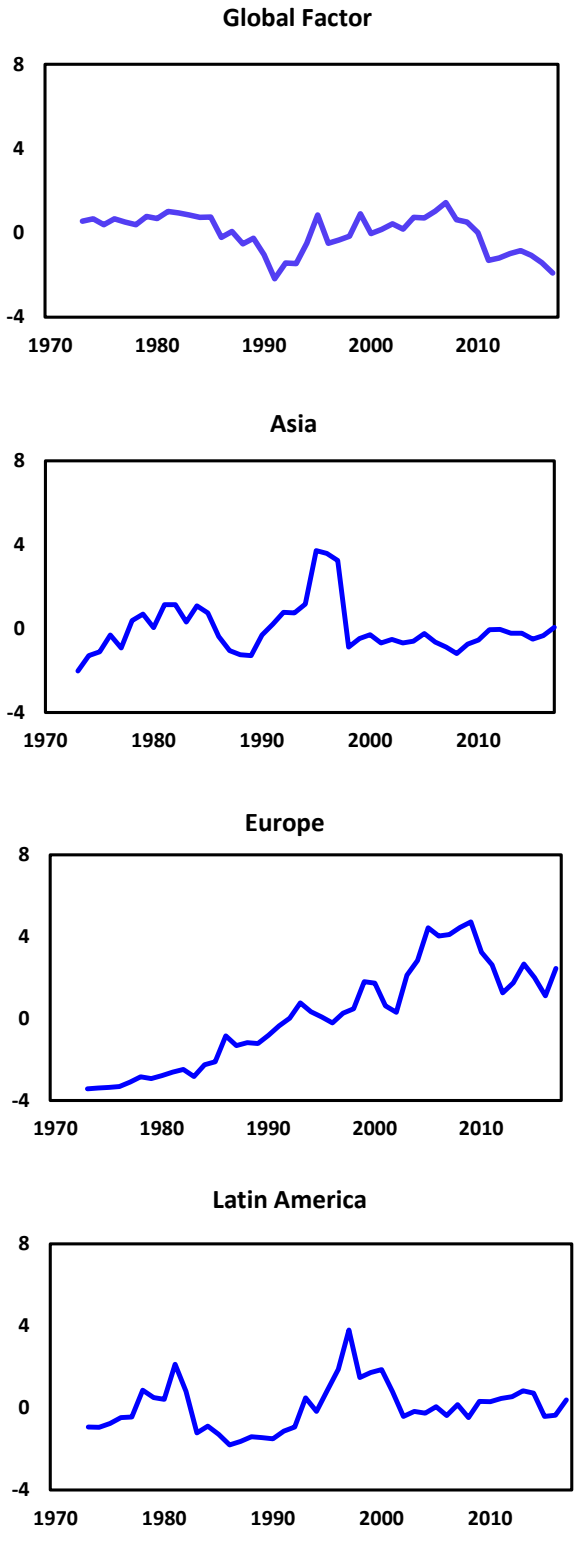
Figure 1
Capital Flows
(Share of Exports)



Notes: Capital flows are captured with International Gross Primary Issuance of Bonds, Equites, and Syndicated Loans.

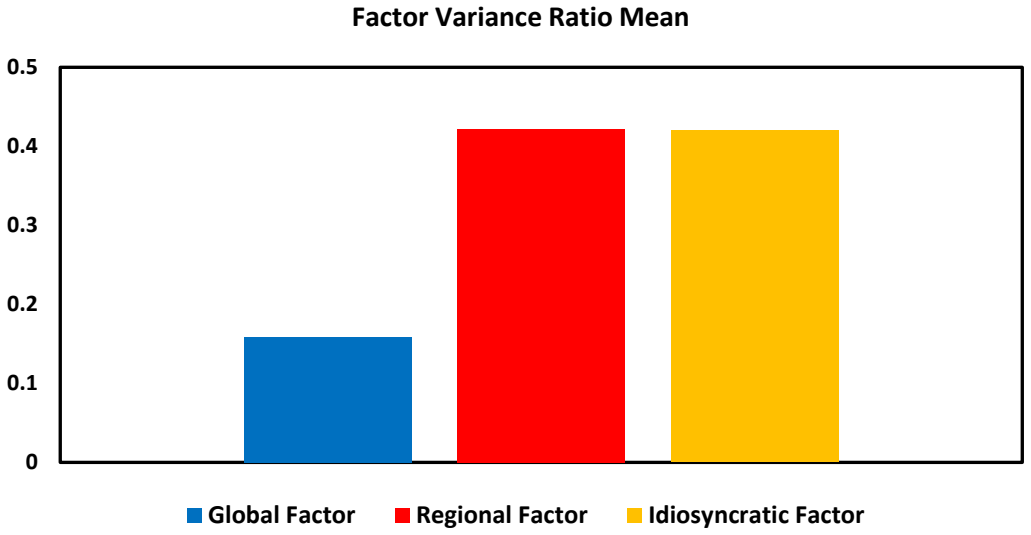
Figure 2
The Global and Regional Factors



Notes: This Figure shows the Global and Regional Factors estimated using a Dynamic Latent Factor Model.

Figure 3

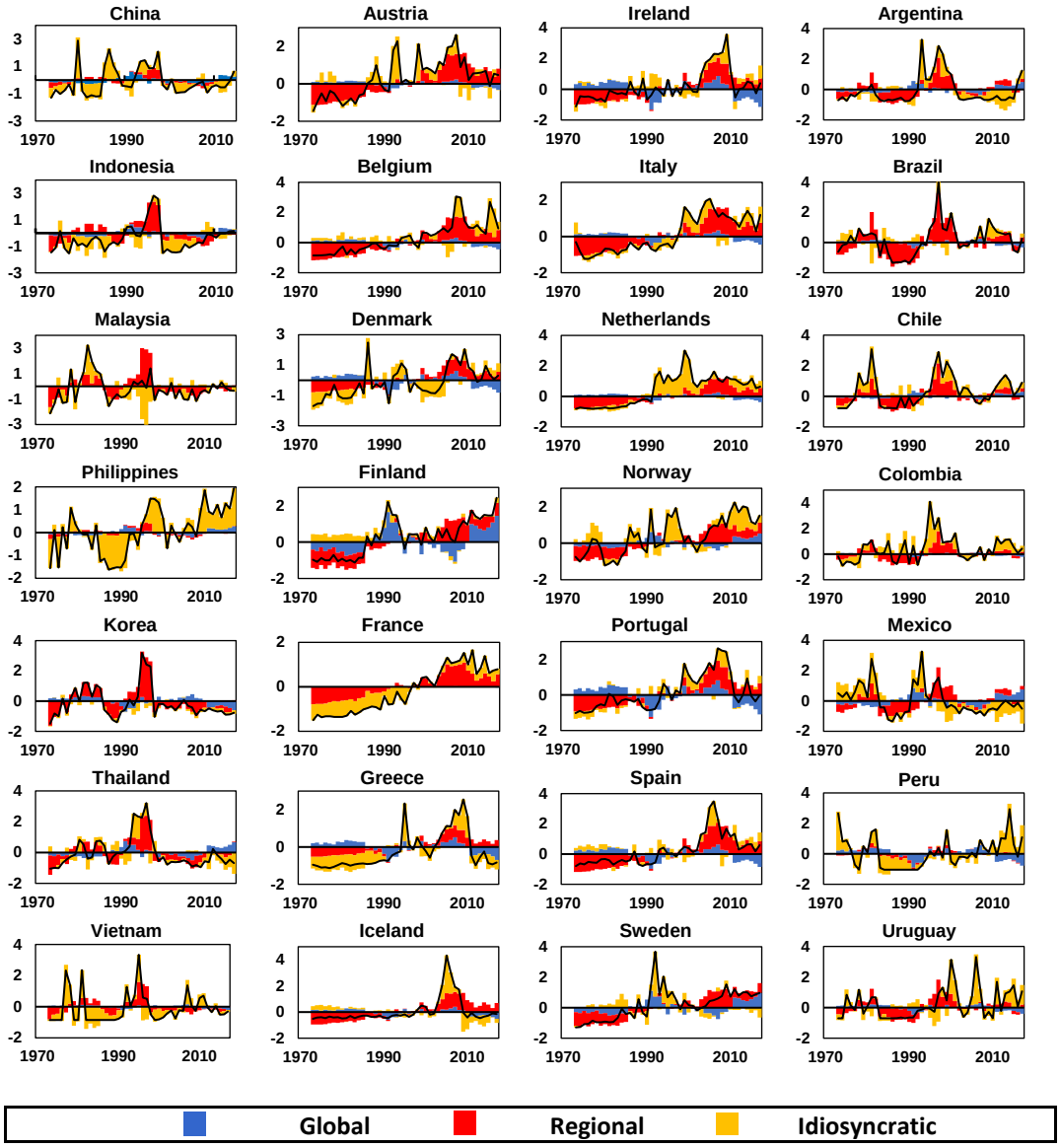
The Role of Global, Regional, and Idiosyncratic Factors: Average Across All Countries



Notes: This Figure shows the average variance decomposition of capital flows (as a share of exports) since the collapse of the Bretton Woods System until 2017 across all countries. Capital Flows are captured by International Gross Primary Issuance.

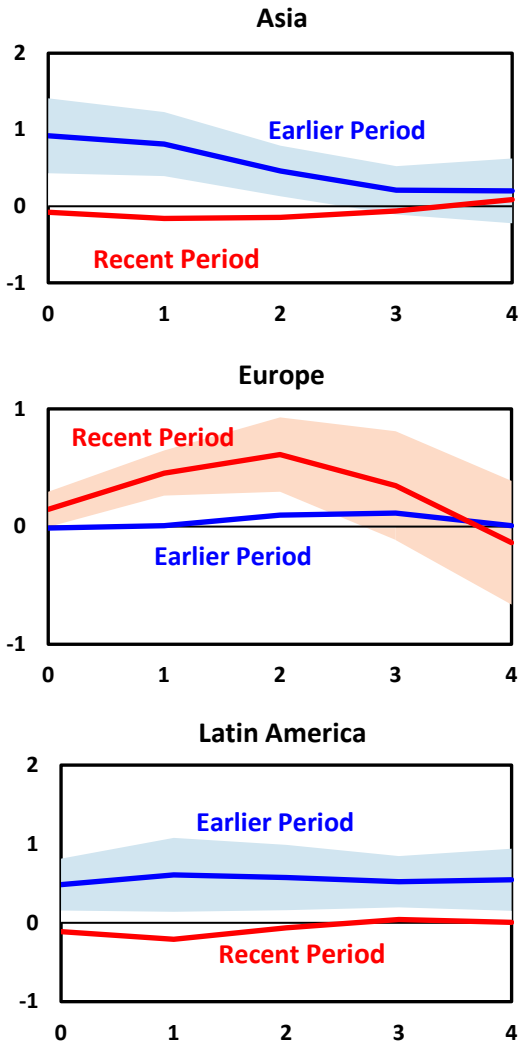
Figure 4

The Role of Global, Regional, and Idiosyncratic Factors: Evolution over Boooms and Bust



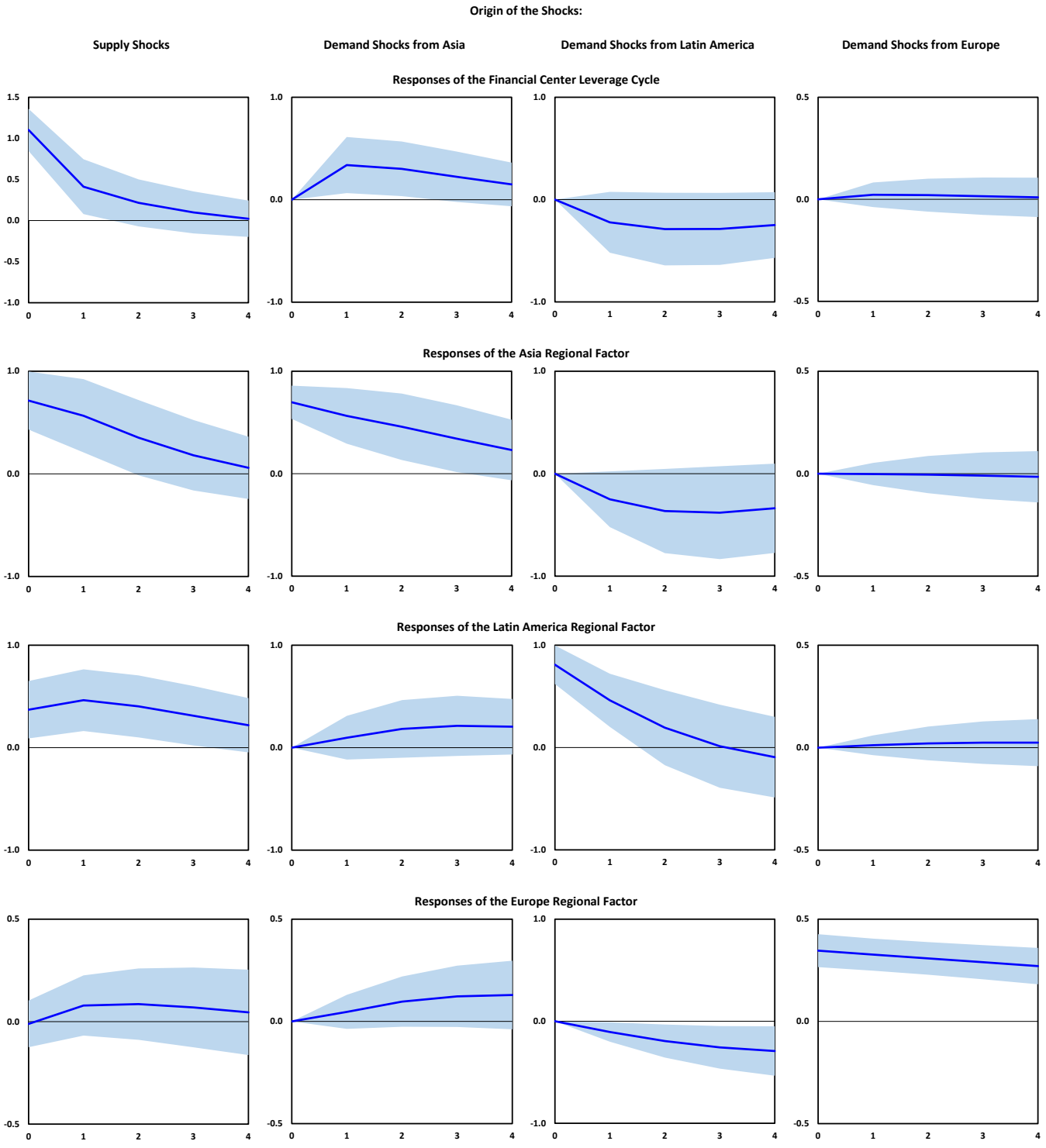
Notes: This Figure shows the role of the Global, Regional, and Idiosyncratic Factors on the evolution of the (normalized) Capital Flows/Exports (shown as a black line). Capital Flows are captured by International Gross Primary Issuance. For each country, we normalized Capital Flows/Exports to a zero-mean, unit-variance series prior to the estimation of the Dynamic Latent Factor Model.

Figure 5
Effects of Leverage Shocks



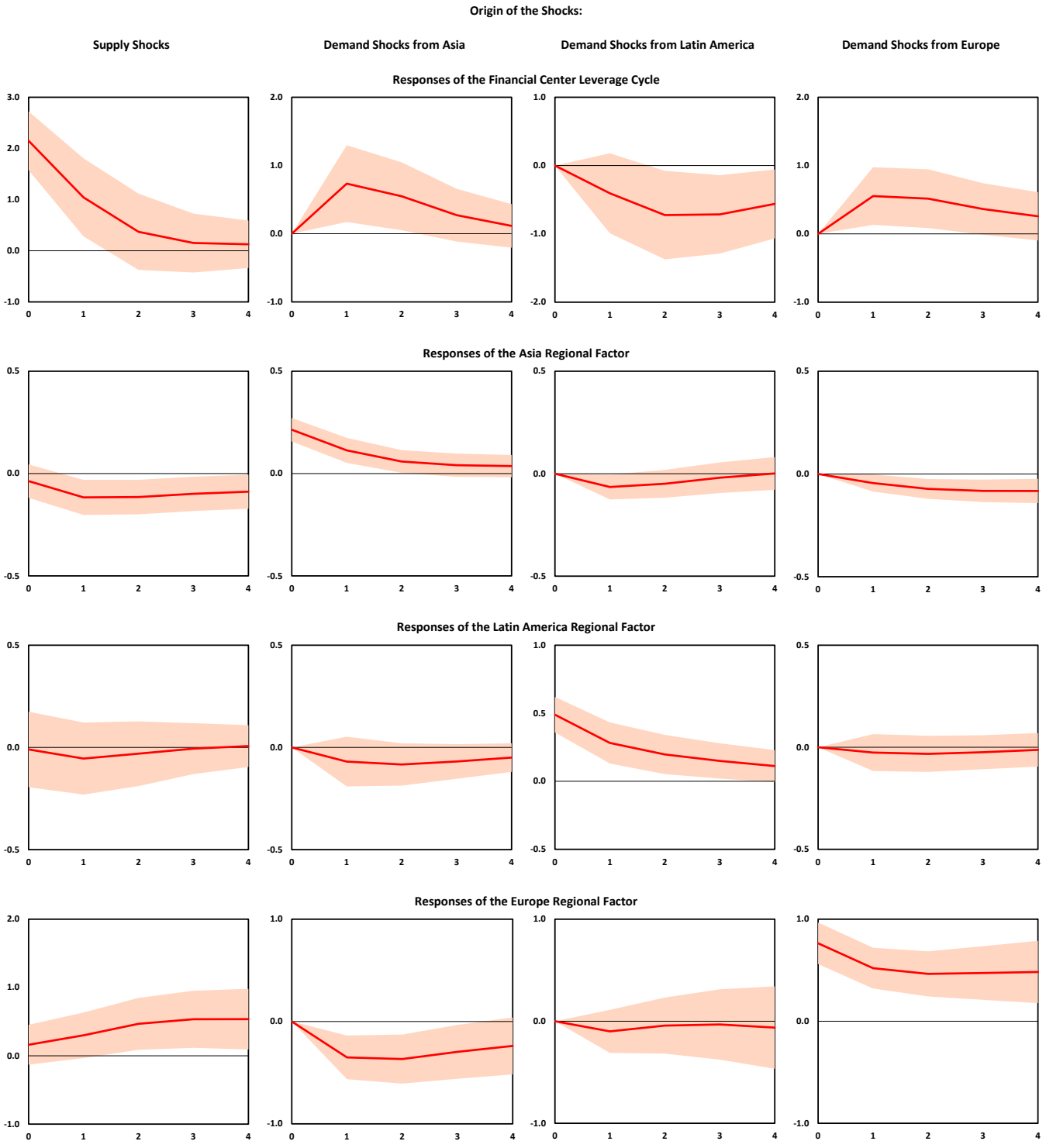
Notes: This Figure shows the response of the Regional Factors to a one-standard deviation shock to the Leverage Cycle in the Financial Center (at different horizons: 0, 1, 2, 3, 4 (years)) in the Earlier Period (1973 to 1998) and in the Recent Period (1999 to 2017). The shaded region is the 90% confidence interval.

Figure 6 A
Impulse Responses in the Earlier Period, 1973-1998



Notes: This Figure shows the response of the Financial Center Leverage Cycle and the Asia, Latin America and Europe Regional Factors to a one-standard deviation supply shock and three demand shocks originating in Asia, Latin America, and Europe (at different horizons: 0, 1, 2, 3, 4 (years)) in the Earlier Period (1973 to 1998). The shaded region is the 90% confidence interval.

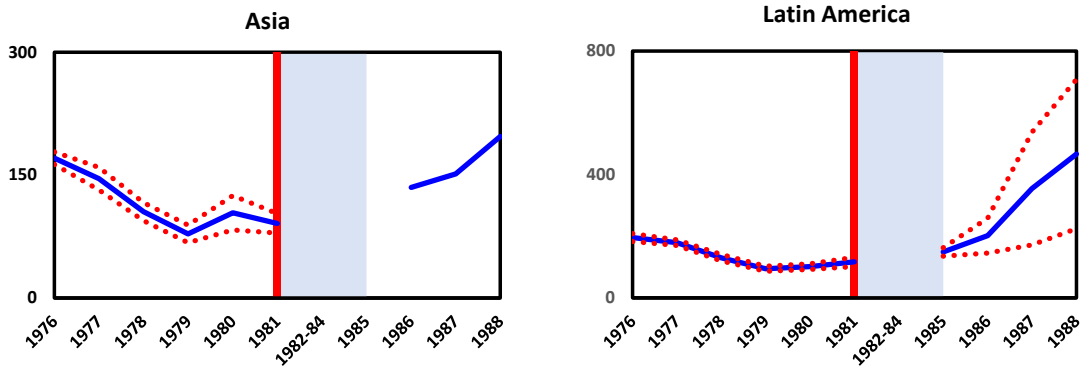
Figure 6 B
Impulse Responses in the Recent Period, 1999-2017



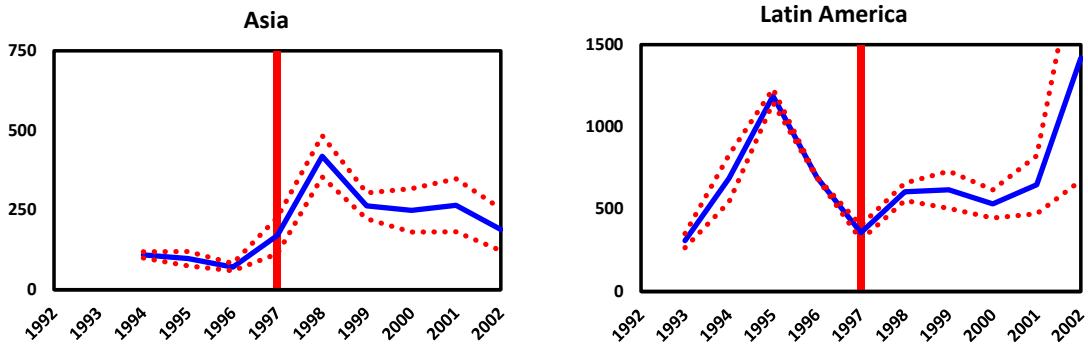
Notes: This Figure shows the response of the Financial Center Leverage Cycle and the Asia, Latin America and Europe Regional Factors to a one-standard deviation supply shock and three demand shocks originating in Asia, Latin America, and Europe (at different horizons: 0, 1, 2, 3, 4 (years)) in the Recent Period (1999 to 2017). The shaded region is the 90% confidence interval.

Figure 7
Borrowing Costs

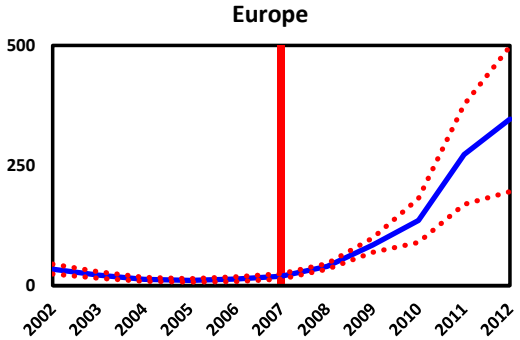
Panel A: Syndicated Loan Spreads
1976-1988



Panel B: EMBIG Spreads
1992-2002



Panel C: 10-Year Bond Spreads
2002-2012



Notes: This Figure shows the evolution of borrowing costs during the capital flow cycles with peaks in 1981, 1997, and 2007. Borrowing Costs are captured with Syndicated Loan Spreads (Panel A), with EMBIG spreads (Panel B), and with 10-Year Bond Yield Spreads (Panel C). The red vertical line indicates the year of the peak of the capital flow cycle and the blue shaded area in Panel A identifies the years with no data on spreads.

Table 1 A
Variance Decomposition in the Earlier Period, 1973-1998

Variance Decomposition Financial Center Leverage Cycle

Horizon	Fraction of Variance Due to:			
	Supply Shock	Demand Shocks from :		
		Asia	Latin America	Europe
0	100.0%	0.00%	0.00%	0.00%
1	89.4%	7.39%	3.19%	0.03%
2	80.8%	11.61%	7.49%	0.05%
3	75.3%	13.37%	11.23%	0.06%
4	72.2%	13.92%	13.84%	0.06%

Variance Decomposition Asia Regional Factor

Horizon	Fraction of Variance Due to:			
	Supply Shock	Demand Shocks from :		
		Asia	Latin America	Europe
0	51.2%	48.81%	0.00%	0.00%
1	48.9%	47.42%	3.67%	0.00%
2	44.1%	46.88%	9.02%	0.00%
3	40.1%	46.01%	13.84%	0.00%
4	37.7%	45.05%	17.27%	0.01%

Variance Decomposition Latin America Regional Factor

Horizon	Fraction of Variance Due to:			
	Supply Shock	Demand Shocks from :		
		Asia	Latin America	Europe
0	17.3%	0.00%	82.67%	0.00%
1	28.6%	0.77%	70.58%	0.01%
2	35.2%	2.93%	61.88%	0.04%
3	38.1%	5.49%	56.37%	0.07%
4	38.7%	7.63%	53.61%	0.10%

Variance Decomposition Europe Regional Factor

Horizon	Fraction of Variance Due to:			
	Supply Shock	Demand Shocks from :		
		Asia	Latin America	Europe
0	0.1%	0.00%	0.00%	99.90%
1	2.6%	0.89%	4.50%	92.04%
2	3.5%	2.91%	12.31%	81.31%
3	3.3%	4.71%	20.23%	71.78%
4	2.8%	5.83%	26.89%	64.51%

Notes: This Table shows the variance decomposition of the Financial Center Leverage Cycle, and the three Regional Factors: Asia, Latin America, and Europe at different horizons: 0,1, 2, 3, 4 (years).

Table 1 B
Variance Decomposition in the Recent Period, 1999-2017

Variance Decomposition Financial Center Leverage Cycle

Horizon	Fraction of Variance Due to:			
	Supply Shock	Demand Shocks from :		
		Asia	Latin America	Europe
0	100.0%	0.00%	0.00%	0.00%
1	85.0%	8.01%	2.45%	4.55%
2	73.6%	10.56%	8.68%	7.20%
3	67.6%	10.51%	13.83%	8.11%
4	64.7%	10.18%	16.67%	8.47%

Variance Decomposition Asia Regional Factor

Horizon	Fraction of Variance Due to:			
	Supply Shock	Demand Shocks from :		
		Asia	Latin America	Europe
0	2.9%	97.13%	0.00%	0.00%
1	18.7%	73.60%	5.27%	2.43%
2	27.0%	59.72%	6.36%	6.94%
3	30.9%	52.01%	5.71%	11.41%
4	33.0%	46.96%	5.05%	15.01%

Variance Decomposition Latin America Regional Factor

Horizon	Fraction of Variance Due to:			
	Supply Shock	Demand Shocks from :		
		Asia	Latin America	Europe
0	0.0%	0.00%	99.96%	0.00%
1	0.9%	1.46%	97.39%	0.20%
2	1.1%	3.13%	95.34%	0.46%
3	1.0%	4.09%	94.33%	0.57%
4	1.0%	4.53%	93.90%	0.59%

Variance Decomposition Europe Regional Factor

Horizon	Fraction of Variance Due to:			
	Supply Shock	Demand Shocks from :		
		Asia	Latin America	Europe
0	4.3%	0.00%	0.00%	95.71%
1	10.5%	11.16%	0.90%	77.40%
2	20.0%	15.39%	0.70%	63.87%
3	27.4%	15.22%	0.56%	56.87%
4	31.9%	14.11%	0.58%	53.44%

Notes: This Table shows the variance decomposition of the Financial Center Leverage Cycle, and the three Regional Factors: Asia, Latin America, and Europe at different horizons: 0,1, 2, 3, 4 (years).