Essays on International Capital Flows

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Abstract of Dissertation

Essays on International Capital Flows

This dissertation consists of three essays that empirically investigate topics in international capital flows of advanced and emerging economies: volatility of capital flows, capital flows to periphery countries, and interactions between private and sovereign borrowing. The first chapter studies the time-varying volatility of international capital flows of 38 countries since 2000. Volatile international capital flows increase the risk of financial crises and reduce economic growth. The theoretical literature predicts that financial globalization will make capital flows more volatile. Importantly, the deepening of financial globalization has led to the emergence of the global financial cycle, making taming capital flows even more challenging. It is essential to measure capital flow volatility and examine what factors affect it. A set of panel regressions show that tighter global financial conditions and higher local financial development lead to higher capital flow volatility. I also find a threshold effect: financial volatility and risk in the global financial center trigger more volatility of the gross capital flow in the more financially developed countries. These empirical findings provide insights into international capital flow management.

In the second chapter, 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.

In the third chapter, we examine the capital flows to the periphery again from a different perspective by using the same database. Our focus is on the relationship between capital flows to the private and sovereign sectors. In particular, we examine whether sovereign issuance in international capital markets helps to create a market for private international issuance (crowding in) or sovereign international issuance reduces the ability of the private sector to borrow in the international market (crowding out). We examine whether the interactions between public and private international issuance vary in times of bonanzas (busts) in global liquidity, are affected by the level of the country's international public debt, or are impacted by the country's sovereign risk. Our results indicate that the interactions do vary in different states.

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Chapter 1: Capital Flow Volatility: The Effects of Financial Development and Global Financial Conditions

1.1. Introduction

Following the collapse of the Bretton Woods system in the 1970s, countries started to eliminate capital controls, and financial globalization resumed. Since then, capital flows have surged and remained volatile. Even though integrated financial markets can fuel economic growth by optimally allocating capital, volatile capital flows can increase the risk of crises and reduce economic growth, especially in emerging economies.[1] Dealing with volatile international capital flows is a major concern in both academic and policy circles. Borio (2014) first emphasizes that it is not possible to understand business fluctuations and the corresponding analytical and policy challenges without understanding the financial cycle. He documents that financial cycle is best captured by the joint behaviors of credit and property prices. Moreover, Rey (2015) and Miranda-Agrippino and Rey (2020) have concluded that increasing international financial integration has led to the emergence of a global financial cycle. Credit aggregates, capital flows, and asset prices all over the world are strongly influenced by US monetary policy but not aligned with countries' specific macroeconomic conditions.[2] Also, Bruno and Shin (2015) find evidence that US monetary policy strongly affects cross-border bank capital flows. A contractionary shock to US monetary policy leads to a decrease in cross-border banking capital flows,

[1] Ramey and Ramey (1995) find that countries with higher economic volatility have lower economic growth. Kaminsky (2005) examines the impacts of international capital flows on growth and financial stability from the 1970s to the 1990s. Steady capital flows are essential to financial stability and economic growth.

[2] They also claim that "Trilemma is dead". However, many subsequent papers, such as Klein and Shambaugh (2015) and Obstfeld et al. (2019), have argued that the trilemma is still important since pegged countries have less autonomy than floats. Research agrees is that no country with open financial markets is immune to shocks from the global financial center.

which is called the risk-taking channel of monetary policy. In other words, these empirical findings indicate that the global financial center (United States) has increasingly significant impacts on international capital flows, which have played a vital role in the global financial cycle.[3] As a result, taming volatile capital flows has been a great challenge for the global economy since the beginning of financial globalization, and this challenge can become more severe in the context of the global financial cycle.

A better understanding of the evolution and determinants of capital flow volatility is fundamental for designing capital flow management and macroprudential policy in the current international monetary and financial system. A variety of models suggest that financial globalization leads to a higher level of international capital flow volatility. Using models with information costs, Calvo and Mendoza (2000) and Bacchetta and van Wincoop (2000) show that financial globalization can produce high volatility of capital flows and herding behavior. Chari and Kehoe (2004) develop a model of herd behavior to show that information frictions in the international financial markets combined with weak fundamentals can lead to excessive volatility of capital flows. Recently, Broner and Ventura (2016) develop a model to explain that financial globalization generates volatile and procyclical capital flows because of the multiple equilibria determined by investor sentiment.

The empirical literature explaining the level of volatile capital flows is large.[4] However, the literature explaining the volatility of capital flows is much smaller.[5] First,

[3] Cerutti et al. (2019b) argue that common shocks from financial center like the USA explain little variation in most types of capital flows. But the criterion of judging the importance of the global financial cycle is still controversial.

[4] For the recent evidence of volatile gross capital flows, See Milesi-Ferretti and Tille (2011), Forbes and Warnock (2012), Fratzscher (2012), Broner et al. (2013), Bluedorn et al. (2013), and Ghosh et al. (2014).

[5] The evolutions of the level and time-varying volatility of a capital flow series could be quite different, especially for volatile gross flows. The booms and busts of capital flows may have lasting large amplitudes,

Cipriani and Kaminsky (2007) investigate the behavior of the volatility of gross issuance in international financial markets (countries' capital inflows) and the role of volatility in the financial center. They find that gross capital inflows became less erratic as the volatility of monetary policy in the financial center declined in the 1990s and early 2000s. Other studies focus on the determinants of capital flow volatility. Broner and Rigobon (2006) use standard deviations of total capital flows to document that capital flows to emerging countries are much more volatile than those to developed countries. They suggest that domestic and foreign macroeconomic fundamental variables explain little of the dynamics of capital flows, while the fundamentals of country characteristics explain a substantial amount of the unconditional volatility of capital flows across countries. Similarly, by analyzing the standard deviations of capital inflows during 1970-2000, Alfaro et al. (2007) show that domestic institutional quality and monetary policy have played a role in the long-run volatility of capital flows. On the other hand, both Broto et al. (2011) and Pagliari and Hannan (2017) use panel regressions to analyze the determinants of the volatility of the various types of capital flows and suggest that push (global) factors tend to be more important than pull (domestic) factors in explaining the volatility of capital flows.

To date, the existing empirical literature has not clearly illustrated how the financial development of countries affects capital flow volatility and has not highlighted the impacts of the global financial cycle. Do the deepening of financial development and globalization increase or decrease capital flow volatility? What factors have significant effects on capital flow volatility? Do pull factors still matter for capital volatility in the presence of the global financial cycle? This study attempts to evaluate the dynamics of capital flow volatility since

while the volatility of capital flows may be quite small. On the other hand, even the levels of capital flows are not huge, the fickle behaviors of capital flows may generate high volatility.

2000 and answer these questions.

The first contribution of this study is to incorporate financial condition indexes of periphery countries and global financial centers into the push-pull framework to explain international capital flow volatility. The existing empirical literature on capital flow volatility still adopts the same push and pull factors that are used to explain capital flow levels. Nevertheless, the dynamics and determinants of capital flow volatility can be quite different from those of capital flow levels, so that traditional push and pull factors that explain capital flow levels well may no longer be appropriate in analyzing capital flow volatility. Worse, too many explanatory variables could create multilinearity and endogeneity issues. Given these problems, a better set of push and pull factors for the volatility of capital flows is warranted. Since I am interested in explaining capital flow volatility, pull and push factors measuring financial and macroeconomic volatility are the preferred choices. In the international finance literature, the VIX index has been used as the ubiquitous proxy for risk and volatility in the global financial center. However, this index is derived from the price inputs of the S&P 500 index options and represents the expectation of 30-day forward-looking equity market volatility rather than the overall risk and volatility of the financial system. Financial condition indexes that have been constructed and widely used for monitoring, nowcasting, and forecasting may better explain capital flow volatility.[6] The financial condition index used in this study captures information on a large number of financial variables that measure liquidity, risk, and volatility in money markets, debt and equity markets, and even shadow banking systems,

[6] Hatzius et al. (2010) survey and compare a variety of different approaches by which financial condition indexes are constructed. Kliesen et al. (2012) also survey and compare many financial condition and financial stress indexes. All those indexes, in fact, measure the same thing, so they should be highly correlated.

so that it measures the overall financial instability (volatility, risk, and uncertainty).

The second contribution of this study is to estimate the idiosyncratic financial condition factor of each country and use it as the key pull factor of country-specific financial volatility to explain capital flow volatility. Recently, Kaminsky (2019) has commented that global leverage, risk appetite, and uncertainty have been at the core of the empirical literature on capital flows since the Great Financial Crisis. The unobservable global factors extracted from these variables drive the comovement of capital flows and amplify the effects of monetary policy in the financial centers. Hence, countries' financial conditions may be highly correlated and commonly driven by the latent global and group (advanced or emerging) financial condition factors. It is necessary to exclude global and group components from them. The remaining part is the idiosyncratic component of the country's financial condition. Such an idiosyncratic factor will be a better pull factor in explaining capital flow volatility. In the international business cycle literature, Kose et al. (2003a) use a Bayesian dynamic latent factor model to extract the common cycle factors at multiple levels, obtaining country-specific, regional, and world business cycle factors. This approach can be conveniently applied to extract multi-level common factors of different macroeconomic variables.[7] In this study, with data on the financial condition indexes of countries, I apply the Bayesian dynamic latent factor model to obtain the idiosyncratic financial condition factor for each country and use it as the pull factor.

The last contribution of this study is to improve our understanding of threshold effects in financial development and globalization in terms of capital flow volatility. The

[7] Cerutti et al. (2019a) apply the same method to extract the common dynamics in gross inflows, distinguishing between global factors affecting all countries and factors affecting sub-groups of countries by income level or region.

empirical literature indicates that financial liberalization decreases macroeconomic volatility but that this effect is subject to threshold effects. Kose et al. (2003b) find that financial openness is associated with an increase in the ratio of consumption volatility to income volatility at the beginning of financial liberalization. Once the financial openness crosses a particular threshold, this ratio starts to decrease. Furthermore, Kose et al. (2011) identify that once threshold conditions for financial depth and institutional quality are satisfied, the benefit from financial openness improves significantly. Bekaert et al. (2006) also suggest that countries with more open capital accounts have lower consumption growth volatility after opening equity markets. However, for countries that are economically fragile and that have low-quality institutions with a less developed financial sector, equity market liberalization may increase real volatility rather than reduce it. These empirical studies imply that emerging economies cannot gain the benefits of financial integration and should not open their economies to capital flows until they improve their financial and institutional development above a certain threshold.[8] Given the emergence of the global financial cycle, push factors are becoming increasingly significant, which may change the dynamics of capital flow volatility and alter the threshold effects in further. Hence, how financial development and openness affect capital flow volatility in the context of the global financial cycle is worth investigating.

The main results of this study indicate the following.

First, I apply the method from Engle and Rangel (2008) to estimate all types of capital flow volatility for each country. The advantage of this method is that it can estimate

[8] From the perspective of time horizon, Kaminsky and Schmukler (2008) show that the effects of financial liberalization are time-varying. In the short run, large booms and busts appear after financial liberalization. However, institutions improve later on, and financial markets tend to stabilize in the long run.

the time-varying volatility of macroeconomic data at a relatively low frequency rather than the standard deviation over the sample period, illustrating the evolution of capital flow volatility. Estimations show that this approach works well. Surges, stops, flights, and retrenchments of gross capital flows are reflected in their volatility. The results suggest that instrument type matters for the volatility of capital flow. In general, bank flows appear to be the most volatile, and FDI flows have been the most stable among all types of disaggregate flows since 2000, which is consistent with the conventional wisdom.[9] FDI is mainly driven by longer-term optimistic expectations about the recipient country and is more difficult to reverse than other types of capital flows because such investment usually entails physical investment in plants and equipment and aims to control underlying assets to some extent. Portfolio and bank flows tend to be much more susceptible to conditions and shocks in both domestic and global financial markets.

Second, I obtain the idiosyncratic financial condition factors for all the countries by the financial condition indexes of the sample countries and the Bayesian latent factor model discussed above. They are used in the panel regressions of capital flow volatility with other pertinent pull and push factors. By and large, the results indicate that higher local financial development is associated with higher capital flow volatility, and tighter global and idiosyncratic financial conditions cause more volatile capital flows. Meanwhile, other pull factors, including financial openness and real exchange rate volatility, and push factors, such as global and US real economic volatility, do not have that significant effects on capital flow volatility. Results slightly vary across different country groups and types

[9] Eichengreen et al. (2018) document that foreign direct investment inflows are more stable than non-FDI inflows. Within non-FDI inflows, portfolio debt and bank-intermediated flows are most volatile. These patterns still hold despite recent structural and regulatory changes.

of capital flows.

Third, given the findings of the previous panel regressions, I implement the panel threshold model introduced in Hansen (1999) to examine whether domestic financial development amplifies or reduces external shocks on capital flow volatility. The financial development of countries is used as a threshold variable rather than an explanatory variable. I examine the effects of the global financial conditions on capital flow volatility in both low and high financial development states. The results show a threshold effect: global financial conditions have larger and more significant effects on the gross flow volatility in more financially developed countries. But, this threshold effect is not significant for all disaggregate flow volatility.

Additionally, the impulse response of local projection developed by Jordà (2005) is a useful tool to compute impulse responses to an identified shock without specification and estimation of the underlying multivariate dynamic system. What is more, this method is flexible enough to deal with nonlinear effects. In this study, the state-dependent local projection model developed in Ramey and Zubairy (2018) has been utilized to investigate the threshold effect just found in a dynamic way and check the robustness of the results. The outcomes of the impulse responses confirm the findings obtained from the fixed effects panel threshold regressions. The implication is that more financially developed peripheral countries are subject to more exposure to volatility in the global financial center.

The rest of this chapter is organized as follows. Section 1.2 describes the data. Section 1.3 measures capital flow volatility. Section 1.4 estimates the latent financial condition factors. Section 1.5 examines capital flow volatility by using panel regressions with push and pull factors. Section 1.6 applies state-dependent local projections to

investigate the threshold effects in further. Section 1.7 concludes.

1.2. The Data

1.2.1. Gross Capital Flow Data

In this research, all the international capital flow data come from the Financial Account portion of IMF Balance of Payments Statistics (BOPS) database, which is the most comprehensive database available on international capital flows.[10] The early literature in this field concentrated on studying net capital flows rather than gross flows. Broner et al. (2013) examine gross capital flows and find that they are larger and more volatile than net capital flows.[11] In fact, net flows reflect current accounts of countries, and gross flows indicate the balance sheets of countries in terms of assets and liabilities. The behaviors of gross capital flows can reveal more information about how various push and pull factors drive the capital flows over the cycles and during crises.[12] In IMF's BOPS datasets, gross inflows (net inflows) are gross liability flows from foreign agents, and gross outflows (net outflows) are gross asset flows generated by domestic agents. Thus, gross flows can be positive or negative. The financial account of the BOPS database does not directly provide gross capital flows of a country. In this study, the gross capital inflows of one country are the sum of FDI inflows (outflows), portfolio inflows (outflows), and bank inflows (outflows).[13] Then I define:

[10] This database has been updated based on the Sixth Edition of the IMF's Balance of Payments and International Investment Position Manual (BPM6).

[11] Avdjiev et al. (2018) distinguish net flows and gross flows in detail and point out that what is commonly called "gross flows" in the literature is more accurately described as "net inflows" and "net outflows".

[12] See Obstfeld (2012) for more discussion on net flows and gross flows. Caballero and Simsek (2020) develop a model of gross capital flows and show that foreign investment exit (fickleness) and domestic investments abroad return home (retrenchment) happen simultaneously during asset fire sales. Net capital flows hide these patterns of gross capital flows.

[13] Portfolio flows consist of equity and debt flows. The volatilities of equity and debt flows may differ greatly from each other. In this chapter, I only investigate the total portfolio flows, but it is also important to separate

$$Gross\ Inflows \equiv FDI\ Inflows + Portfolio\ Inflows + Bank\ Inflows$$
$$Gross\ Outflows \equiv FDI\ Outflows + Portfolio\ Outflows + Bank\ Outflows$$

I extract the capital flow data of 38 countries, including 19 advanced economies and 19 emerging economies from the database.[14] Country group dummy variables are generated based on the IMF Country Composition of World Economic Outlook Groups. The quarterly capital flow data quality in the IMF BOPS database, especially for disaggregate capital flow data by instrument, is relatively poor before the 2000s. Because of this disadvantage, this study only investigates quarterly capital flow data from 2000Q1 to 2017Q4, and the sample periods of countries vary slightly. Another issue is that the datasets contain many zeros and missing values, and data users can hardly distinguish them. Zero-value observations could be generated by either lack of reported data or capital controls. To address this issue, I adopt the strategies that are similar to those in Forbes and Warnock (2012) to fix the capital flow datasets.[15] Before estimating the volatility of capital flows, capital flows should be scaled. Most existing empirical literature in this field uses the nominal GDP of each country to scale its capital flows. However, GDP data in USD can be too volatile because of the effect of foreign exchange rates, which may bring about undesired volatility. Thus, it is necessary to reduce the volatility of the GDP before it is used to scale capital flow series. In line with Kaminsky (2017), I apply the Hodrick-Prescott filter method to extract the trend part of the GDP of a country and divide the GDP trend by four. Then it is used to scale the quarterly capital flow series of that country.[16]

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them in the further research. Since the largest part of other investment flows is bank flows, this study uses bank flows to denote other investment flows.

[14] See the country list in Appendix 1.A.

[15] The details can be found on Online Appendix A in Forbes and Warnock (2012). All the changes I have made to the original capital flow data are recorded in Appendix 1.B.

[16] The Hodrick-Prescott Filter model is set with $\lambda = 100$ to get the GDP trend part since GDP is annual data.

Nominal GDP in USD of all the sample countries are from the World Bank World Development Indicators (WDI) database.

1.2.2. Push and Pull Factor Data

Pull factors refer to country-specific variables. First, the financial condition index data of countries are from IMF (2017). Koop and Korobilis (2014) use factor augmented vector autoregressive models with time-varying parameters (TVP-FAVAR) and stochastic volatility to construct an effective financial condition index for the United States. Through this methodology, IMF (2017) chooses a set of 10 financial indicators to develop a dataset of the cross-country and comparable Financial Condition Indexes for 43 advanced and emerging market economies from 1991M1 to 2016M9. [17] Second, the financial development index data of countries come from the IMF Financial Development Index Database, which provides nine annual indexes for 183 countries from 1980 onwards. Due to the complex multidimensional nature of financial development, these nine indexes summarize how developed financial institutions and financial markets are in terms of financial depth, access, and efficiency.[18] Depth evaluates the size and liquidity of financial institutions and markets; access measures the ability of individuals and companies to access to financial services; efficiency assesses the ability of institutions to provide financial

[17] These country-level financial indicators include corporate spreads, term spreads, interbank spreads, sovereign spreads, the change in long-term interest rates, equity and house price returns, equity return volatility, the change in the market share of the financial sector, and credit growth.

[18] Svirydzenka (2016) explains the methodology in detail. Specifically, the overall Financial Development Index (FD) is an aggregate of the Financial Institutions Index (FI) and the Financial Markets Index (FM). Then, the Financial Institution Index is an aggregate of Financial Institutions Depth Index (FID), Financial institutions Access Index (FIA), and the Financial Institutions Efficiency Index (FIE). Finally, the Financial Markets Index is an aggregate of Financial Markets Depth Index (FMD), financial Markets Access Index (FMA), and the Financial Markets Efficiency Index (FME). Kaminsky and Schmukler (2008) have illustrated that financial liberalization is followed by large booms and busts only in the short run, and in the long run institutions improve and financial markets tend to stabilize. Their empirical evidence implies that financial integration can promote the financial development. Hence, financial development level also reflects the degree of financial integration.

services at low cost and with sustainable revenues and the level of activity if capital markets. Third, the degree of capital account openness of a country is measured by the Chinn-Ito Index.[19] This index is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The Chinn-Ito Index dataset contains 182 countries and encompasses from 1970 to 2017. At last, the real effective exchange rate (REER) data of countries come from the World Bank Global Economic Monitor (GEM) Database.

Push factors stand for global variables or variables of a global financial center like the United States. First, I select the Chicago Fed's Adjusted National Financial Conditions Index (ANFCI) as a push factor. In the wake of the Global Financial Crisis, numerous measures of the US financial condition and financial stress have been constructed by researchers and institutions.[20] The Chicago Fed's National Financial Conditions Index (NFCI) is extracted by using dynamic factor analysis from a set of more than one hundred series in a broad range of money markets, debt and equity markets, and the traditional and shadow banking systems. As a result, it comprehensively measures the U.S. financial conditions.[21] The Adjusted National Financial Conditions Index (ANFCI) is slightly different from the National Financial Conditions Index (NFCI). The former represents a

[19] Chinn and Ito (2006) initially introduced this index, and Chinn and Ito (2008) give more information on how the index is constructed and how it compares with other measures of cross-border financial flows. This index of openness can also be regarded as a measure of financial integrations/interconnectedness with the international financial markets.

[20] Kliesen et al. (2012) survey and compare many Financial Condition Indexes (FCIs) and Financial Stress Indexes (FSIs). They distinguish FCI and FSI in term of variables adopted in the constructions of the indexes and point out the primary difference is that the former tends to contain quantities, prices, and economic indicators while the latter generally use only prices.

[21] Positive values of this index indicate financial conditions that are tighter than average, while negative values indicate financial conditions that are looser than average. Alessandri and Mumtaz (2019) use this index to identify US financial regimes.

component of the latter.[22] The adjusted index is uncorrelated with economic conditions, so it is a "financial-only" index that excludes the accounting for the state of the business cycle and the level of inflation. This index is taken from the Federal Reserve Economic Data (FRED) and starts 1971M1 onward. Second, quarterly real GDP growth rate data of the US since 2000 also come from the FRED database. Third, I select a newly constructed Global Conditions Index (GCI) developed by Cuba-Borda et al. (2018) to reflect the global real economic activity. It is a monthly measure from 1970M9 to 2017M12 and constructed using a small set of world economic variables.[23] This index can be used to generate nowcast estimates of world GDP growth or to assess the probability of global economic recessions. The US real GDP growth rate and the GCI index are used to estimate the real economic volatilities of the U.S. and the world.

1.3. Measuring Capital Flow Volatility

It is worth to take a look at the descriptive statistics of capital flow volatility in the samples. The most straightforward measure for the volatility of one economic variable is its standard deviation or coefficient of variation. A coefficient of variation (CV) is a better descriptive statistic than a standard deviation (SD) when we compare volatilities of variables that have different magnitudes. However, the disadvantage of CV is that if the mean is negative or close to zero, CV will become an extreme and much less effective statistic. The median can help to eliminate the effects of such extreme value. Table 1.1 reports the medians of coefficients of variation of different types of scaled capital flows.

[22] See Brave and Kelly (2017). It is based across 105 indicators of risk, credit, and leverage in the U.S. financial system.

[23] These variables include world industrial production (IP) growth, world retail sales (RS) growth, and the new export order component of the global Purchasing Managers Index (PMI), as well as quarterly world GDP growth.

For all countries, the median of coefficients of variation of gross inflows is close to that of gross outflows. Bank flows are the most volatile, and portfolio flows are more volatile than FDI flows. For both advanced and emerging economies, the results are similar to those of the whole sample. These medians of CVs imply that the instrument type matters for capital flow volatility.

Nevertheless, one shortcoming of this sort of measure is that it cannot show the dynamics of volatility over time.[24] Engle and Rangel (2008) have constructed a measure of the volatility for macroeconomic variables whose frequency is usually much lower than that of financial variables.[25] This approach produces the measure of volatility from the residuals of an $AR(1)$ process, and it can be directly used to estimate the volatility of capital flow. Both Broto et al. (2011) and Pagliari and Hannan (2017) have compared different methods that can be used to estimate the volatility of capital flows. They all hold that this approach performs well and can be considered as a benchmark measure for capital flow volatility. Therefore, following the same model as Pagliari and Hannan (2017), with data of scaled quarterly capital flows in 38 countries since 2000, I estimate the residuals from the following $ARIMA(1,1,0)$ model:

$$\Delta y_{ijt}^{k} = \alpha + \rho \Delta y_{ij,t-1}^{k} + \nu_{ijt}^{k} \tag{1.1}$$

where y is the scaled capital flow of type ij (i: inflows, outflows; j: gross flows, FDI flows,

[24] Neumann et al. (2009) make use of the standard deviation of capital flows over a rolling window of annual data to measure capital flow volatility. However, the estimations depend on the window length and will lose observations. Broto et al. (2011) assess this approach and conclude that it tends to overly smooth the volatility processes.

[25] In asset pricing literature, the GARCH model developed by Bollerslev (1986) has been widely applied to estimate and predict the volatility of financial variables. The GARCH family models perform very well with financial data which are abundant. Unfortunately, when they are applied to macroeconomic variables such as capital flow data, the GARCH model is prone to fail to converge resulting from data scarcity. Changing model specifications of GARCH models may help to solve the non-convergence problem, but this will make the volatilities obtained from different models incomparable to each other.

portfolio flows, bank flows) in country k. Focusing on a longer effect, I transform absolute values of residuals into symmetric five-quarter moving averages:

$$\sigma_{ijt}^{k} = \sqrt{\frac{1}{5}\sum_{n=t-2}^{t+2} |\nu_{ijt}^{k}|} \tag{1.2}$$

As a result, σ_{ijt}^{k} is the estimated volatility of the capital flow and will be used as the dependent variables in the empirical framework.

Figures 1.1 and 1.2 present the estimations of gross inflow and outflow volatilities of each country. Like Eichengreen et al. (2018) in each period, I compute the medians of each type of capital flow volatility within a country group. They constitute time series of capital flow volatility medians. Figures 1.3 and 1.4 present the evolutions of capital flow volatility medians. The estimations are basically consistent with the results of the coefficients of variation in Table 1.1. For all countries, bank flows are the most volatile, and FDI flows are the most stable. Beyond capital flows' standard deviations and coefficients of variation, these estimated time-varying volatilities of capital flows can be used to construct panel data for further analysis in exploring the determinants of international capital flow volatility.

1.4. Estimating Idiosyncratic Financial Condition Factors

The financial condition indexes of both the periphery countries and the global financial center have been described in Section 1.2. They measure financial volatility and risk of the overall financial system in each country, so they are ideal explanatory variables in the push-pull empirical framework. However, in the context of the financial globalization and global financial cycle, countries' financial condition indexes can be highly correlated and commonly driven by the financial condition of the global financial

center. It may be problematic to treat countries' financial condition indexes as pull factors directly. Besides, since the patterns of capital flows are different in advanced economies and emerging economies, it is also reasonable to remove the effects of country group financial conditions from countries' financial conditions. There is no indicator measuring the overall financial conditions of advanced and emerging economies for the time being. Fortunately, Kose et al. (2003a) have provided a Bayesian latent dynamic factor model that can estimate country-specific, regional, and global common factors of business cycles with various economic time series of countries. In particular, Jackson et al. (2016) apply a two-level Bayesian dynamic factor model to IMF Real House Price Data and obtain world factor, advanced economy factor, and emerging economy factor of real house prices of sample countries. Following their model specifications, I make use of financial condition indexes of sample countries to estimate the global financial condition factor and the group financial condition factors and then compute the idiosyncratic financial condition factors of countries. In this way, a set of estimated idiosyncratic financial condition factors can serve as ideal pull factors of financial volatility to examine international capital flow volatility. With a total of 38 countries (19 advance economies and 19 emerging economies), I estimate the following latent factor model:

$$y_{it} = \alpha + \beta^{global} f_t^{global} + \beta_r^{group} f_{rt}^{group} + \varepsilon_{it} \tag{1.3}$$

where y_{it} is the financial condition index in country i at period t. Assume the unobservable idiosyncratic factors ε_{it} follow an $AR(p)$ process:

$$\varepsilon_{it} = \rho_{i1}\varepsilon_{i,t-1} + \rho_{i2}\varepsilon_{i,t-2} + ... + \rho_{ip}\varepsilon_{i,t-p} + \mu_{it} \tag{1.4}$$

where $\mu_{i,t} \sim N(0, \sigma_i^2)$ and $E(\mu_{i,t}\mu_{i,t-s}) = 0$ for $s \neq 0$. Then, assume unobservable global factor f_t^{global} and group factors f_{rt}^{group} follow these $AR(q)$ process:

$$f_t^{global} = \rho_1 {f_t^{global}}_{t-1} + \rho_2 {f_t^{global}}_{t-2} + ... + \rho_q {f_t^{global}}_{t-q} + \mu_t \tag{1.5}$$

$$f_{rt}^{group} = \rho_{r1} {f_{rt}^{group}}_{t-1} + \rho_{r2} {f_{rt}^{group}}_{t-2} + ... \rho_{rq} {f_{rt}^{group}}_{t-q} + \mu_{rt} \tag{1.6}$$

where $\mu_t \sim N(0, \sigma^2)$, $\mu_{rt} \sim N(0, \sigma_r^2)$, $E(\mu_t \mu_{t-s}) = E(\mu_{rt} \mu_{r,t-s}) = 0$ for $s \neq 0$.

I apply Bayesian techniques with data to estimate the parameters and factors above. First, simulating draw from complete posterior distributions for the model parameters and factors, and then successively draw from a series of conditional distributions using a Markov Chain Monte Carlo (MCMC) procedure. Posterior distribution properties are based on 10,000 MCMC replications after 5,000 burn-in replications. To implement the Bayesian techniques, the conjugate priors are summarized here:

$$\begin{aligned}
(\beta^{global}, \beta_r^{group})' &\sim N(0, I_2) \\
(\rho_{i1}, \rho_{i2}, ..., \rho_{ip})' &\sim N[0, dig(1, 0.5, ... 0.5^{p-1})] \\
(\rho_1^{global}, \rho_2^{global}, ..., \rho_q^{global})' &\sim N[0, dig(1, 0.5, ... 0.5^{q-1})] \\
(\rho_{r1}^{group}, \rho_{r2}^{group}, ..., \rho_{rq}^{group})' &\sim N[0, dig(1, 0.5, ... 0.5^{q-1})] \\
(\sigma_i^2)' &\sim IG(6, 0.001)
\end{aligned} \tag{1.7}$$

where $i = 1, ..., 38$ and $IG(\cdot)$ is the Inverse Gamma distribution. The lengths of the idiosyncratic and factor autoregressive polynomials are set to 4 ($p = 4$ and $q = 4$).

Figure 1.5 reports the estimations of these multi-level financial condition factors. It shows that the estimated global factor captures the Great Financial Crisis and the Eurozone Crisis. The correlation coefficient between the latent global financial condition factor and the Adjusted National Financial Condition Index (ANFCI) of the U.S. is as high as 0.72. Meanwhile, the group financial condition factors also capture the comovements of financial conditions within advanced and emerging economy groups. Overall, the Bayesian dynamic latent factor model performs very well, so countries' idiosyncratic financial

condition factors better reflect the volatility and risk of countries' domestic financial systems.

1.5. Panel Regressions

1.5.1. Fixed Effects Panel Regressions

The pull and push factor framework in this research mainly includes the financial volatility and real economic volatility as the explanatory variables. I first estimate the following panel regressions with fixed effects:

$$\begin{aligned}\sigma_{kt}^{ij} = \alpha_k^{ij} + \beta_0^{ij} + \beta_{FC}^{ij} FC_{k,t-1} + \beta_{FD}^{ij} FD_{k,t-1} \\ + \beta_{OPEN}^{ij} OPEN_{k,t-1} + \beta_{REERV}^{ij} REERV_{k,t-1} \\ + \gamma_{GFCI}^{ij} GFCI_{t-1} + \gamma_{USRV}^{ij} USRV_{t-1} + \gamma_{GCIV}^{ij} GCIV_{t-1} + \varepsilon_{kt}^{ij}\end{aligned} \tag{1.8}$$

where the dependent variable σ_{kt}^{ij} is estimated capital flow volatility of type ij in country k, α_k^{ij} is country fixed-effect item for capital flow of ij, and ε_{kt}^{ij} is the error item. The pull factors include the country financial condition factor FC_{kt}, country financial development index FD_{kt}, country capital account openness index $OPEN_{kt}$, and country real exchange rate volatility $REERV_{kt}$. This set of pull factors reflect financial volatility and risk, real economic volatility, and relevant country characteristics. The push factors contain global (U.S.) financial condition index $GFCI_t$, US real GDP growth volatility $USRV_t$ and global condition index volatility $GCIV_t$. Similar to the measure of capital flow volatility, the volatilities of country real effective exchange rates, global condition index (GCI) volatility, and the U.S. real GDP growth rate volatility are estimated by the same method in Engle and Rangel (2008) that is discussed in Section 1.3. The approach of Driscoll and Kraay (1998) has been used to get consistent standard errors to address the issue of heteroskedasticity and autocorrelation. The regression results for samples of all countries,

advanced economies, and emerging economies are presented from Table 1.2 to Table 1.7, respectively.

Tables 1.2 and 1.3 present the regression results for all sample countries. They clearly show that the global financial condition push factor measured by ANFCI is significant at the 1% significance level across all types of capital flow volatility except the bank inflow. The positive coefficients indicate that higher volatility and risk in the global financial center lead to more volatile capital flows of periphery countries. All coefficients of idiosyncratic financial condition factors are positive as well. They are all significant except FDI inflow and outflow volatility. Tighter financial conditions of periphery countries also increase capital flows volatility. Interestingly, the financial development level of countries is significant for all types of capital flow volatility, and the positive coefficients suggest that a higher financial development level is associated with higher capital flow volatility. On the other hand, countries' capital account openness seems not to have significant impacts on most types of capital flow volatility. So, for the sample of all countries, both financial push and pull factors are significant for capital flows volatility. Moreover, financial development is the key pull factor for capital flow volatility. This might imply that the financial development difference between advanced and emerging economies explains that advanced economies have higher capital flow volatility than emerging economies do. More analysis is needed within each country group.

Then I divide the samples into two country groups, advanced and emerging economies. Tables 1.4 and 1.5 report the estimations for advanced economies. The global financial condition and idiosyncratic financial condition factor are still significant for most types of capital flow volatility. However, financial development is only significant for

portfolio and bank flow volatility in the advanced economy group. Tables 1.6 and 1.7 show the results of emerging economies. The global financial condition and financial development are still significant for most types of capital flow volatility. But the coefficients of idiosyncratic financial condition factor in emerging economies is not as significant as those in advanced economies.

One interesting result is that capital account openness does not seem to matter for all capital flow volatilities even though most of the coefficients are positive. In the literature, the effectiveness of capital control still remains controversial. My results suggest that capital control have various effects on capital flow volatilities. Alternatively, countries have controls in an attempt to control volatility, but conditional on other factors. It may be that the fixed effects absorb most of that since many countries do not change much in Chinn-Ito Index.[26]

To sum up, country financial development, idiosyncratic financial condition, and the global and group financial condition are significant for explaining capital flow volatility. First, increases in the financial development level of a country tend to bring higher capital flow volatility, especially for emerging economies, and country capital account openness does not significantly affect capital flow volatility. Second, idiosyncratic financial condition factors of advanced economies are significant to capital flow volatility. However, the domestic financial conditions of emerging markets are not. Third, a tighter financial condition in the global financial center will increase international capital flow volatility for all countries. In other words, volatility, risk, and uncertainty of the global

[26] Yeyati et al. (2009) show that the effects of capital controls can be asymmetric. Klein (2012) shows that walls (long-standing controls) are effective but absorbed in fixed effect, while gates (episodic controls) that switch on and off do not do much.

financial center have significant spillover effects on capital flow volatility globally, reflecting the global financial cycle's existence from the perspective of capital flow volatility. Finally, even though all the R-squared of panel regressions are not high, they are consistent with existing empirical literature on capital flows. They are close to the R-squared levels reported in Rey (2015) and Cerutti et al. (2019b). These preliminary findings from the fixed-effect panel regressions raise several questions in further. Are the effects of these pull and push factors on capital flow volatility nonlinear? Will a higher financial development level amplify the impacts of global financial condition on capital flow volatility? Will the different types of capital flow volatility respond differently to the shocks from the global financial center? More analysis is needed to answer these questions.

1.5.2. Panel Threshold Regressions

A country's financial development is a fundamental and institutional factor that affects many other macroeconomic variables of that country. In the context of the global financial cycle, shocks form the global financial center transmit to periphery countries via various channels and then generate responses in local economies. It is reasonable to conjecture that different levels of financial development make capital flow volatility react differently to the shock from the push factor. The fixed effects threshold panel model can be used to investigate potential non-linear mechanisms. Following the non-dynamic panel threshold model in Hansen (1999), I extend the previous fixed effects panel regression framework into panel threshold regressions with one threshold in financial development.[27] I estimate the following panel threshold model：

[27] The estimation algorithm and program come from Wang (2015).

$$\begin{aligned}\sigma_{kt}^{ij} = \alpha_k^{ij} + \beta_0^{ij} + \beta_{FC}^{ij} FC_{k,t-1} + \beta_{OPEN}^{ij} OPEN_{k,t-1} + \beta_{REERV}^{ij} REERV_{k,t-1} \\ + \theta_1^{ij} GFCI_{t-1} \cdot I(FD_{k,t-1} \le \eta_{FD}^{ij}) + \theta_2^{ij} GFCI_{t-1} \cdot I(FD_{k,t-1} > \eta_{FD}^{ij}) \\ + \gamma_{USRV}^{ij} USRV_{t-1} + \gamma_{GCIV}^{ij} GCIV_{t-1} + \varepsilon_{kt}^{ij}\end{aligned} \tag{1.9}$$

where the left-hand side is the dependent variable σ_{kt}^{ij}, the volatility of capital flows ij in country k. The right-hand side includes individual fixed-effects α_k^{ij}, pull factors (FC_{kt}, $OPEN_{kt}$, and $REERV_{kt}$), push factors ($GFCI_t$, $USRV_t$, and $GCIV_t$), and disturbances ε_{kt}^{ij}. The major distinction here is that the threshold variable FD_{kt} and its threshold parameters η_{FD}^{ij} divide the equations into two regimes with different coefficients θ_1^{ij} and θ_2^{ij}. $I(\cdot)$ is an indicator function.

Table 1.8 reports the basic descriptive statistics of the financial development indexes of sample countries. The mean of all countries is 0.56; the mean of advanced economies is 0.69; the mean of emerging economies is 0.43. Tables 1.9 and 1.10 report the fixed-effects panel regression results with the financial development threshold for all countries. The global financial condition has larger and more significant impacts on all types of capital flow volatility except for bank flows when the periphery countries are in the higher financial development state. The threshold values of financial development for gross flows are 0.36 and 0.34, which are lower than the mean of all countries. The threshold values of financial development vary greatly across the types of capital flow volatility. For advanced economies, Tables 1.11 and 1.12 also show that the global financial condition has larger and more significant effects on capital flow volatility except for bank flows. The threshold values of financial development for gross flows and FDI flows are around 0.75, which is slightly higher than the mean of advanced economies. For emerging economies, Tables 1.13 and 1.14 indicate that the global financial condition has larger and more

significant effects on capital flow volatility except for FDI flows. The threshold values of financial development for gross flows are 0.36 and 0.37, which are lower than the mean of emerging economies. Therefore, it is clear that there is a threshold effect for gross flow volatility: global financial volatility and risk transmit more strongly to the capital flow volatility of the periphery countries that are more financially developed under the global financial cycle. In addition, the instrument type of capital flows matter for the reactions of capital flow volatility to shocks from the global financial conditions.

So far, these non-dynamic fixed effects panel estimations have provided evidence to improve our understanding of what factors affect capital flow volatility and what the mechanisms are. It is also necessary to investigate the dynamic responses of different types of capital flow volatility to the global financial condition, which also helps to examine whether the results above are robust.

1.6. State-dependent Local Projections

The panel-VAR model is a useful method to address the potential endogeneity issues and estimate the impulse responses of variables of interest to shocks, but so far it is not convenient enough to deal with various non-linear specifications. The previous results show that the impacts of the global financial condition on capital flow volatility are non-linear due to different financial development regimes. The local projection method proposed by Jordà (2005) has one significant advantage that it is flexible enough to model the non-linear effects. Considering the threshold effect found in the previous panel estimations, I extend the state-dependent local projection model in Ramey and Zubairy (2018) to a panel version. I estimate the following equation for horizon $0, 1, 2, \ldots, h$:

$$\begin{aligned}\sigma_{k,t+h}^{ij} = {} & I_{t-1}^{ij}[\alpha_{L,h}^{ij} + \beta_{L,h}^{ij} GFCI_t + \psi_{L,h}^{ij} Z_{t-1}] \\ & + (1 - I_{t-1}^{ij})[\alpha_{H,h}^{ij} + \beta_{H,h}^{ij} GFCI_t + \psi_{H,h}^{ij} Z_{t-1}] + \mu_k^{ij} + \xi_{k,t+h}^{ij}\end{aligned} \tag{1.10}$$

and the state dummy variables are below:

$$I_t^{ij} = \begin{cases} 1, & FD_{kt} \leq \eta_{FD}^{ij} \\ 0, & FD_{kt} > \eta_{FD}^{ij} \end{cases} \tag{1.11}$$

where the shock variable is global financial condition $GFCI_t$. The vector of control variables Z_t includes the rest pull and push factors. The threshold value of financial development η_{FD}^{ij} for capital flow ij is obtained from the previous fixed effects threshold panel regressions.

Figure 1.6 reports the state-dependent impulse responses of gross flow volatility to the shock of the global financial condition. A positive shock from the global financial condition generates significant positive impulse responses of gross flow volatility, which means that a tighter global financial condition will lead to higher gross flow volatility of periphery countries. The impulse responses in the higher financial development state are stronger than those in the lower financial development states. In the first three horizons, impulse responses are significantly different from each other. These facts illustrate that the threshold effect does exist and significant for gross flow volatility, confirming the findings in Section 1.5. Bedsides, this threshold effect is more persistent in emerging economies than in advanced economies. However, for disaggregate flow volatility, the threshold effect is not significant, as shown in Figures 1.7, 1.8, and 1.9. In other words, instrument type plays a vital role in the responses of flow volatility to the global financial condition shock. Another possible reason is that the threshold variable is overall financial development. For specific types of flows, specific financial development indicators may be needed to

illustrate the threshold effect better.

1.7. Conclusions

This chapter uses gross capital flow data from 38 countries since 2000 to estimate the gross and disaggregate flow volatility. The time-varying volatility estimations show that bank flows are the most volatile, while FDI flows are the most stable. Following the push-pull factor framework, I construct a panel dataset that includes the estimated capital flow volatilities and a set of pull and push factors. Particularly, I introduce the financial condition indexes of the global financial center and periphery countries as the core push and pull factors to examine capital flow volatility. Taking into financial globalization and global financial cycle account, I extract the idiosyncratic financial condition factors from the countries' financial condition indexes by the Bayesian dynamic latent model, making the core pull factors more domestic.

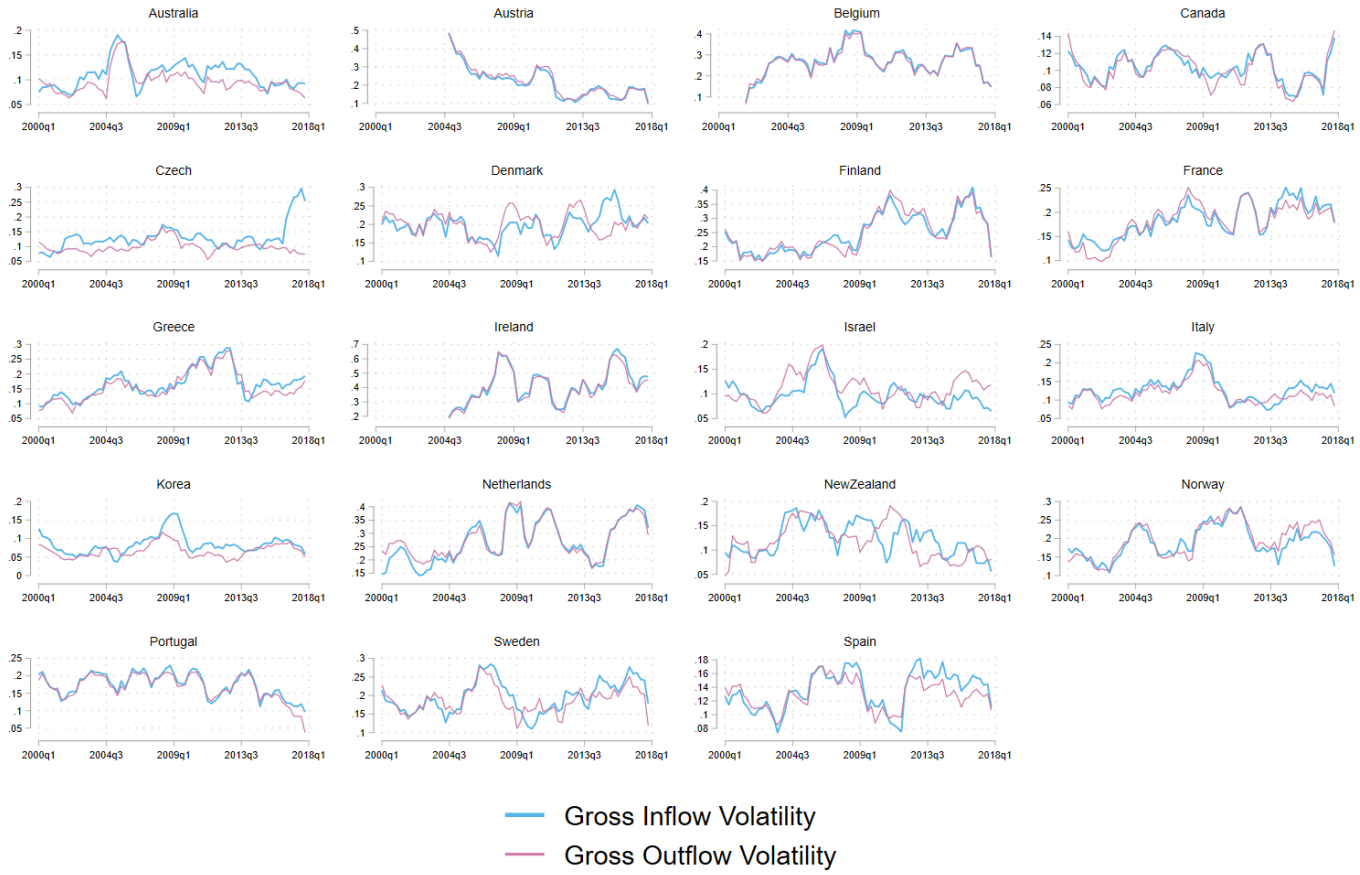
The fixed effects panel regressions show that a higher local financial development level and tighter global and idiosyncratic financial conditions lead to more volatile capital flows. As a result, the financial pull factor is still essential in explaining capital flow volatility, but the global financial cycle has become increasingly important. Also, by panel threshold regressions, I find that there is a threshold effect between the local financial development and the global financial conditions on gross flow volatility. The global financial conditions have more significant impacts on gross flow volatility when the country is more financially developed. However, this threshold effect is not significant for disaggregate flow volatility. Finally, the state-dependent local projection impulse responses confirm that this threshold effect does exist.

Overall, the empirical findings in this chapter improve the understanding of

capital flow volatility since 2000. The financial condition in the global financial center is a critical indicator for policymakers implementing capital flow management. For periphery countries, it is essential to rethink the effects of financial development. On the one hand, as financial globalization tends to increase capital flow volatility, the improved microstructures of domestic financial markets and institutions may help stabilize capital flows. On the other hand, financial development may amplify the shocks from push factors on capital flow volatility. Consequently, given the emergence of the global financial cycle, building a developed domestic financial system has become more critical and urgent for periphery countries. Importantly, a more advanced and integrated macroprudential policy framework for countries is required to tame volatile capital flows.

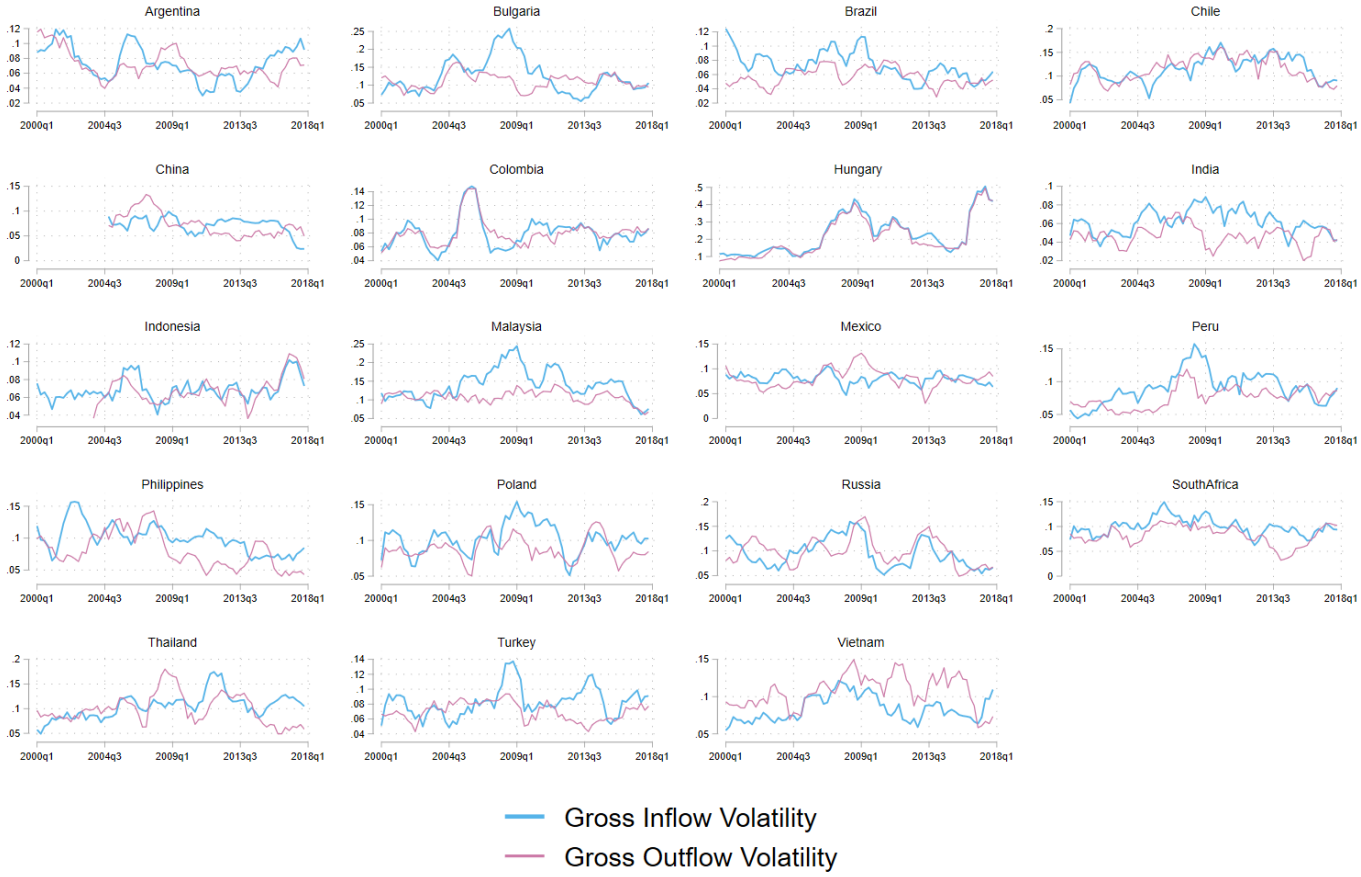
1.8. Figures

Figure 1.1: Gross Flow Volatility of Advanced Economies



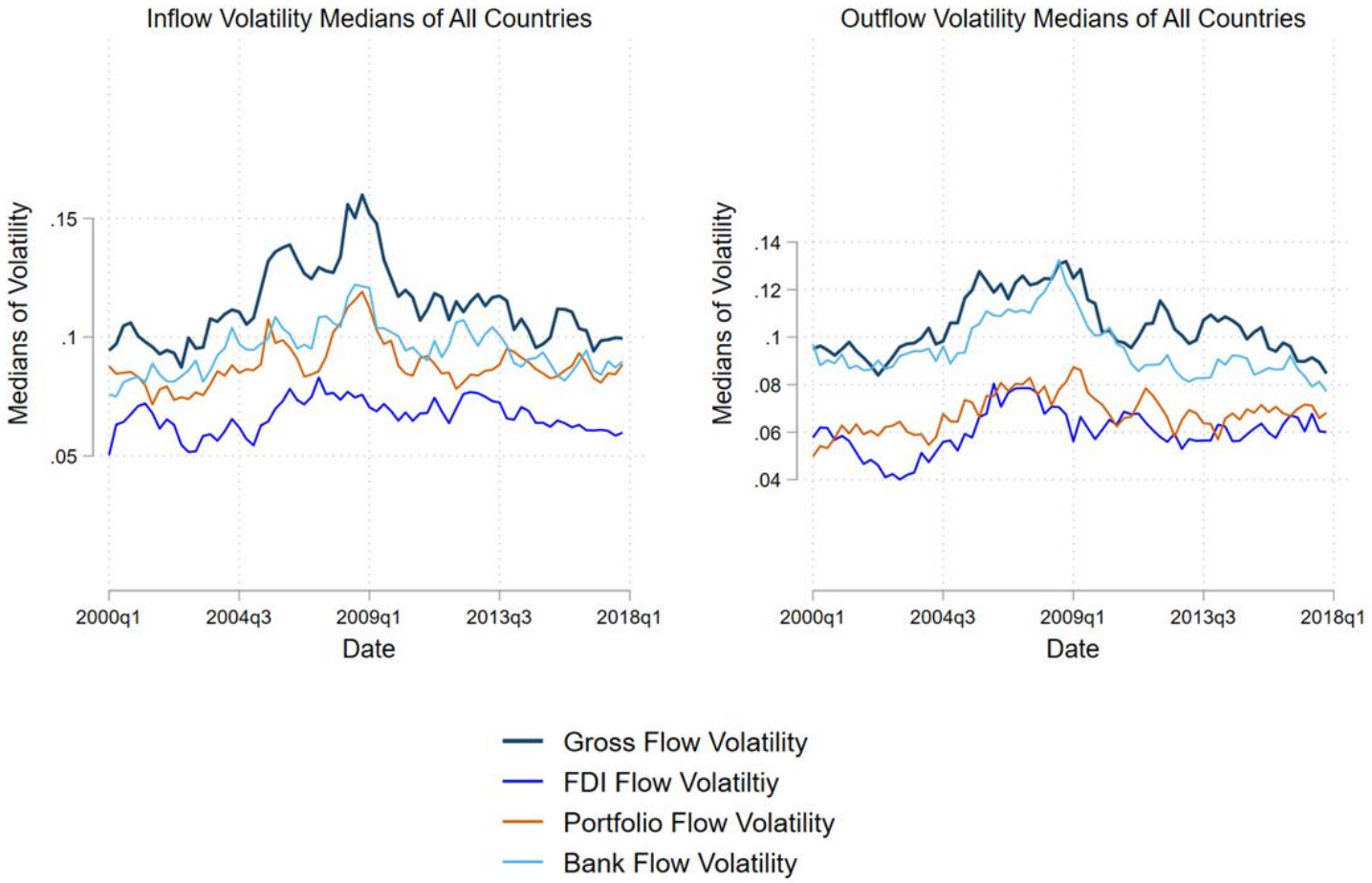
Notes: This figure presents the estimations of gross flow volatilities in advanced economies. Capital flows are scaled by GDP trend, and capital flow volatility is estimated by the method introduced in Section 1.3.

Figure 1.2: Gross Flow Volatility of Emerging Economies



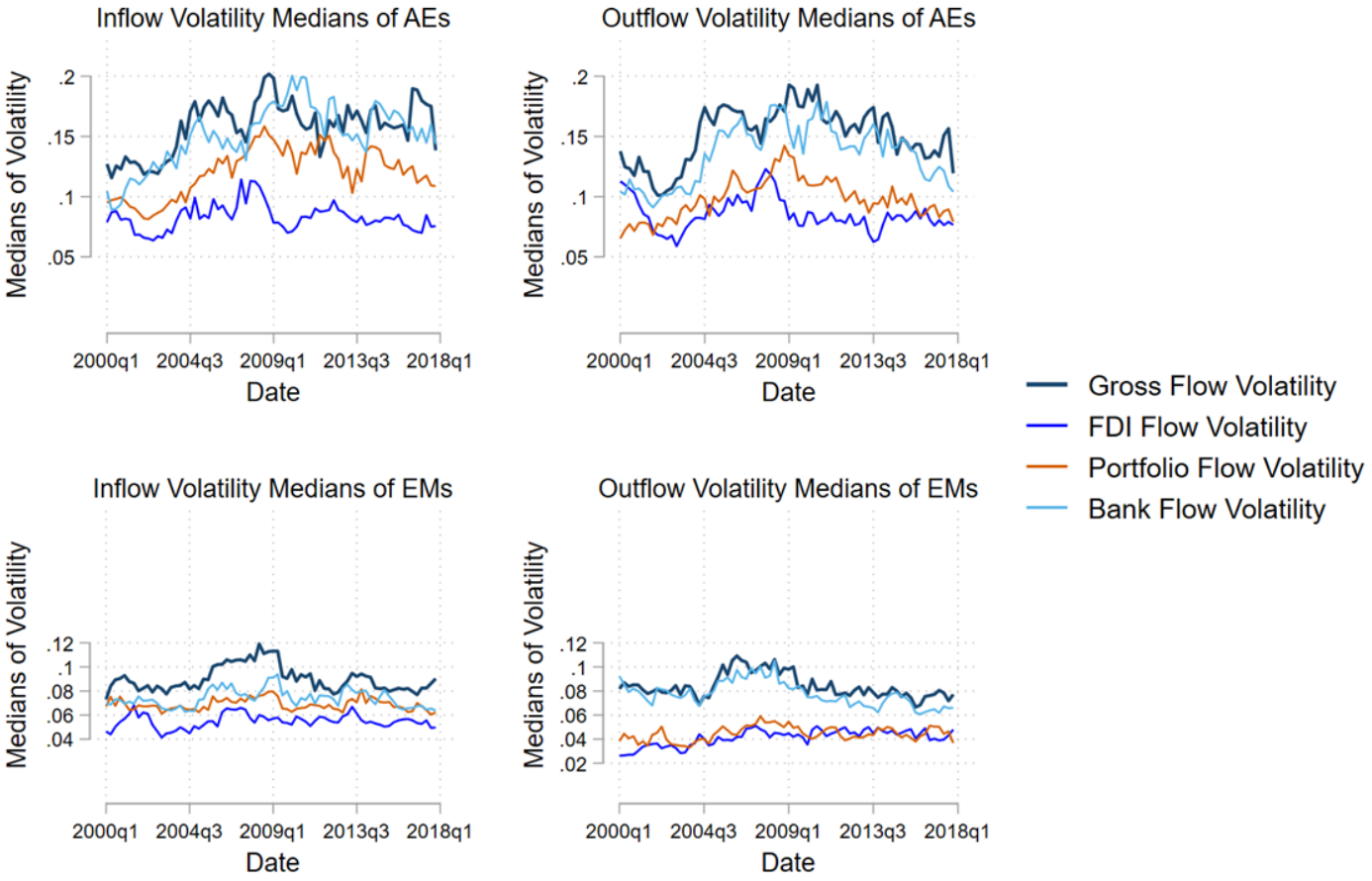
Notes: This figure presents the estimations of gross flow volatilities in emerging economies. Capital flows are scaled by GDP trend, and capital flow volatility is estimated by the method introduced in Section 1.3.

Figure 1.3: Capital Flow Volatility Medians of All Countries



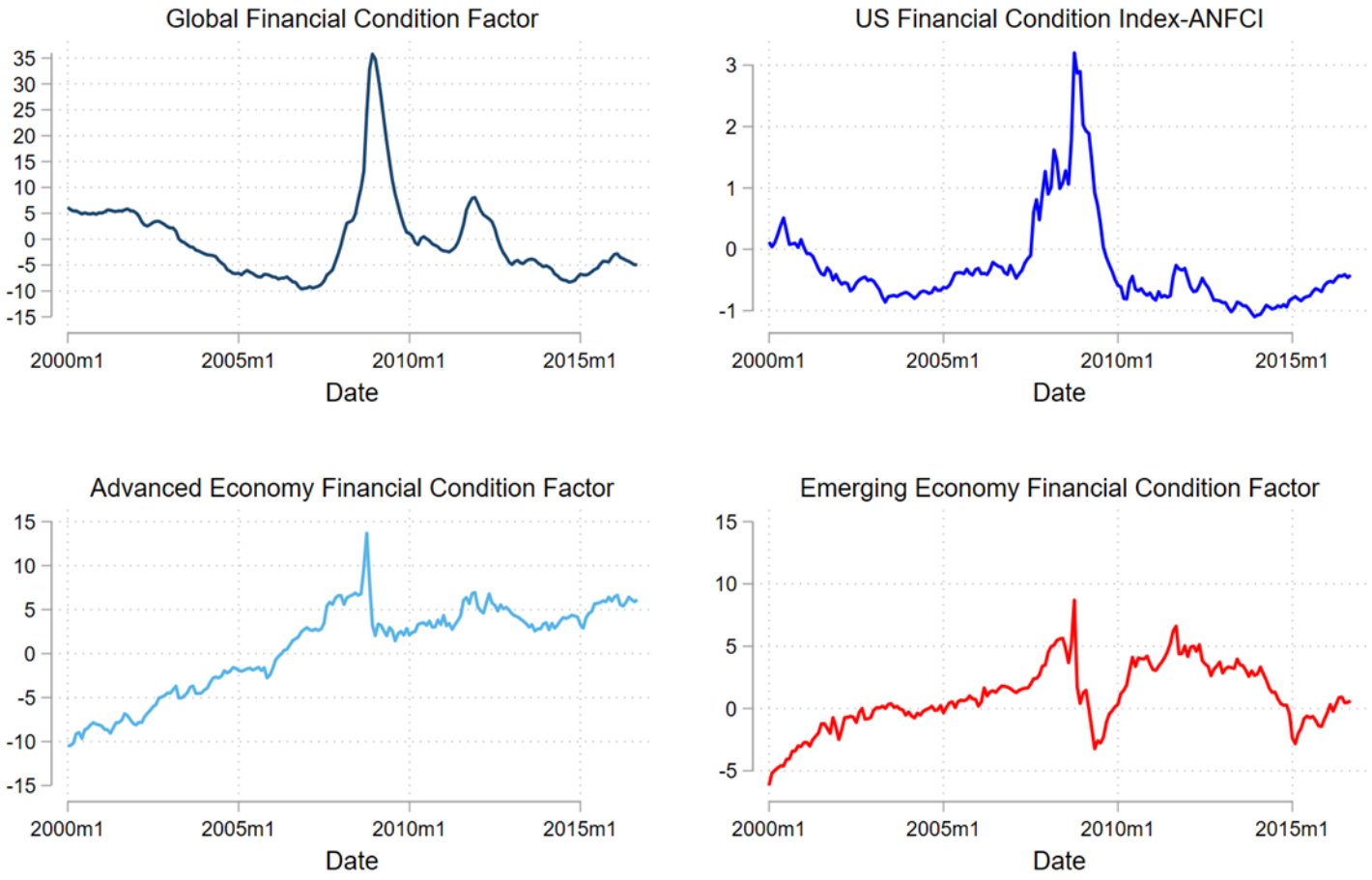
Notes: This figure presents the medians of different types of capital flow volatility over time of all countries. By the method introduced in Section 1.3, types of capital flow volatility are estimated for each country. In each period, the median of a type of capital flow volatility of all countries is selected to form the series of medians of capital flow volatility.

Figure 1.4: Capital Flow Volatility Medians of Advanced and Emerging Economies



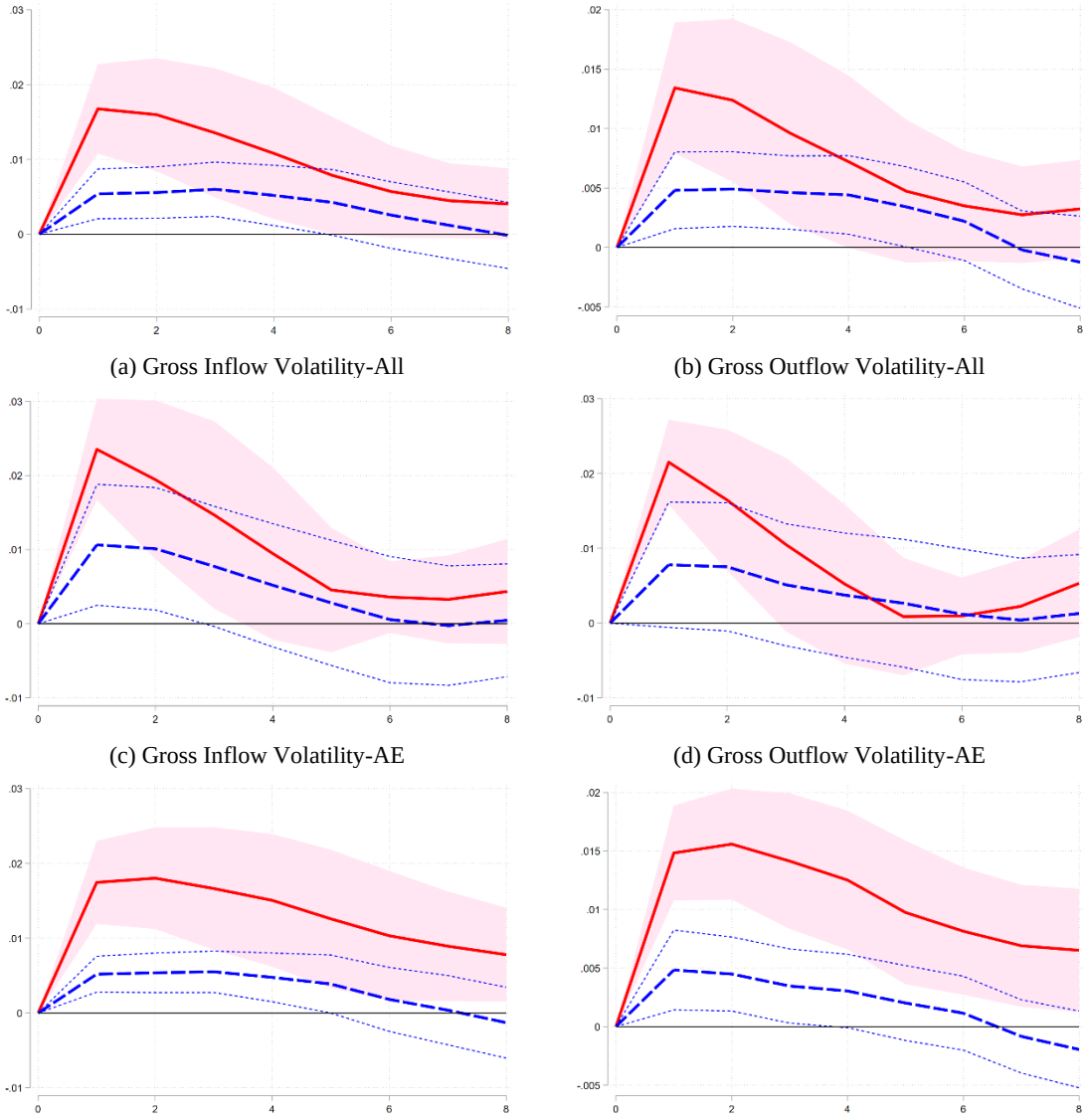
Notes: This figure presents the medians of different types of capital flow volatility over time of advanced and emerging economies. By the method in Section 1.3, types of capital flow volatility are estimated for each country. In each period, the medians of a type of capital flow volatility of advanced and emerging economies are selected to form the series of medians of capital flow volatility, respectively.

Figure 1.5: Financial Condition Push Factors



Notes: This figure reports the estimations of latent global financial condition factor, advanced economy financial condition factor, and emerging economy financial condition factor estimated from the two-level Bayesian dynamic latent factor model introduced in Section 1.4. US financial condition index are original data (Chicago Fed's Adjusted National Financial Condition Index) from FRED.

Figure 1.6: Impulse Responses of Gross Flow Volatility



(a) Gross Inflow Volatility-All

(b) Gross Outflow Volatility-All

(c) Gross Inflow Volatility-AE

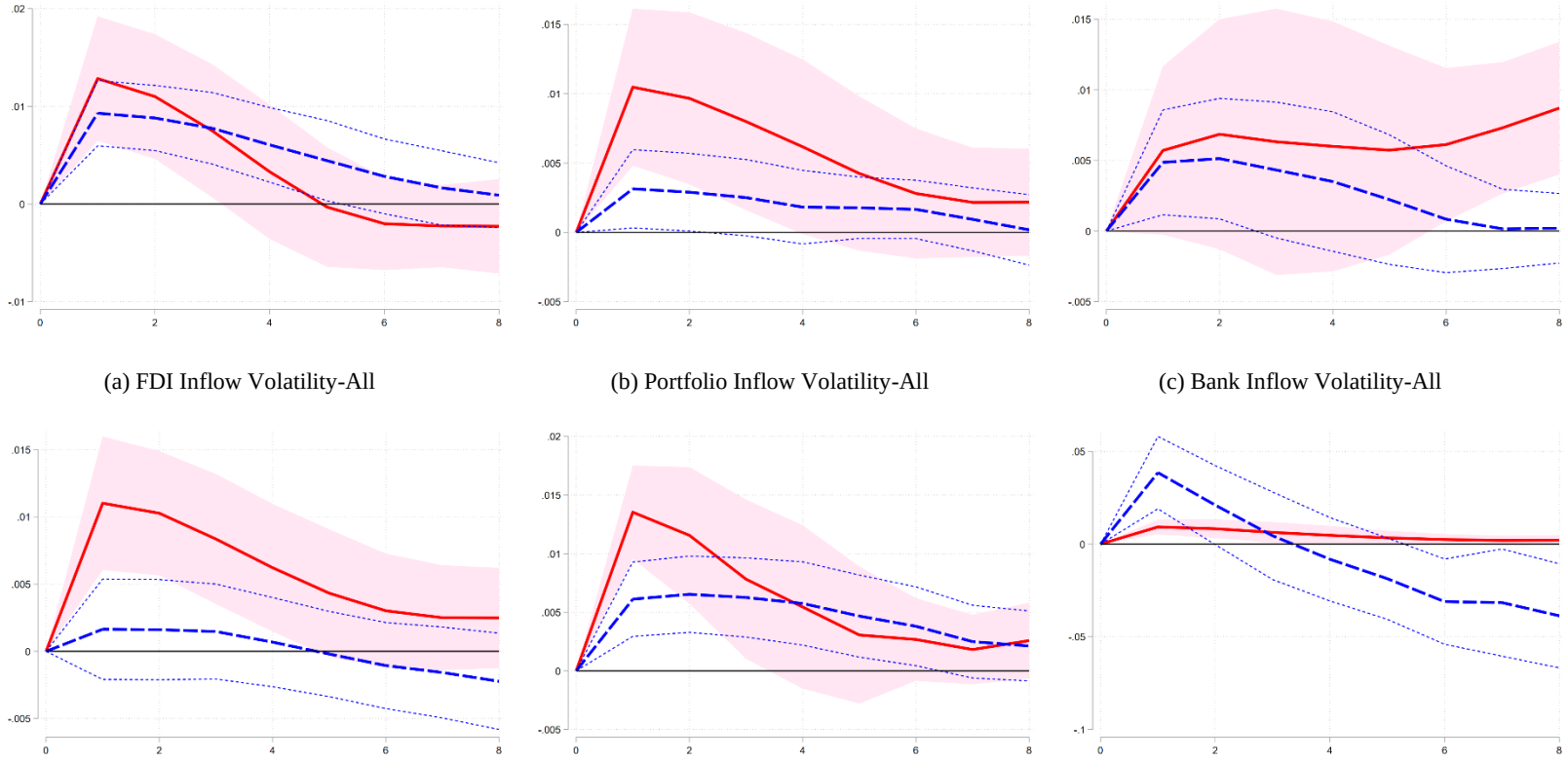
(d) Gross Outflow Volatility-AE

(e) Gross Inflow Volatility-EM

(f) Gross Outflow Volatility-EM

Notes: The impulse variable is the global financial condition (Chicago Fed's Adjusted National Financial Condition Index). The response variables are estimated gross flow volatility of all countries, advances economies, and emerging economies. The red solid lines indicate the responses in the higher financial development states with 90% confidence bands, and the blue dash lines indicate the responses in the lower financial development states with 90% confidence bands.

Figure 1.7: Impulse Responses by Capital Flow Volatility Type in All Countries



(a) FDI Inflow Volatility-All

(b) Portfolio Inflow Volatility-All

(c) Bank Inflow Volatility-All

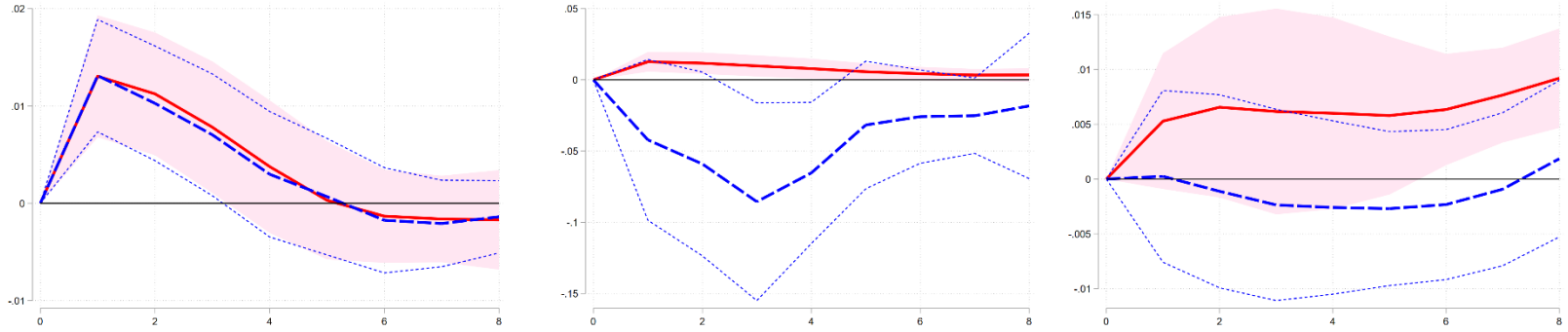
(d) FDI Outflow Volatility-All

(e) Portfolio Outflow Volatility-All

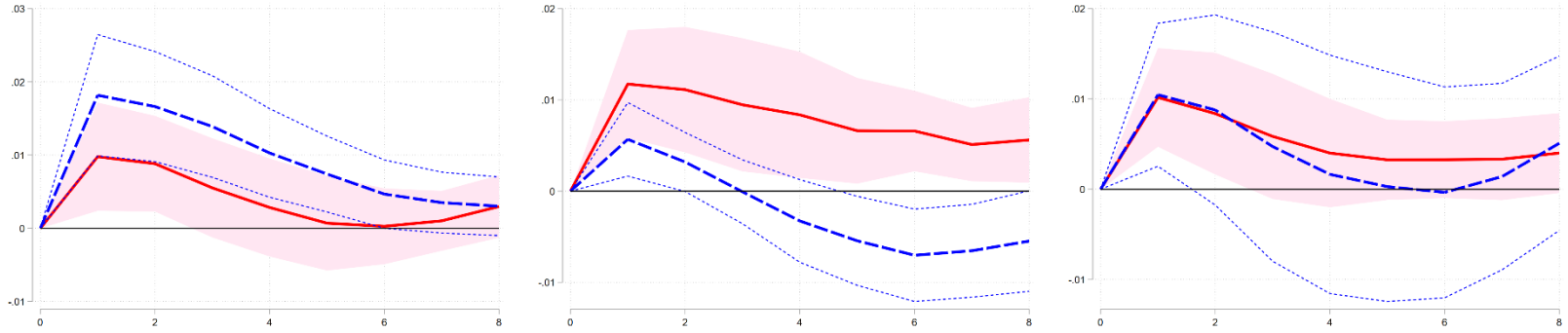
(f) Bank Outflow Volatility-All

Notes: The impulse variable is the global financial condition (Chicago Fed's Adjusted National Financial Condition Index). The response variables are types of estimated disaggregate flow volatility for all countries. The red solid lines indicate the responses in the higher financial development states with 90% confidence bands, and the blue dash lines indicate the responses in the lower financial development states with 90% confidence bands.

Figure 1.8: Impulse Responses by Capital Flow Volatility Type in Advanced Economies



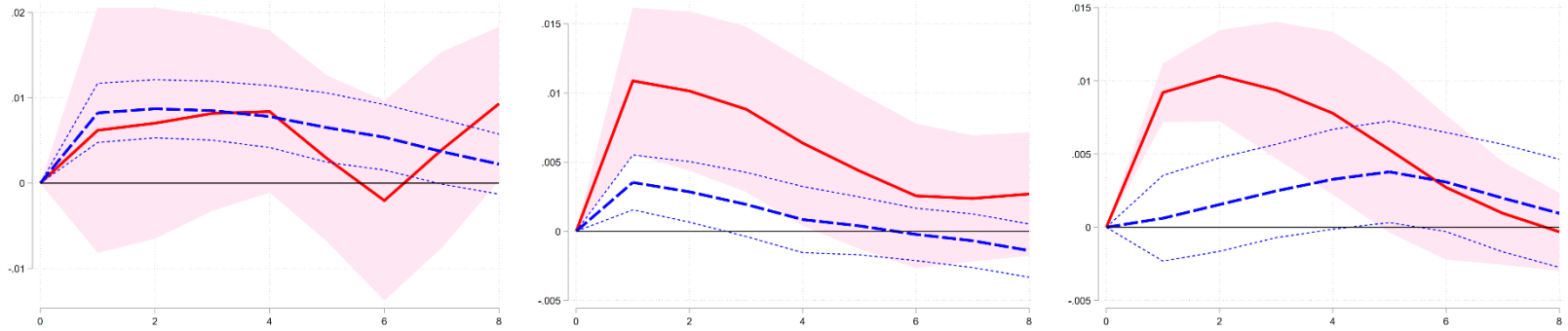
(a) FDI Inflow Volatility-AE (b) Portfolio Inflow Volatility-AE (c) Bank Inflow Volatility-AE



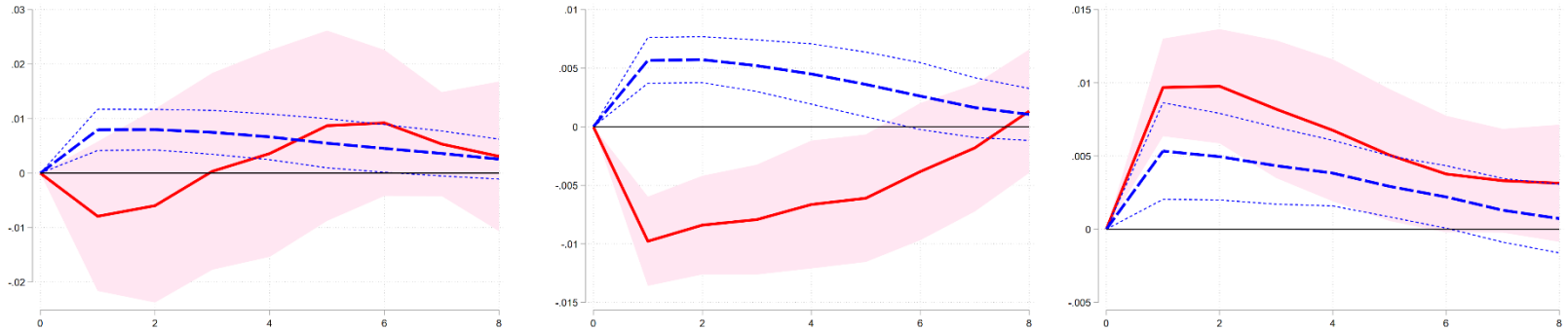
(d) FDI Outflow Volatility-AE (e) Portfolio Outflow Volatility-AE (f) Bank Outflow Volatility-AE

Notes: The impulse variable is the global financial condition (Chicago Fed's Adjusted National Financial Condition Index). The response variables are types of estimated capital flow volatilities for advanced economies. The red solid lines indicate the responses in the higher financial development states with 90% confidence bands, and the blue dash lines indicate the responses in the lower financial development states with 90% confidence bands.

Figure 1.9: Impulse Responses by Capital Flow Volatility Type in Emerging Economies



(a) FDI Inflow Volatility-EM (b) Portfolio Inflow Volatility-EM (c) Bank Inflow Volatility-EM



(d) FDI Outflow Volatility-EM (e) Portfolio Outflow Volatility-EM (f) Bank Outflow Volatility-EM

Notes: The impulse variable is the global financial condition (Chicago Fed's Adjusted National Financial Condition Index). The response variables are types of estimated capital flow volatilities for emerging economies. The red solid lines indicate the responses in the higher financial development states with 90% confidence bands, and the blue dash lines indicate the responses in the lower financial development states with 90% confidence bands.

1.9. Tables

Table 1.1: Coefficients of Variation Medians of Capital Flows

	Gross Inflow	Gross Outflow	FDI Inflow	FDI Outflow	Portfolio Inflow	Portfolio Outflow	Bank Inflow	Bank Outflow
All Countries Coefficients of Variation Median	1.26	1.33	0.9	1.27	1.79	1.91	3.11	3.5
Advanced Economies Coefficients of Variation Median	1.39	1.32	1.41	1.3	2.04	1.35	3.71	3.65
Emerging Markets Coefficients of Variation Median	0.87	1.49	0.76	1.26	1.48	2.33	2.66	3.18

Notes: The coefficient of variation can be obtained by: $CV = \sigma/\mu$, where σ is the standard deviation and μ is the mean.

Table 1.2: Fixed Effects Panel Regressions of Gross Flow Volatility in All Countries

VARIABLES	(1) Gross Inflow Vol	(2) Gross Outflow Vol
Country Financial Condition Factor (t-1)	0.00629***	0.00379**
	(0.00199)	(0.00182)
Financial Development (t-1)	0.132***	0.113**
	(0.0487)	(0.0490)
Capital Account Openness (t-1)	0.0169	0.0200**
	(0.0119)	(0.00945)
Real Effective Exchange Rate Vol (t-1)	0.00302	0.00105
	(0.00328)	(0.00339)
Global Financial Condition (t-1)	0.0152***	0.0131***
	(0.00299)	(0.00303)
Global Economic Condition Vol (t-1)	-0.00805	-0.00759
	(0.0120)	(0.0112)
US Real GDP Growth Vol (t-1)	-0.0223*	-0.0188*
	(0.0127)	(0.0107)
Constant	0.0747**	0.0757**
	(0.0320)	(0.0300)
Observations	2,486	2,472
Number of Countries	38	38
Country FE	YES	YES
within R-squared	0.0938	0.0703

Notes: This table reports the fixed-effect panel regressions of gross flow volatility of all countries. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Driscoll-Kraay standard errors in parentheses.$*** p < 0.01; ** p < 0.05; * p < 0.1$.

Table 1.3: Fixed Effects Panel Regressions of Disaggregate Flow Volatility in All Countries

VARIABLES	(1) FDI Inflow Vol	(2) Portfolio Inflow Vol	(3) Bank Inflow Vol	(4) FDI Outflow Vol	(5) Portfolio Outflow Vol	(6) Bank Outflow Vol
Country Financial Condition Factor (t-1)	0.00305	0.00710***	0.0118***	0.000293	0.00439***	0.00450***
	(0.00192)	(0.00172)	(0.00151)	(0.00165)	(0.00155)	(0.00125)
Financial Development (t-1)	0.0672*	0.106***	0.115***	0.103***	0.138***	0.0739***
	(0.0370)	(0.0214)	(0.0254)	(0.0287)	(0.0135)	(0.0274)
Capital Account Openness (t-1)	0.0150	0.000951	0.0291***	0.0306***	-0.00322	0.0101
	(0.0134)	(0.00867)	(0.00463)	(0.00897)	(0.00645)	(0.00646)
Real Effective Exchange Rate Vol (t-1)	-0.00122	-0.00195	-0.00315	-0.00111	-0.000191	-0.00308
	(0.00270)	(0.00243)	(0.00226)	(0.00320)	(0.00187)	(0.00222)
Global Financial Condition (t-1)	0.0104***	0.00832***	0.00323	0.0113***	0.00740***	0.00957***
	(0.00203)	(0.00286)	(0.00258)	(0.00266)	(0.00159)	(0.00239)
Global Economic Condition Vol (t-1)	-0.0160**	-0.00733	0.0196**	-0.0198**	0.00505	-0.00453
	(0.00675)	(0.00992)	(0.00919)	(0.00889)	(0.00567)	(0.00824)
US Real GDP Growth Vol (t-1)	-0.00766	0.00788	-0.00807	-0.00501	-0.0167**	-0.00581
	(0.00821)	(0.0144)	(0.0103)	(0.00950)	(0.00770)	(0.00876)
Constant	0.0572**	0.0466***	0.0339**	0.0181	0.0171*	0.0822***
	(0.0266)	(0.0121)	(0.0166)	(0.0228)	(0.00954)	(0.0144)
Observations	2,486	2,465	2,484	2,423	2,382	2,472
Number of Countries	38	38	38	38	37	38
Country FE	YES	YES	YES	YES	YES	YES
within R-squared	0.0400	0.107	0.145	0.0758	0.122	0.0691

Notes: This table reports the fixed-effect panel regressions of disaggregate flow volatility for all countries. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Driscoll-Kraay standard errors in parentheses. $*** p < 0.01$; $** p < 0.05$; $* p < 0.1$.

Table 1.4: Fixed Effects Panel Regressions of Gross Flow Volatility in Advanced Economies

VARIABLES	(1) Gross Inflow Vol	(2) Gross Outflow Vol
Country Financial Condition Factor (t-1)	0.00856***	0.00841***
	(0.00269)	(0.00229)
Financial Development (t-1)	0.130	0.171*
	(0.0876)	(0.0909)
Capital Account Openness (t-1)	0.0411*	0.0342**
	(0.0227)	(0.0144)
Real Effective Exchange Rate Vol (t-1)	0.00935	0.00272
	(0.00753)	(0.00765)
Global Financial Condition (t-1)	0.0172***	0.0140***
	(0.00457)	(0.00452)
Global Economic Condition Vol (t-1)	-0.0194	-0.0107
	(0.0165)	(0.0159)
US Real GDP Growth Vol (t-1)	-0.0328**	-0.0293*
	(0.0157)	(0.0153)
Constant	0.0772	0.0497
	(0.0684)	(0.0643)
Observations	1,231	1,231
Number of Countries	19	19
Country FE	YES	YES
within R-squared	0.0890	0.0889

Notes: This table reports the fixed-effect panel regressions of gross flow volatility of advanced economies. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Driscoll-Kraay standard errors in parentheses. $*** p < 0.01$; $** p < 0.05$; $* p < 0.1$.

Table 1.5: Fixed Effects Panel Regressions of Disaggregate Flow Volatility in Advanced Economies

VARIABLES	(1) FDI Inflow Vol	(2) Portfolio Inflow Vol	(3) Bank Inflow Vol	(4) FDI Outflow Vol	(5) Portfolio Outflow Vol	(6) Bank Outflow Vol
Country Financial Condition Factor (t-1)	0.00627***	0.01000***	0.0158***	0.00232	0.00639***	0.00692***
	(0.00216)	(0.00217)	(0.00176)	(0.00220)	(0.00240)	(0.00144)
Financial Development (t-1)	-0.0804	0.127***	0.209***	-0.0420	0.211***	0.205***
	(0.0539)	(0.0406)	(0.0620)	(0.0357)	(0.0383)	(0.0628)
Capital Account Openness (t-1)	0.0477**	0.0170	0.0281	0.0479*	-0.0199	0.0112
	(0.0210)	(0.0194)	(0.0216)	(0.0249)	(0.0182)	(0.0170)
Real Effective Exchange Rate Vol (t-1)	-0.0198***	-0.00264	0.00883	-0.0164***	0.0129***	-0.00369
	(0.00449)	(0.00806)	(0.00702)	(0.00513)	(0.00456)	(0.00646)
Global Financial Condition (t-1)	0.0156***	0.0109**	-0.00155	0.0180***	0.00802***	0.00874**
	(0.00341)	(0.00435)	(0.00404)	(0.00490)	(0.00210)	(0.00330)
Global Economic Condition Vol (t-1)	-0.0206*	-0.00656	0.0376***	-0.0280*	0.00728	-0.00405
	(0.0119)	(0.0152)	(0.0119)	(0.0154)	(0.00701)	(0.0118)
US Real GDP Growth Vol (t-1)	-0.00861	0.0102	-0.0296**	-0.00216	-0.0284***	-0.0104
	(0.0151)	(0.0187)	(0.0112)	(0.0185)	(0.00907)	(0.0107)
Constant	0.160***	0.0282	-0.0280	0.128***	-0.0133	0.0156
	(0.0498)	(0.0304)	(0.0487)	(0.0391)	(0.0191)	(0.0385)
Observations	1,231	1,231	1,231	1,231	1,231	1,231
Number of Countries	19	19	19	19	19	19
Country FE	YES	YES	YES	YES	YES	YES
within R-squared	0.0610	0.150	0.193	0.0749	0.170	0.109

Notes: This table reports the fixed-effect panel regressions of disaggregate flow volatility for advanced economies. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Driscoll-Kraay standard errors in parentheses. $***\ p < 0.01$; $**\ p < 0.05$; $*\ p < 0.1$.

Table 1.6: Fixed Effects Panel Regressions of Gross Flow Volatility in Emerging Economies

VARIABLES	(1) Gross Inflow Vol	(2) Gross Outflow Vol
Country Financial Condition Factor (t-1)	0.00200	-0.00591***
	(0.00188)	(0.00110)
Financial Development (t-1)	0.125***	0.0459
	(0.0363)	(0.0300)
Capital Account Openness (t-1)	0.00970	0.0152
	(0.0112)	(0.00943)
Real Effective Exchange Rate Vol (t-1)	0.00252	0.00450
	(0.00276)	(0.00395)
Global Financial Condition (t-1)	0.0135***	0.0112***
	(0.00224)	(0.00231)
Global Economic Condition Vol (t-1)	0.00231	-0.00449
	(0.00809)	(0.00785)
US Real GDP Growth Vol (t-1)	-0.0137	-0.0104
	(0.00992)	(0.00681)
Constant	0.0511***	0.0693***
	(0.0164)	(0.0145)
Observations	1,255	1,241
Number of Countries	19	19
Country FE	YES	YES
within R-squared	0.137	0.109

Notes: This table reports the fixed-effect panel regressions of gross flow volatility of emerging economies. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Driscoll-Kraay standard errors in parentheses. $*** p < 0.01; ** p < 0.05; * p < 0.1$.

Table 1.7: Fixed Effects Panel Regressions of Disaggregate Flow Volatility in Emerging Economies

VARIABLES	(1) FDI Inflow Vol	(2) Portfolio Inflow Vol	(3) Bank Inflow Vol	(4) FDI Outflow Vol	(5) Portfolio Outflow Vol	(6) Bank Outflow Vol
Country Financial Condition Factor (t-1)	-0.000167	0.00117	0.00320***	-0.000977	-0.00111	-0.00275***
	(0.00190)	(0.00121)	(0.00107)	(0.00135)	(0.00133)	(0.000619)
Financial Development (t-1)	0.121***	0.0596***	0.0382**	0.166***	0.0753***	-0.0268**
	(0.0348)	(0.0150)	(0.0163)	(0.0325)	(0.0152)	(0.0131)
Capital Account Openness (t-1)	0.00602	-0.000590	0.0280***	0.0259***	0.00153	0.0109
	(0.0126)	(0.00755)	(0.00561)	(0.00701)	(0.00475)	(0.00801)
Real Effective Exchange Rate Vol (t-1)	0.00359	0.000687	-0.00263	0.00241	-0.00126	0.00116
	(0.00345)	(0.00154)	(0.00218)	(0.00366)	(0.00180)	(0.00234)
Global Financial Condition (t-1)	0.00744***	0.00547***	0.00641***	0.00658***	0.00535***	0.00827***
	(0.00195)	(0.00144)	(0.00143)	(0.00193)	(0.00130)	(0.00224)
Global Economic Condition Vol (t-1)	-0.00762	-0.00855*	-7.44e-05	-0.00797	-0.00139	-0.00490
	(0.00620)	(0.00453)	(0.00567)	(0.00666)	(0.00459)	(0.00578)
US Real GDP Growth Vol (t-1)	-0.00444	0.00547	0.00954	-0.00656	-0.00640	-0.00235
	(0.00640)	(0.00774)	(0.00793)	(0.00957)	(0.00474)	(0.00774)
Constant	0.0167	0.0502***	0.0507***	-0.0237	0.0240***	0.0909***
	(0.0169)	(0.00755)	(0.00895)	(0.0183)	(0.00637)	(0.00860)
Observations	1,255	1,234	1,253	1,192	1,151	1,241
Number of Countries	19	19	19	19	18	19
Country FE	YES	YES	YES	YES	YES	YES
within R-squared	0.0716	0.0556	0.153	0.136	0.101	0.109

Notes: This table reports the fixed-effect panel regressions of disaggregate flow volatility for emerging economies. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Driscoll-Kraay standard errors in parentheses. $*** p < 0.01$; $** p < 0.05$; $* p < 0.1$.

Table 1.8: Descriptive Statistics of Country Financial Development Indexes

FD Indexes of All Countries		Mean	Std. Dev.	Min	Max	Observations
	overall	0.56	0.18	0.2	0.95	N = 2736
	between		0.18	0.28	0.89	n = 38
	within		0.05	0.37	0.7	T = 72

FD Indexes of Advanced Economies		Mean	Std. Dev.	Min	Max	Observations
	overall	0.69	0.13	0.32	0.95	N = 1368
	between		0.13	0.37	0.89	n = 19
	within		0.04	0.58	0.82	T = 72

FD Indexes of Emerging Economies		Mean	Std. Dev.	Min	Max	Observations
	overall	0.43	0.11	0.2	0.73	N = 1368
	between		0.1	0.28	0.62	n = 19
	within		0.06	0.24	0.56	T = 72

Notes: This table reports descriptive statistics of the IMF Financial Development Indexes in terms of the whole sample, advanced economies, and emerging economies.

Table 1.9: Panel Threshold Regressions of Gross Flow Volatility in All Countries

VARIABLES	(1) Gross Inflow Vol	(2) Gross Outflow Vol
Country Financial Condition Factor (t-1)	0.00545	0.00396
	(0.00329)	(0.00315)
Capital Account Openness (t-1)	0.0328*	0.0383*
	(0.0166)	(0.0189)
Real Effective Exchange Rate Vol (t-1)	0.00234	0.000526
	(0.00528)	(0.00568)
Global Economic Condition Vol (t-1)	-0.0102	-0.00881
	(0.00726)	(0.00715)
US Real GDP Growth Vol (t-1)	-0.0145	-0.00858
	(0.00929)	(0.00873)
Global Financial Condition (t-1) - Low FD	0.00554	0.00245
	(0.00422)	(0.00291)
Global Financial Condition (t-1) - High FD	0.0160***	0.0130***
	(0.00394)	(0.00378)
Constant	0.124***	0.111***
	(0.0155)	(0.0165)
Financial Development Threshold	0.36	0.34
Observations	2,278	2,211
Number of Countries	34	33
Country FE	YES	YES
within R-squared	0.080	0.061

Notes: This table reports the fixed-effect panel threshold regressions of gross flow volatility for all countries. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Robust standard errors in parentheses. $*** p < 0.01$; $** p < 0.05$; $* p < 0.1$.

Table 1.10: Panel Threshold Regressions of Disaggregate Flow Volatility in All Countries

VARIABLES	(1) FDI Inflow Vol	(2) Portfolio Inflow Vol	(3) Bank Inflow Vol	(4) FDI Outflow Vol	(5) Portfolio Outflow Vol	(6) Bank Outflow Vol
Country Financial Condition Factor (t-1)	0.00267	0.00825***	0.00872**	-0.00005	0.00396	0.00452*
	(0.00294)	(0.00233)	(0.00322)	(0.00326)	(0.00249)	(0.00239)
Capital Account Openness (t-1)	0.0230	0.0179*	0.0376***	0.0436*	0.0145	0.0180**
	(0.0208)	(0.00893)	(0.0107)	(0.0219)	(0.00860)	(0.00834)
Real Effective Exchange Rate Vol (t-1)	-0.00192	-0.00168	-0.00169	-0.00132	0.000163	-0.00263
	(0.00637)	(0.00263)	(0.00260)	(0.00674)	(0.00271)	(0.00290)
Global Economic Condition Vol (t-1)	-0.0145**	-0.00666	0.00815	-0.0241***	0.00172	-0.00278
	(0.00534)	(0.00626)	(0.00691)	(0.00534)	(0.00509)	(0.00660)
US Real GDP Growth Vol (t-1)	0.00168	0.00775	-0.00751	0.00483	-0.00480	-0.0107
	(0.0100)	(0.00701)	(0.00786)	(0.00781)	(0.00710)	(0.00869)
Global Financial Condition (t-1) - Low FD	0.00704**	-0.00173	0.00197	0.00276	0.00542***	0.0401***
	(0.00333)	(0.00290)	(0.00295)	(0.00384)	(0.00188)	(0.00914)
Global Financial Condition (t-1) - High FD	0.0162***	0.0111***	0.00809	0.0134***	0.0111***	0.00860***
	(0.00551)	(0.00249)	(0.00509)	(0.00363)	(0.00398)	(0.00273)
Constant	0.0752***	0.0891***	0.0894***	0.0605***	0.0705***	0.112***
	(0.0195)	(0.0107)	(0.00976)	(0.0180)	(0.00815)	(0.0102)
Financial Development Threshold	0.74	0.39	0.74	0.37	0.75	0.24
Observations	2,278	2,211	2,211	2,010	2,077	2,211
Number of Countries	34	33	33	30	31	33
Country FE	YES	YES	YES	YES	YES	YES
within R-squared	0.041	0.115	0.086	0.069	0.068	0.056

Notes: This table reports the fixed-effect panel threshold regressions of disaggregate flow volatility for all countries. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Robust standard errors in parentheses. $*** p < 0.01; ** p < 0.05; * p < 0.1$.

Table 1.11: Panel Threshold Regressions of Gross Flow Volatility in Advanced Economies

VARIABLES	(1) Gross Inflow Vol	(2) Gross Outflow Vol
Country Financial Condition Factor (t-1)	0.00874*	0.00914**
	(0.00456)	(0.00426)
Capital Account Openness (t-1)	0.0572*	0.0578*
	(0.0313)	(0.0303)
Real Effective Exchange Rate Vol (t-1)	0.000312	-0.00847
	(0.00835)	(0.00760)
Global Economic Condition Vol (t-1)	-0.0135	-0.00473
	(0.0135)	(0.0118)
US Real GDP Growth Vol (t-1)	-0.0198	-0.0146
	(0.0144)	(0.0110)
Global Financial Condition (t-1) - Low FD	0.00716*	0.00546
	(0.00408)	(0.00500)
Global Financial Condition (t-1) - High FD	0.0237***	0.0198***
	(0.00764)	(0.00635)
Constant	0.131***	0.126***
	(0.0325)	(0.0344)
Financial Development Threshold	0.76	0.76
Observations	1,072	1,072
Number of Countries	16	16
Country FE	YES	YES
within R-squared	0.099	0.090

Notes: This table reports the fixed-effect panel threshold regressions of gross flow volatility for advanced economies. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Robust standard errors in parentheses. $*** p < 0.01$; $** p < 0.05$; $* p < 0.1$.

Table 1.12: Panel Threshold Regressions of Disaggregate Flow Volatility in Advanced Economies

VARIABLES	(1) FDI Inflow Vol	(2) Portfolio Inflow Vol	(3) Bank Inflow Vol	(4) FDI Outflow Vol	(5) Portfolio Outflow Vol	(6) Bank Outflow Vol
Country Financial Condition Factor (t-1)	0.00541	0.0134***	0.0127**	0.000952	0.00685*	0.00695*
	(0.00411)	(0.00318)	(0.00474)	(0.00450)	(0.00345)	(0.00347)
Capital Account Openness (t-1)	0.0330	0.0316	0.0496	0.0336	0.0124	0.0357**
	(0.0325)	(0.0350)	(0.0401)	(0.0409)	(0.0253)	(0.0141)
Real Effective Exchange Rate Vol (t-1)	-0.0241**	-0.00615	0.00302	-0.0200***	0.00901	-0.0104
	(0.00836)	(0.00702)	(0.00479)	(0.00591)	(0.00745)	(0.00768)
Global Economic Condition Vol (t-1)	-0.00994	0.00389	0.0218	-0.0261***	0.00545	-0.000637
	(0.00814)	(0.0101)	(0.0131)	(0.00690)	(0.00866)	(0.0107)
US Real GDP Growth Vol (t-1)	0.0104	0.00365	-0.0262**	0.0155	-0.00670	-0.0188
	(0.0162)	(0.0103)	(0.0122)	(0.00908)	(0.0117)	(0.0169)
Global Financial Condition (t-1) - Low FD	0.00139	-0.0195***	-0.00653	0.0109***	-0.00239	0.0234***
	(0.00352)	(0.00508)	(0.00509)	(0.00357)	(0.00251)	(0.00584)
Global Financial Condition (t-1) - High FD	0.0172***	0.0111***	0.00637	0.0185***	0.00891**	0.00652
	(0.00581)	(0.00356)	(0.00588)	(0.00507)	(0.00327)	(0.00641)
Constant	0.0877**	0.0950**	0.0994**	0.0896**	0.0801***	0.134***
	(0.0358)	(0.0371)	(0.0396)	(0.0410)	(0.0271)	(0.0183)
Financial Development Threshold	0.74	0.37	0.74	0.76	0.59	0.62
Observations	1,072	1,072	1,072	1,072	1,072	1,072
Number of Countries	16	16	16	16	16	16
Country FE	YES	YES	YES	YES	YES	YES
within R-squared	0.102	0.192	0.123	0.097	0.112	0.077

Notes: This table reports the fixed-effect panel threshold regressions of disaggregate flow volatility for advanced economies. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Robust standard errors in parentheses. $*** p < 0.01$; $** p < 0.05$; $* p < 0.1$.

Table 1.13: Panel Threshold Regressions of Gross Flow Volatility in Emerging Economies

VARIABLES	(1) Gross Inflow Vol	(2) Gross Outflow Vol
Country Financial Condition Factor (t-1)	-0.000599	-0.00542**
	(0.00281)	(0.00230)
Capital Account Openness (t-1)	0.0240	0.0236
	(0.0168)	(0.0193)
Real Effective Exchange Rate Vol (t-1)	0.00388	0.00520
	(0.00639)	(0.00705)
Global Economic Condition Vol (t-1)	-0.00594	-0.00720
	(0.00580)	(0.00692)
US Real GDP Growth Vol (t-1)	-0.0100	-0.00495
	(0.0127)	(0.0135)
Global Financial Condition (t-1) - Low FD	0.00462	0.00479*
	(0.00456)	(0.00245)
Global Financial Condition (t-1) - High FD	0.0190***	0.0151**
	(0.00596)	(0.00576)
Constant	0.0980***	0.0842***
	(0.0130)	(0.0127)
Financial Development Threshold	0.36	0.38
Observations	1,206	1,139
Number of Countries	18	17
Country FE	YES	YES
within R-squared	0.123	0.115

Notes: This table reports the fixed-effect panel threshold regressions of gross flow volatility for emerging economies. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Robust standard errors in parentheses. $*** p < 0.01$; $** p < 0.05$; $* p < 0.1$.

Table 1.14: Panel Threshold Regressions of Disaggregate Flow Volatility in Emerging Economies

VARIABLES	(1) FDI Inflow Vol	(2) Portfolio Inflow Vol	(3) Bank Inflow Vol	(4) FDI Outflow Vol	(5) Portfolio Outflow Vol	(6) Bank Outflow Vol
Country Financial Condition Factor (t-1)	-0.00217	-4.04e-05	0.00204	-0.00214	-0.00112	-0.00107
	(0.00300)	(0.00157)	(0.00174)	(0.00289)	(0.00159)	(0.00186)
Capital Account Openness (t-1)	0.0182	0.00492	0.0333***	0.0464**	0.0130	0.0122
	(0.0217)	(0.00861)	(0.00949)	(0.0210)	(0.00834)	(0.00874)
Real Effective Exchange Rate Vol (t-1)	0.00432	0.00162	-0.00164	0.00300	-0.00125	0.000753
	(0.00730)	(0.00270)	(0.00348)	(0.00826)	(0.00333)	(0.00284)
Global Economic Condition Vol (t-1)	-0.0103	-0.0137*	-0.00590	-0.0102	-0.00142	-0.00500
	(0.00676)	(0.00762)	(0.00511)	(0.00796)	(0.00579)	(0.00680)
US Real GDP Growth Vol (t-1)	-0.00563	0.0104	0.0111	-0.00917	-0.00651	0.00191
	(0.0127)	(0.00931)	(0.00758)	(0.0131)	(0.00914)	(0.00663)
Global Financial Condition (t-1) - Low FD	0.00909*	0.00273	-0.00104	0.0104	0.00709**	0.00428**
	(0.00452)	(0.00266)	(0.00241)	(0.00596)	(0.00253)	(0.00163)
Global Financial Condition (t-1) - High FD	-0.00837	0.0128**	0.00960***	-0.0229	-0.00513**	0.0113***
	(0.0129)	(0.00439)	(0.00295)	(0.0206)	(0.00199)	(0.00296)
Constant	0.0635***	0.0729***	0.0633***	0.0471***	0.0545***	0.0781***
	(0.0156)	(0.0101)	(0.00976)	(0.0114)	(0.00711)	(0.00925)
Financial Development Threshold	0.62	0.52	0.36	0.62	0.59	0.43
Observations	1,206	1,139	1,139	938	1,005	1,139
Number of Countries	18	17	17	14	15	17
Country FE	YES	YES	YES	YES	YES	YES
within R-squared	0.042	0.063	0.150	0.095	0.077	0.121

Notes: This table reports the fixed-effect panel threshold regressions of disaggregate flow volatility for emerging economies. The dependent variables in each column is estimated capital flow volatility, and the explanatory variables are pull and push factors with one period lag. Robust standard errors in parentheses. $***\ p < 0.01$; $**\ p < 0.05$; $*\ p < 0.1$.

Chapter 2: Boom-Bust Capital Flow Cycles: Global or Regional?[1]

2.1. 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

[1] This chapter is co-authored with Graciela L. Kaminsky and Leandro Medina.

monetary policies are possible if and only if the capital account is managed."[2] While early on, the focus of attention was just on the role of monetary policy in the financial center,[3] 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[4] and risk appetite in amplifying capital flow cycles became the new focal point.[5]

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.[6] In this chapter, 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, 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

[2] See Borio (2014), Rey (2015), and Miranda-Agrippino and Rey (2020).

[3] See for example, Calvo et al. (1993, 1996).

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

[5] See also, Forbes and Warnock (2012), Ghosh et al. (2014), and Rey (2015).

[6] See, for example, Cerutti et al. (2017), and Cerutti and Hong (2018).

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 chapter is organized as follows. Section 2.2 reviews the empirical literature on "push" and "pull" factors. Section 2.3 presents our database on capital flows. Section 2.4 presents the estimated dynamic factor model and reports the results. Section 2.5 estimates the role of the financial center on regional cycles using Jordà (2005) local projections. Section 2.6 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

2.7 present the conclusion and discusses future areas of research.

2.2. 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.[7] 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 et al. (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

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

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 Ghosh et al. (2014). These studies 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 (2015). 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 et al. (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 et al. (2019) 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.

2.3. 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 study 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[8]

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

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.[9] 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 chapter, 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

[9] 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.

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.[10] For each country, we construct a measure of total gross capital inflows which include primary issuance of bonds, syndicated loans, and 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 2.1 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.

2.4. Global and Regional Factors

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

2.4.1. The Model

We estimate global and regional factors using the methodology developed by Kose

[10] It is important to do cluster analysis and principal components to check our choice of regions. In this chapter, we follow the choice in Kaminsky and Reinhart (2000). They find that Latin America depends on US Banks and Asia on Japanese banks as a way to influence the regions we chose.

et al. (2003).[11] We estimate the following latent factor model:

$$y_{i,t} = \alpha_i + \beta_i^{global} f_t^{global} + \beta_i^{region} f_{r,t}^{region} + \varepsilon_{i,t} \tag{2.1}$$

where $E(\varepsilon_{i,t}\varepsilon_{j,t-s}) = 0$ for $i \neq j$.

$y_{i,t}$ 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 et al. (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:

$$\varepsilon_{it} = \rho_{i1}\varepsilon_{i,t-1} + \rho_{i2}\varepsilon_{i,t-2} + \cdots + \rho_{ip}\varepsilon_{i,t-p} + u_{it} \tag{2.2}$$

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

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

$$f_t^{global} = \rho_1^{global} f_{t-1}^{global} + \rho_2^{global} f_{t-2}^{global} + \cdots + \rho_q^{global} f_{t-q}^{global} + u_t^{global} \tag{2.3}$$

$$f_{rt}^{region} = \rho_{r1}^{region} f_{r,t-1}^{region} + \rho_{r2}^{region} f_{r,t-2}^{region} + \cdots + \rho_{rq}^{region} f_{r,t-q}^{region} + u_{rt}^{region} \tag{2.4}$$

where we assume that $u_t^{global} \sim N(0, \sigma_{global}^2)$, $u_{rt}^{region} \sim N(0, \sigma_{region,r}^2)$, $E(u_t^{global} u_{t-k}^{global}) = 0$, and $E(u_{rt}^{region} u_{r,t-k}^{region}) = 0$ for $k \neq 0$.

It is difficult to estimate dynamic factor models when the factors are unobservable,

[11] See also, Jackson et al. (2016), Kose et al. (2012).

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 (2.1)-(2.4): 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:

$$\begin{aligned}
(\beta^{global}, \beta_r^{region})' &\sim N(0, I_2) \\
(\rho_{i1}, \rho_{i2}, \ldots, \rho_{ip})' &\sim N[0, dig(1, 0.5, \ldots 0.5^{p-1})] \\
(\rho_1^{global}, \rho_2^{global}, \ldots, \rho_q^{global})' &\sim N[0, dig(1, 0.5, \ldots 0.5^{q-1})] \\
(\rho_{r1}^{region}, \rho_{r2}^{region}, \ldots, \rho_{rq}^{region})' &\sim N[0, dig(1, 0.5, \ldots 0.5^{q-1})] \\
(\sigma_i^2)' &\sim IG(6, 0.001)
\end{aligned} \tag{2.5}$$

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 $N(0,\Sigma)$, where the $\Sigma = \begin{bmatrix} 1 & 0 \\ 0 & .5 \end{bmatrix}$.

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:

$$var(y_{it}) = (\beta_i^{global})^2 var(f_t^{global}) + (\beta_{ri}^{region})^2 + var(f_{rt}^{region}) + var(\varepsilon_{it}) \qquad (2.6)$$

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

$$\frac{(\beta_i^{global})^2 var(f_t^{global})}{var(y_{it})}$$

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

$$\frac{(\beta_i^{region})^2 var(f_{rt}^{region})}{var(y_{it})}$$

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

$$\frac{var(\varepsilon_{it})}{var(y_{it})}$$

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

2.4.2. Estimations

Figure 2.2 shows the evolution of the global factor and the regional factors for Asia, Europe, and Latin America.[12] 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.

[12] In our samples, countries in Asia and Latin America are all emerging economies, and countries in Europe are all advanced economies. The regional grouping is also a grouping by market type. More importantly, Kaminsky and Reinhart (2000) have indicated that regional financial centers have both trade links and financial sector links with countries within the same region. Capital flow comovements in a region may be quite strong. Thus, regional grouping in this way does make sense. The country in the first of the ordering of all the countries anchors estimation of the global factor, and the country in the first of the ordering of regional country group anchors estimation of the regional factor. In our estimations, China is the first country of the whole samples and Asia country group; Argentina is the first country of the Latin America country group; Austria is the first country of the Europe country group. Changing the country orderings has not bring significant changes in our estimations of the factors.

Figure 2.3 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 2.4 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.

2.5. 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.[13] In this section, we do a preliminary analysis of the links between global liquidity and regional boom-bust cycles. We use the Jordà (2005) local projections

[13] See for example, Acharya and Schnabl (2010), Borio and Disyatat (2011), and Bruno and Shin (2015a, 2015b).

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.[14] 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: $h = 0, 1, 2, 3, 4$ (years):

$$\begin{aligned} f^R_{t+h} = {} & I^e[\alpha^e_h + \beta^e_h(L)\cdot f^R_{t-1} + \gamma^e_h \cdot fc_t] \\ & + I^r[\alpha^r_h + \beta^r_h(L)\cdot f^R_{t-1} + \gamma^r_h \cdot fc_t] + \varepsilon_{t+h} \end{aligned} \tag{2.7}$$

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

[14] It is also worth of examining what is driving the leverage cycle in the global financial center since there are various possible factors that may affect it. Also, the financial condition in the global financial center can also be a good indicator reflecting the global liquidity conditions.

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.[15]

Our results are shown in Figure 2.5. 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 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

[15] 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.

year after the shock.

2.6. 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.

2.6.1 Identifying Demand and Supply Shocks with a SVAR Model

We estimate a K - dimensional VAR model of order p and $t = 1, ..., T$:

$$y_t = \alpha + \sum_{n=1}^{p} A_n y_{t-n} + \mu_t, t = 1, ..., T \tag{2.8}$$

which we can rewrite as:

$$y_t = \alpha + \sum_{n=1}^{p} A_n y_{t-n} + B\varepsilon_t, t = 1, ..., T \tag{2.9}$$

where $y_t = [fc_t, F_t^A, F_t^E, F_t^L]^T$, 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, $i = 1, ..., p$, 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 $Cov(\varepsilon_t) = \Sigma\mu$, and the structural shocks are $\varepsilon_t = B^{-1}\mu_t$, B captures the instantaneous effect of the structural shocks, and $Cov(\varepsilon_t) = \Sigma\mu$ is a diagonal matrix. We can also link the covariance matrix of the reduced residuals to that of the structural shocks:

$$Cov(\mu_t) = B\Sigma B^T \tag{2.10}$$

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:

$$B = \begin{bmatrix} b_{11} & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 \\ b_{31} & 0 & b_{33} & 0 \\ b_{41} & 0 & 0 & b_{44} \end{bmatrix} \tag{2.11}$$

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 (2.10):

$$y_t = I_e[\alpha^e + \Sigma_{n=1}^{p} A_n^e y_{t-n} + \mu_t] + I_r[\alpha^r + \Sigma_{n=1}^{p} A_n^r y_{t-n} + \mu_t]$$

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. 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: $h = 0, 1, 2, 3, 4$ (years). Figure 2.6 and Figure 2.7 report respectively, the impulse responses in the earlier period and in the recent period. Similarly, Table 2.1 and Table 2.2 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 2.6 and Table 2.1, 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 2.1, 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 2.6 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 2.7 and Table 2.2 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.

2.6.2 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.[16] Figure 2.7 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.[17] The evidence in Figure 2.8 indicates that the regional bonanzas in the emerging periphery in the earlier period and the regional 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.

[16] 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.

[17] 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.

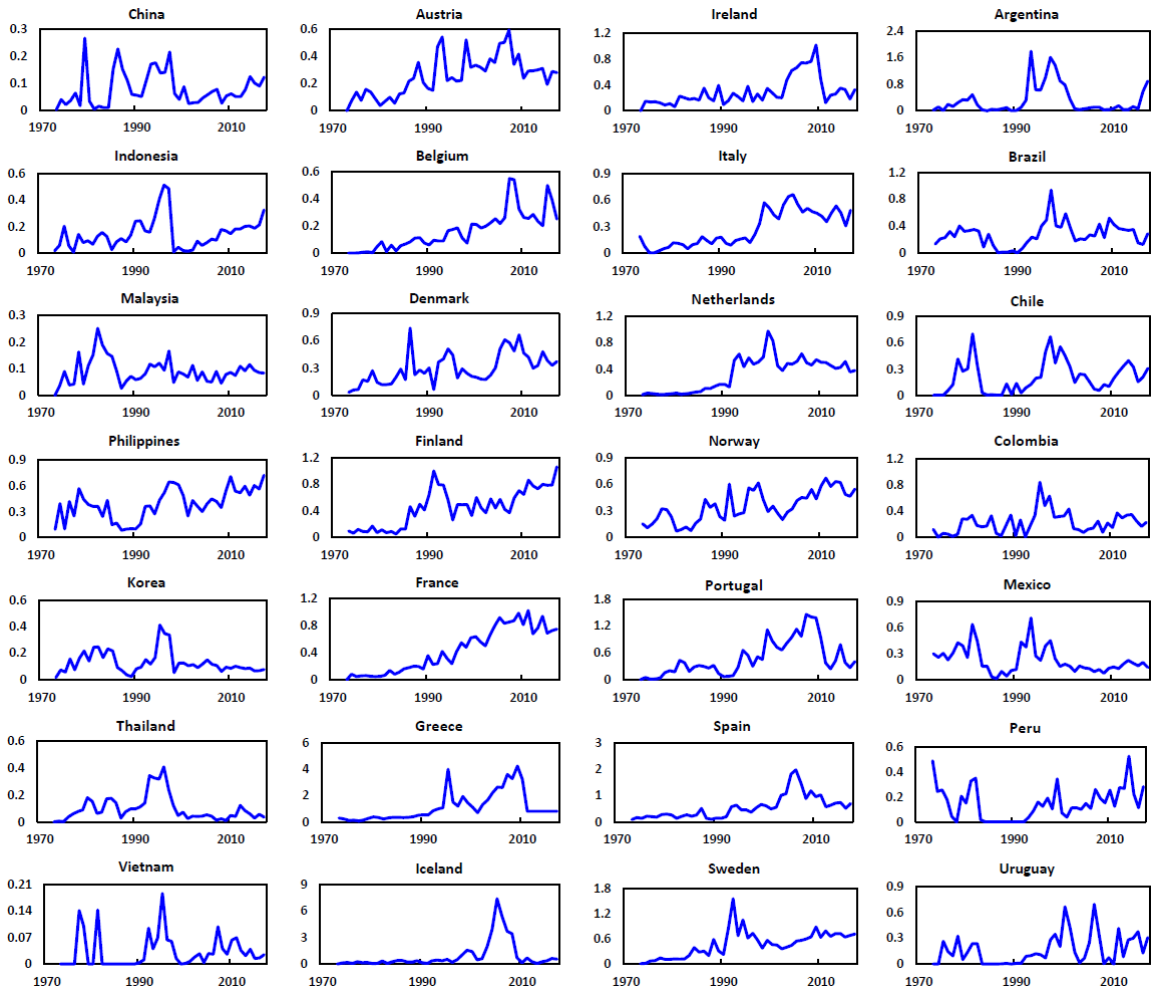
Importantly, the evolution of borrowing costs in the aftermath of the bonanzas in these three regions, both during the earlier and the recent periods, also suggests the presence of supply shocks. In all these episodes, global investors withdrew from international capital markets and the cost of borrowing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

2.7 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.

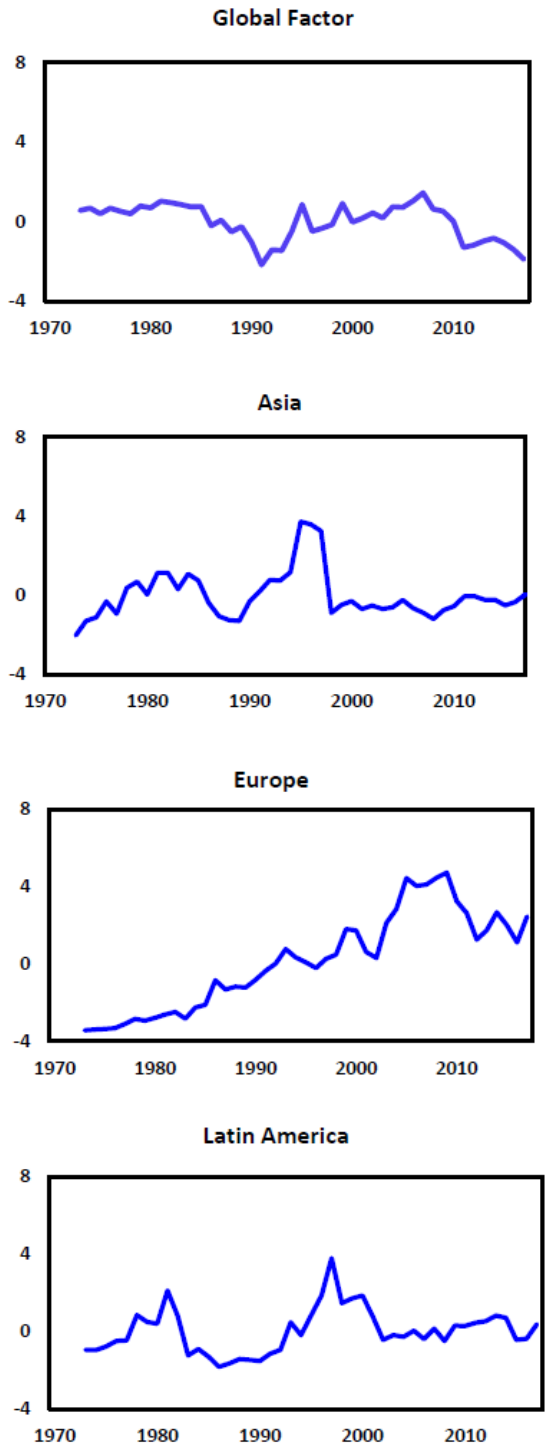
2.8 Figures

Figure 2.1: Capital Flows (Share of Exports)



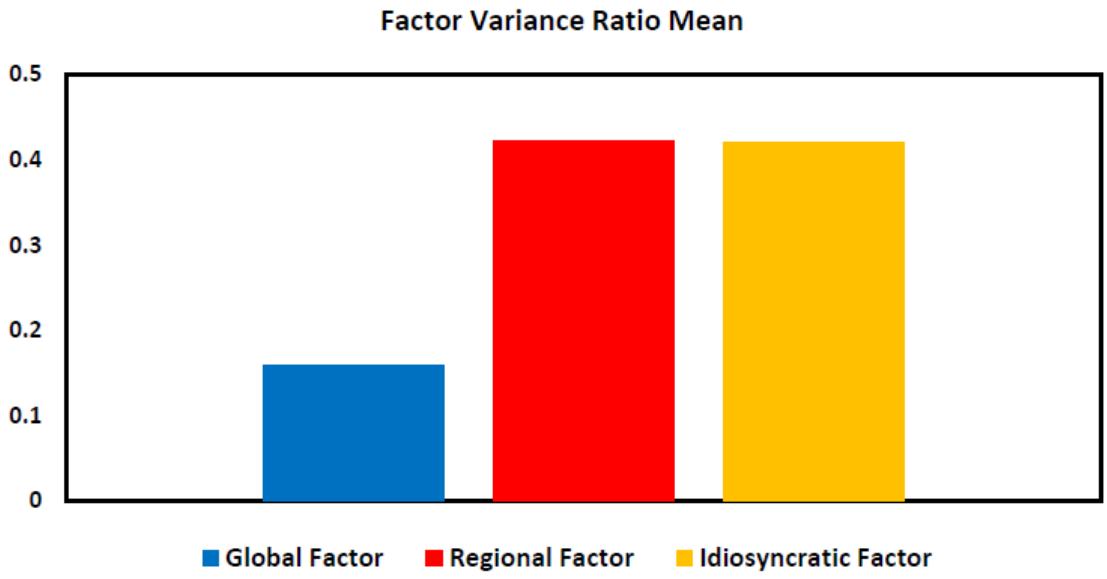
Notes: Capital flows are captured with International Gross Primary Issuance of Bonds, Equites, and Syndicated Loans.

Figure 2.2: The Global and Regional Factors



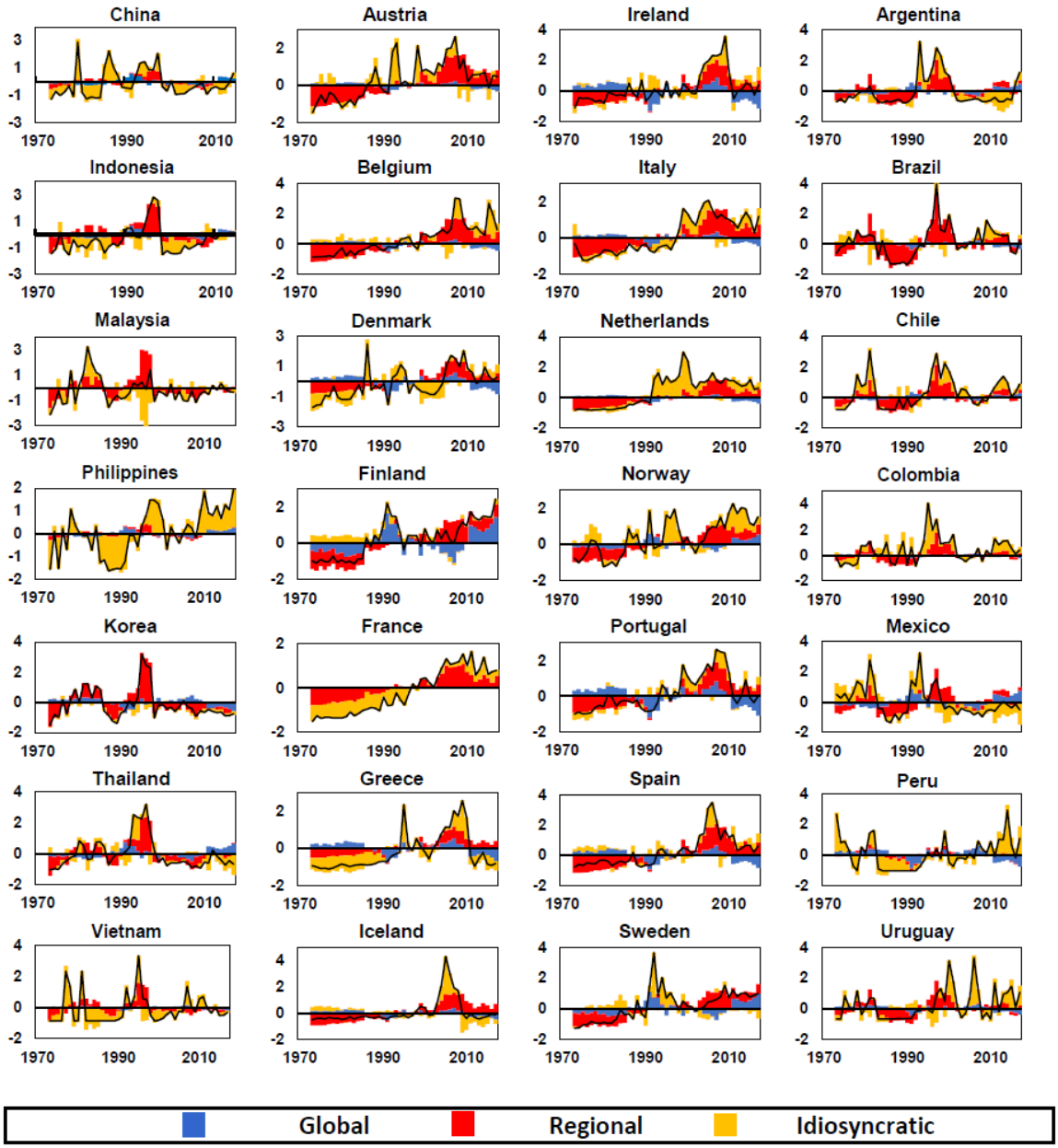
Notes: This Figure shows the Global and Regional Factors estimated using a Dynamic Latent Factor Model.

Figure 2.3: The Role of Global, Regional, and Idiosyncratic Factors: Average Across All Countries



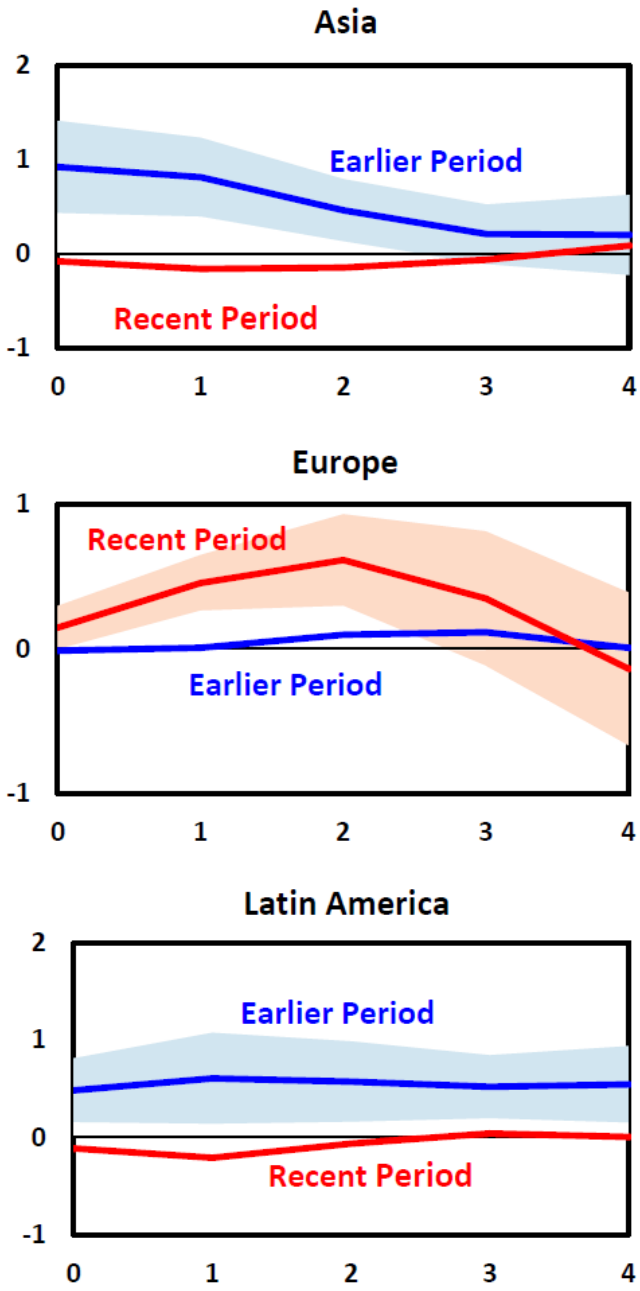
Notes: This Figure shows the average variance decomposition of capital flows(as a share of exports) since the collapse of the Bretton Woods System until 2017 across all countries. Capital Flows are captured by International Gross Primary Issuance.

Figure 2.4: The Role of Global, Regional, and Idiosyncratic Factors: Evolution over Boom and Bust



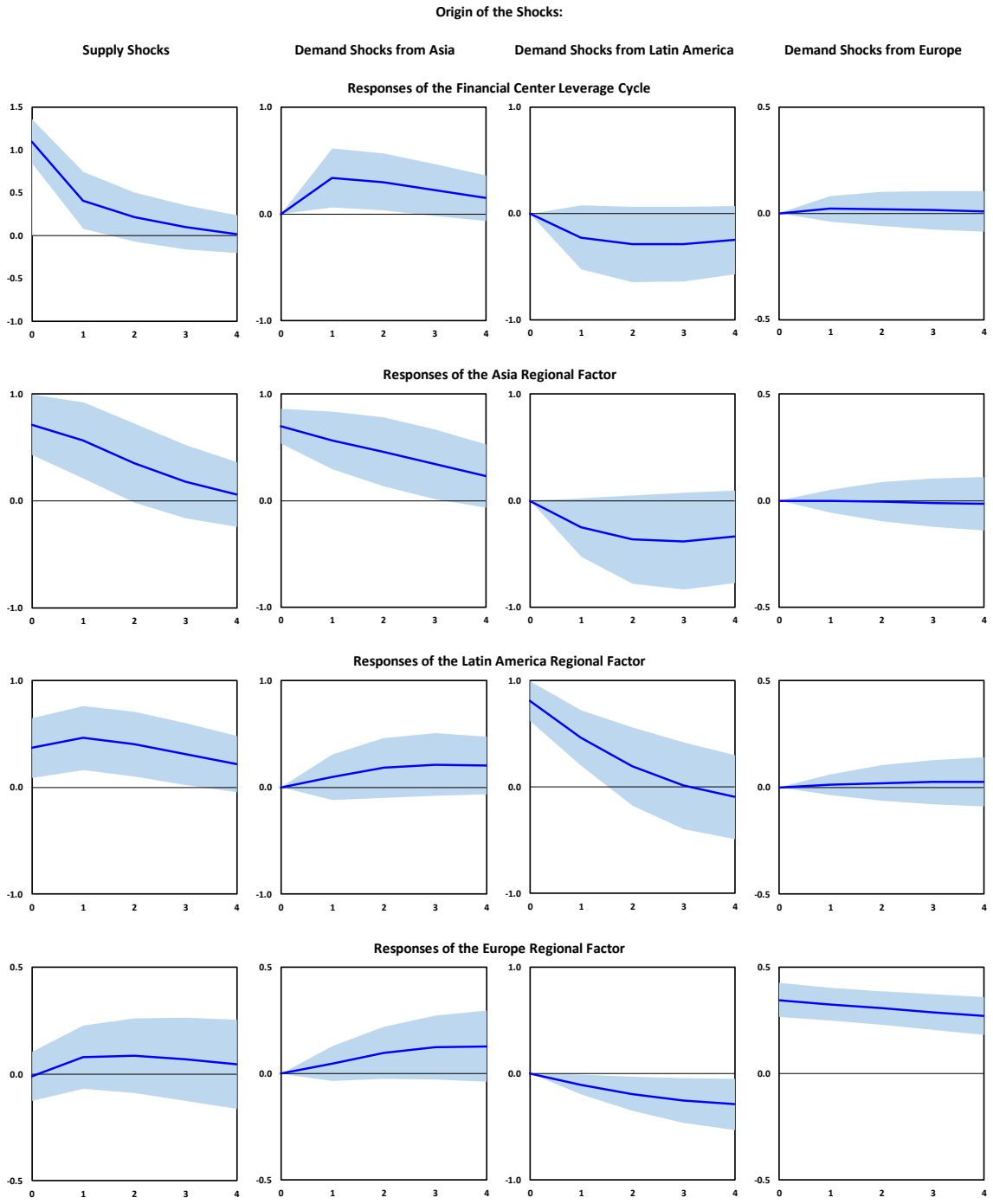
Notes: This Figure shows the role of the Global, Regional, and Idiosyncratic Factors on the evolution of the (normalized) Capital Flows/Exports (shown as a blackline). Capital Flows are captured by International Gross Primary Issuance. For each country, we normalized Capital Flows/Exports to a zero-mean,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

Figure 2.5: Effects of Leverage Shocks



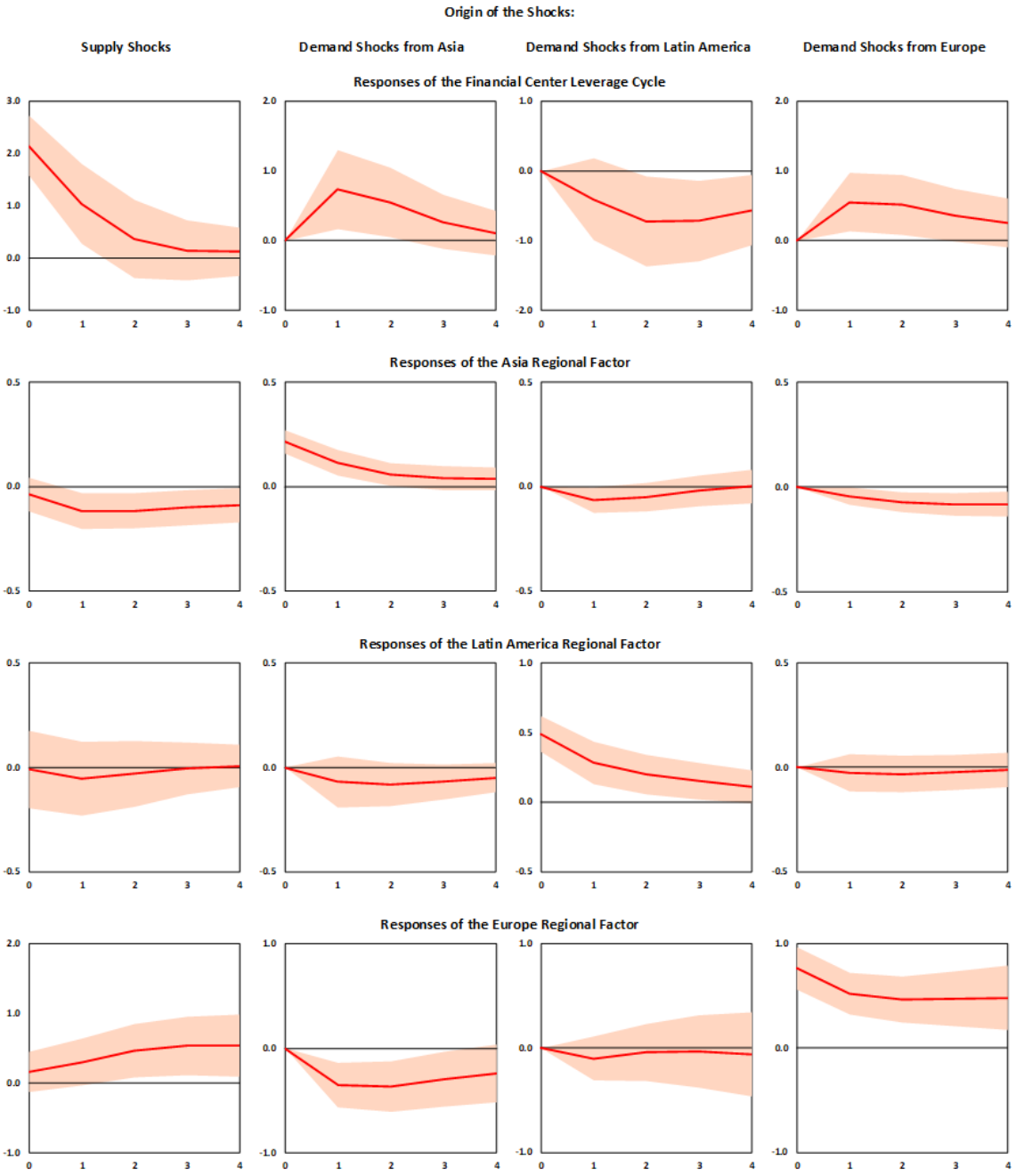
Notes: This Figure shows the response of the Regional Factors to a one-standard deviation shock to the Leverage Cycle in the Financial Center (at different horizons: 0, 1, 2, 3, 4 (years)) in the Earlier Period (1973 to 1998) and in the Recent Period (1999 to 2017). The shaded region is the 90% confidence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

Figure 2.6: Impulse Responses in the Earlier Period, 1973-1998



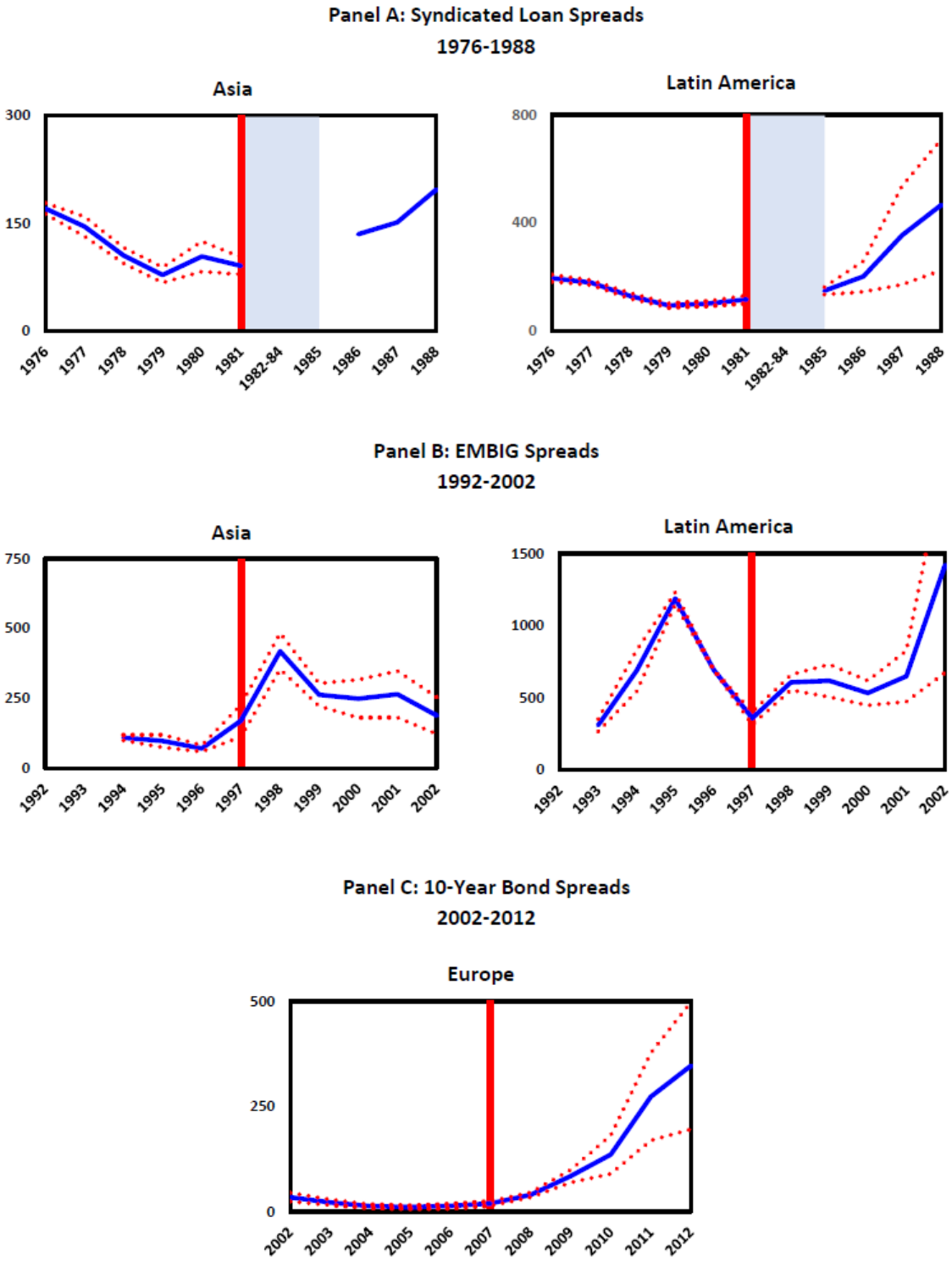
Notes: This Figure shows the response of the Financial Center Leverage Cycle and the Asia, Latin America and Europe Regional Factors to a one-standard deviation supply shock and three demand shocks originating in Asia, Latin America, and Europe (at different horizons: 0, 1, 2, 3, 4 (years)) in the Earlier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

Figure 2.7: 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 2.8: Borrowing Costs



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.

2.9 Tables

Table 2.1: 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 2.2: 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).

Chapter 3: Private and Sovereign International Borrowing: Complements or Substitutes?[1]

3.1 Introduction

Almost 45 years 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 flows. United States and Germany were the first to eliminate capital controls. Japan, the United Kingdom, and Latin America followed later in the 1970s. The rest of Europe followed suit in the late 1980s by relaxing controls on its path to the monetary union. By the early 1990s East Asia had removed most capital controls. 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 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. One theme of this research is the distinction between global "push" factors and country-specific "pull" factors. While all research on capital flows examines the role of country fragilities (pull factors) on capital flows, the questions most frequently asked are about the role of the financial center. Is monetary policy in the financial center at the core of the volatility of capital flows to the periphery? Does monetary policy in the financial center trigger crises in the periphery? Calvo et al. (1993, 1996) were

[1] This chapter is co-authored with Graciela L. Kaminsky.

the first to emphasize the importance of external push factors in explaining capital flows to emerging economies. They isolated monetary policy in the financial center as one of the main culprits fueling capital flow bonanzas to the emerging periphery. Most recently, the focus of attention of the literature on capital flows has emphasized the role of global investors' risk appetite and risk aversion.[2] All this literature has focused on explaining total capital flows or at most studying the triggers of booms and busts by type of instrument: FDI, portfolio flows, and bank flows.[3]

Much less attention has been given to the analysis of capital flows by types of borrowers (sovereigns and corporations) and their interactions. Sovereign borrowing attracted a lot of attention during the earlier years of financial globalization when emerging markets defaulted *en masse* in the aftermath of the capital flow boom of the late 1970s beginning of the 1980s. However, the focus of attention at that time was mostly on the links between external debt and sovereign risk.[4] With the increase in corporate international borrowing around the world starting in the 1990s and especially in the 2000s, new research starts to focus on the role of the government on the ability of corporations to tap international capital markets. This literature centers on the effects of sovereign defaults on international borrowing by corporations. Naturally, this growing research is just limited to the experiences of developing countries.[5]

In this chapter, we focus on the interaction of sovereign borrowing and corporate borrowing in international capital markets. We ask: Does government borrowing in

[2] See Borio (2014), Rey (2015), and Miranda-Agrippino and Rey (2020).
[3] For an analysis of capital flows by type of instrument, see, for example, Cerutti and Hong (2018), Cerutti et al. (2017). Also, see Koepke (2019) for a review of the literature on capital flows to emerging countries.
[4] See, for example, Feder and Just (1977) and Edwards (1984).
[5] See, for example, Arteta & Hale (2008) and Das et al. (2010).

international capital markets crowd out private issuance? Or does it crowd in private issuance? [6] Several authors have argued that sovereign borrowing can promote corporate borrowing. The idea is that sovereign bonds provide benchmarks against which to value corporate bonds and hence stimulate the development of the country's corporate bond market, fueling more corporate issuance. Other authors suggest that sovereign borrowing triggers a reassessment of country risk and leads to higher borrowing costs of corporate borrowers, thus crowding out corporate borrowing. In this paper we examine these links for both developing and advanced economies since the restart of financial globalization in the early 1970s. To capture the interactions between public and private international issuance for both developing and advanced economies, we construct a novel database using data from the archives of the World Bank and complementing this data with digital databases (Bloomberg, Dealogic, and SDC Platinum). Using Jordà (2005) local projections, we first estimate the effect of sovereign borrowing on corporate international issuance for both developing and advanced economies from 1973 to 2017. We then use Jordà (2005) local projections methodology together with the Ramey and Zubairy (2018) modifications to examine whether these responses depend on the size of the external public debt, the state of the liquidity in international capital markets, and the degree of sovereign risk.

Our results indicate that the interactions of public and private international issuance vary, with public issuance crowding out private issuance in episodes of low liquidity in international capital markets, high indebtedness in emerging markets, and high sovereign

[6] Once we manage to answer these questions, it is also important to examine the role of domestic issuance on crowding out or in. The interactions between international and domestic issuance are essential to understand the capital structure and allocations of countries. See, for example, Maggiori et al. (2020). They use data on Morningstar on holdings of international investors on domestic and foreign assets.

risk. In contrast, states with bonanzas in the financial center reinforce cycles of public and private international issuance in advanced economies and in emerging economies when their levels of indebtedness are low.

The rest of the chapter is organized as follows. Section 3.2 reviews the empirical literature on the links between sovereign and corporate borrowing in international capital markets. Section 3.3 presents our database of capital flows, as well as our estimates of sovereign international debt. Section 3.4 first reports the links between private and public international issuance using Jordà (2005) local projections. Second, it reports estimations with the Ramey and Zubairy (2018) state dependent local projections to assess whether there is a debt threshold that triggers a crowding-out effect of sovereign issuance on corporate issuance, or whether episodes of financial center leverage bonanzas fuel episodes of reinforcing booms in public and private issuance in the periphery. Finally, we re-examine Reinhart et al. (2003) hypothesis of Debtors' Clubs and external debt intolerance regions. Section 3.5 presents the conclusion and discusses future areas of research.

3.2 Literature Review

The first two decades following the restart of financial globalization in the early 1970s were characterized by a boom in sovereign borrowing of developing countries. This bonanza ended with a wave of sovereign defaults in Africa, Asia, Eastern Europe, and Latin America starting in 1982. Naturally, the early research on capital flows was focused on sovereign borrowing and sovereign default risk.

One of the earliest works on the links between sovereign debt and default risk is that of Edwards (1984). This paper examines the determinants of sovereign default risk using data on syndicated loans denominated in Eurodollars for the 1976- 1980 period. The

focus of this research is on 727 public and publicly guaranteed loans granted to 19 Less-Developed countries. Edwards finds that increases in sovereign debt increases default risk through two different channels: one via higher indebtedness (indicating unsustainability of the debt) and the other via higher debt service/export ratio (indicating potential liquidity problems).[7]

Mostly all the empirical literature on sovereign borrowing has largely focused on explaining sovereign indebtedness and sovereign spreads but mostly ignore the problem that many countries might be cut off from credit markets completely, either permanently or temporarily. Gelos et al. (2011) fill this gap in the literature, and study what triggers market exclusion or access. Their research focuses on 144 developing countries. Their database includes 2053 individual bond issues and 5065 commercial bank syndicated loans. Using a variety of techniques, they find that governments' ability to tap international capital markets is mostly explained by the perceived quality of its policies and institutions. Interestingly, they find that indebtedness and previous defaults do not prevent countries from further accessing international credit markets. In a similar vein, Richmond and Dias (2008) analyze the duration of capital market exclusion by sovereign defaulters from 1980 to 2005. Their findings indicate that countries regain partial market access after approximately 6 years while it takes about 8 years on average to regain full market access. They also find that partial market access depends mostly on external financial markets conditions while full market access depends primarily on long term market expectations and the size of the losses inflicted to creditors.

[7] In contrast, using data on spreads of 102 public and publicly-guaranteed syndicated loans for 1973-1974, Feder and Just (1977) do not find any effects from debt/GNP on the likelihood of default as captured by the spreads.

With a different emphasis, Reinhart et al. (2003) highlight the critical role of sovereign risk for cross-border external capital. They show that countries tend to lose all access to private capital markets when sovereign ratings fall below a critical threshold. In contrast, countries with very high ratings tend to have continuous access to capital, even during recessions and crisis periods. They also find an intermediate group of countries, mostly middle-income countries with highly volatile access to international capital markets. In bad times, with ratings falling and fundamentals deteriorating, these countries suffer rapidly increasing costs of borrowing and may even lose access to international capital markets.

In the 1990s, corporate borrowing in international capital markets started to increase, specially surging in the aftermath of the global crisis in 2008. This new development fueled new empirical research on private international borrowing and the relationship between public and private international borrowing. At the core of this literature has been the effect of sovereign debt crises on the ability of the private sector to tap international capital markets. For example, Arteta and Hale (2008) examine the impact of sovereign defaults on corporate borrowing. They use firm-level data on syndicated loans and bond issues from Dealogic for 30 emerging countries from 1984 to 2004. They find that sovereign debt crises and restructurings have a strong negative impact on private borrowing. After controlling for fundamentals and common shocks, they find that defaults are followed by over a 20 percent drop in foreign loans and bond issuance by domestic firms.

In a similar spirit, Das et al. (2010) study the impact of sovereign debt crises, debt restructurings, and overall sovereign default risk in developing countries on private sector

access to international capital markets. As in Arteta and Hale (2008), Das et al. (2010), they use micro data of corporate issuance for 31 emerging economies from 1980 to 2007 and link it to sovereign risk. The novelty in this paper is that authors capture sovereign risk in a variety of ways. They use information on defaults and associated restructurings using a database that evaluates more than 20,000 pages of case study material on crises. They also use sovereign bond spreads (taken from J.P. Morgan's Emerging Markets Bond Index [EMBI] Global) and sovereign ratings (taken from Standard & Poor's and the Institutional Investor magazine). They find that sovereign default risk as well as sovereign defaults are crucial determinants of private sector access to international capital markets.

Another line of research has focused on the role of sovereign issuance on private issuance, with a focus on the pricing of corporate bonds. Several authors have argued that sovereign borrowing promotes corporate borrowing. The idea is that sovereign bonds provide benchmarks against which to value corporate bonds, and hence stimulate the development of the country's corporate bond market (Fabella and Madhur, 2003). This claim is supported by the casual observation that the liquid corporate bond markets in developed countries are often accompanied by active government bond issuance and trading. As discussed in Dittmar and Yuan (2008), sovereign bonds can improve the corporate market by making it more complete,[8] reducing adverse selection costs,[9] and improving liquidity by acting as hedging instruments. This liquidity service can translate into reduced liquidity premiums and decreased bid-ask spreads. Sovereign bonds may also

[8] For example, Shiller (1998) points out that macro securities, i.e., securities that represent systemic risk factors, help to complete the market by allowing investors to hedge against major income risks.
[9] For example, Yuan (2005) indicates that in the presence of information asymmetries, benchmark securities help to complete the market and help investors with heterogenous information to hedge against adverse selection.

benefit corporate bonds by fueling price discovery. With sovereign bonds helping investors to better hedge adverse selection costs, they also fuel investors' acquisition of more systematic and firm-specific information, leading to an improvement in pricing securities. However, as discussed in Subrahmanyam (1991) and Gorton and Pennacchi (1993), public issuance and the introduction of sovereign benchmark securities may also inhibit price discovery, crowding out the trading of private securities, especially in emerging markets, in which the sovereign bonds have a higher credit rating than corporate bonds. This adverse effect is frequently more prevalent in emerging markets. It is in those countries that sovereign bonds have higher ratings, making these bonds more attractive to international investors as a substitute to corporate bonds, reducing the liquidity in the corporate bond market.

Dittmar and Yuan (2008) use daily data (spanning the years 1996 to 2000) from eight emerging economies (Argentina, Brazil, Chile, Korea, Mexico, the Philippines, Thailand, and Venezuela) to examine the effects of sovereign bonds on corporate bonds. They find that the presence of sovereign bonds lowers both the yield spreads and the bid-ask spreads of existing corporate bonds in emerging markets, that is sovereign bonds enhance corporate bond markets in emerging economies by providing more information, stimulating information production, and thereby generating reduced adverse selection costs and improved liquidity.

Ağca and Celasun (2012) focus on the role of sovereign debt on corporate borrowing costs. The hypothesis they examine is whether increasing foreign sovereign borrowing triggers a reassessment of country risk and leads to higher borrowing costs of corporate borrowers. They test this hypothesis using data on syndicated loan issuances

from 1990 to 2006 for 15 countries and find that an increase in sovereign debt by one standard deviation from its sample mean is associated with 9% higher loan yield spreads.

3.3 The Database

A key contribution of the study is the construction of a new database on public and private international issuance and debt for both advanced and developing countries since the restart of financial globalization following the collapse of the Bretton Woods System in 1973. Most of the analysis of issuance and debt has been focused on developing countries using the database created by the World Bank. There is no equivalent data for advanced economies.[10] The new database we constructed, will allow us to examine a long episode of capital flows booms and busts that can provide further insight on the effects of public issuance and debt on corporate borrowing. The data was collected from the archives of the World Bank and complemented with data from Dealogic and Bloomberg , LDC Platinum to have database spanning almost fifty years. The database we 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. 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

[10] Even the data from the World Bank does not provide data on issuance and debt for some important emerging economies, such as Chile, Poland, and Uruguay and data on other countries starts in the 1980s or even 1990s.

participating in the syndicates for loans, and the markets where the bonds are issued.[11] 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. Using the data on maturity of syndicated loans and bonds and the type of bond (bullet bond or sinking fund bond), we constructed series of public and private international debt starting in 1973. The database we constructed not only does it take into account the original maturity of bonds and loans but also includes all the restructurings of sovereign debt following the defaults of the 1980s, 1990s, and 2000s.[12] We should note that the series of external debt include just the debt from bonds and loans issued in private capital markets from private creditors. The external debt we constructed does not include bilateral loans between countries, nor does it include multilateral loans from international financial institutions. Our estimations include debt for both developing and advanced economies.

In this chapter, we study capital flows to advanced and emerging periphery countries that heavily tap international capital markets. We focus on issuance of 30 countries, 17 advanced economies and 13 emerging economies. The emerging economies are: Argentina, Brazil, Chile, China, Colombia, Indonesia, Korea, Malaysia, Mexico, Peru, Thailand, Turkey, and Uruguay. The advanced economies are: Australia, Austria, Belgium,

[11] 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.

[12] The information on restructurings of sovereign debt was collected from the *Institute of International Finance*, various World Bank publications, such as the *Global Development Finance*, and *International Capital Markets: Developments and Prospects*, various IMF publications, such as *Private Market Financing for Developing Countries*, *International Capital Markets*, and *IMF Staff Reports*, the Bloomberg Platform, and a variety of studies of researchers, such as Sturzenegger and Zettelmeyer (2006).

Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, New Zealand, 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 equities, and then divide total issuance into private issuance and public issuance. Private issuance includes issuance by both financial and non-financial corporations. Public issuance includes issuance of central governments, states/provinces, and municipalities, financial and non-financial state-owned corporations. Private issuance includes issuance of financial and non-financial privately-owned corporations. 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 3.1 shows the evolution of total, private and public international issuance (as a share of exports) since the collapse of the Bretton Woods System in 1973 while Figure 3.2 shows the evolution of the external public debt (as a share of exports).

3.4 Estimations

This section examines the links between public and private issuance. We examine whether sovereign issuance in international capital markets helps to create a market for private international issuance (crowding in) or whether sovereign international issuance reduces the ability of the private sector to tap international capital markets (crowding out). We first examine whether the links are different across advanced and emerging economies. We then allow for time-varying relationships between sovereign borrowing and private

borrowing for both advanced and emerging economies. We ask the following questions: Does the level of public debt matter? Does public issuance only crowd-out private issuance when the level of the public debt is high? What about other causes? Do episodes with investors' high appetite for risk allow both the private and the public sector in the periphery to borrow more intensively? What about bad times? Does public issuance crowd-out private issuance in times of low global liquidity? What about the ability of the sovereign sector to repay its debt? Does the likelihood of a sovereign default affect the ability of the private sector to tap international capital markets?

3.4.1 Advanced and Emerging Economies

We examine whether sovereign borrowing in advanced and in emerging economies affects differently the participation of private corporations in international capital markets. We estimate the effect of public issuance on private issuance at different horizons using Jordà (2005) local projections. We use balanced panel data separately for emerging and advanced economies. Establishing causation from public issuance to private issuance is challenging because a variety of factors, such as current and expected economic conditions, could affect both public and private issuance. We therefore control for a variety of country factors that may affect both public and private issuance, including country GDP growth, country-fixed effects, and country sovereign risk. We also control for a variety of push factors, such as, GDP growth in the financial center and global financial liquidity.[13]

[13] As we discussed above, fluctuations in public issuance are in general endogenous and respond to current and expected economic conditions, making it difficult to identify truly exogenous shocks to public issuance. Another possible methodology to address endogeneity is to identify exogenous shocks to public issuance as the difference between observed levels of public issuance and those predicted by a VAR model. We estimate those exogenous shocks using Structural VAR with two indicators: Public Issuance (share of exports) and the country GDP growth rate. We use those exogenous shocks in the local projections. The results are reported in Appendix 2.

We estimate the following model separately for advanced and emerging economies at different horizons: $h = 0, 1, 2, 3, 4, 5$ (years).

$$PRI^i_{t+h} = \alpha_h + \delta^i_h + \beta_h \cdot PUI^i_t + \theta^{pull}_h(L) \cdot Z^{pull,i}_{t-1} + \theta^{push}_h(L) \cdot Z^{push}_{t-1} + \varepsilon^i_{t,h} \quad (3.1)$$

For each group, PRI is international private issuance as a share of exports, PUI is international public issuance as a share of exports, Z^{pull} is a vector of controls that includes the pull factors: International Public Debt (as a share of exports), country real GDP growth rate, and country sovereign ratings, and Z^{push} is a vector of push factors: U.S. real GDP growth rate and the U.S. Broker-Dealer Leverage Cycle, $\theta^{pull}_h(L)$ and $\theta^{push}_h(L)$ are polynomials in the lag operator, and the coefficient β_h gives the response of private issuance at time $t+h$ to a shock to public issuance at time t. δ^i_h is a country fixed effect and the superscript i identifies the country in the panel.

The results are shown in Figure 3.3. This figure shows the response of International Private Issuance to a shock to International Public Issuance at different horizons: 0,1, … , 5 years. For advanced economies, the results indicate that changes in international public issuance in advanced economies do not crowd in nor crowd out international private issuance. In contrast, for emerging markets the results indicate international public issuance crowds out international private issuance. While this effect is statistically significant, it is not statistically significant since a one-standard deviation shock to public issuance (share of exports) only reduces private issuance (share of exports) by just one tenth of one-standard deviation shock to private issuance.

3.4.2 Time-Varying Relationship between Public and Private Issuance

We now allow for three types of non-linearities. We use the Jordà (2005) local

projections methodology together with the Ramey and Zubairy (2018) modifications to examine the links between public and private issuance in times of global financial bonanzas and in times of global financial crashes, in episodes with country's high and low sovereign indebtedness, and in episodes of high and low country sovereign risk. As before, we estimate the following model separately for advanced and emerging economies at different horizons: $h = 0, 1, 2, 3, 4, 5$ (years).

3.4.2.1 Crowding-in or Crowding-out during Global Financial Booms and Busts?

The boom-bust cycles in capital flows around the world since the restart of financial globalization in the early 1970s have been at the center of attention of both academic and policy circles. The almost 50 years since capital controls were drastically reduced and even completely eliminated around the world, capital flow booms have become quite pronounced and mostly followed by sudden stops in capital flows, as well as currency, banking, and sovereign debt crises. Many suggest that investors' appetite for risk as well as expansionary monetary policy in the financial center are at the core of these bonanzas, with reversals in monetary policy triggering a sharp increase in global investors' risk aversion and dramatic crashes in capital flows around the world. But are these cycles in the financial center reinforced in the periphery? In this section, we examine whether financial bonanzas and busts in the financial center are reinforced by crowding in effects of international public issuance or they are weakened by crowding out effects in countries in the periphery.

To examine the effects of global bonanzas and crashes on interactions in public and private international issuance we follow Bruno and Shin (2015) and capture booms and

busts in global liquidity with the U.S. Broker-Dealer Leverage.[14] To identify the boom-bust cycles in the U.S. Broker Dealer Leverage, we apply the algorithm used to identify business cycles.[15] The first step in the determination of the cycles is the identification of the cyclical turning points. The algorithm that we apply looks for clearly defined swings in the U.S. Broker Dealer Leverage with at least a minimum duration like that of business cycles. We also impose a minimum amplitude of the cycle to be at least 25 percent. Essentially, the algorithm isolates local minima and maxima in a time series, subject to the constraint on the length of upturns and downturns and the constraint on the amplitude of the cycle. We impose the restriction that the cycle cannot have duration of less than 5 years. That is, y_t (U.S. Broker Dealer leverage) is a maximum if:

$$y_{t-2}, y_{t-1} < y_t > y_{t+1}, y_{t+2}$$

and the amplitude of the cycle is at least 25 percent.[16] The trough is identified as the minimum value between two local peaks.

Our algorithm identifies the episodes of 1976-1984, 1989-1996, 2000-2007, and 2010-2017 as boom episodes, with the rest of the years in our sample as episodes of crashes.

We estimate the following model separately for advanced and emerging economies at different horizons: $h = 0, 1, 2, 3, 4, 5$ (years).

$$\begin{aligned} PRI^i_{t+h} = \alpha_h + \delta^i_h + [\beta^{boom}_h \cdot PUI^i_t] \cdot I^{boom}_t + [\beta^{bust}_h \cdot PUI^i_t] \cdot I^{bust}_t \\ + \theta^{pull}_h(L) \cdot Z^{pull,i}_{t-1} + \theta^{push}_h(L) \cdot Z^{push}_{t-1} + \varepsilon^i_{t,h} \end{aligned} \tag{3.2}$$

[14] 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.

[15] See, for example, Bry and Boschan (1971), Harding and Pagan (2002), and Kaminsky and Schmukler (2008).

[16] We impose a minimum amplitude of 25 percent to identify bona fide bonanza (bust) cycles and not just blips in the U.S. Broker Dealer Leverage cycle.

As before, the coefficient β_h gives the response of international private issuance at time $t+h$ to a shock to international public issuance at time t. We allow the coefficient β_h to vary between episodes of booms/busts in the financial center leverage cycle. $I^{boom}(I^{bust})$ is a dummy variable that indicates the state of the financial center leverage cycle when the shock hits and it is equal to 1 during the boom (bust) period.

Figure 3.4 shows the responses of private issuance to public issuance shocks in episodes of financial bonanzas and busts in the financial center. The top panels show the responses in advanced economies and the bottom panels show the responses in emerging economies. Interestingly, an increase in public issuance in advanced economies fuels increases in private issuance in the longer run during bonanzas in the financial center but it crowds out the private sector during financial crashes in the financial center. Our results for advanced economies indicate that the crowding-in effect during bonanzas is not economically significant since a one-standard deviation shock to public issuance (share of exports) only increases private issuance (share of exports) by just one tenth of one-standard deviation shock to private issuance. In contrast, the crowding out effect is larger during busts in the financial center with a one-standard deviation shock to public issuance (share of exports) reducing private issuance (share of exports) by 30 percent of one-standard deviation shock to private issuance.

Our results for emerging economies do not capture any reinforcement effect during bonanzas in the financial center, but we continue to find that international public issuance in times of global illiquidity crowds out private access to international capital markets. The crowding-out effect in emerging economies is similar to that of advanced economies with a one-standard deviation shock to public issuance (share of exports) reducing private

issuance (share of exports) by 25 percent of one-standard deviation shock to private issuance.

3.4.2.2 Crowding-in and Crowding-out: Does International Public Debt Matter?

The increase in government indebtedness in the 2000s, especially in the aftermath of the Global Financial Crisis has triggered a growing literature on the effects of debt on growth. For example, Reinhart and Rogoff (2010) find that while there is no particular link between growth and debt at "normal" debt levels, average growth rates for countries with public debt over roughly 90 percent of GDP are several percent lower than otherwise. Interestingly, they also find that the relationship between public debt and growth is remarkably similar across emerging and advanced economies.

More recently, Eberhardt and Presbitero (2015) study the long-run relationship between public debt and growth in a large panel of countries. They investigate the debt-growth nexus adopting linear and non-linear specifications and they find some support for a negative relationship between public debt and long-run growth across countries, but no evidence for a similar, let alone common, debt threshold within countries.

In a similar vein, Chudik et al. (2017) also examine the long-run impact of public debt expansion on economic growth and investigate whether the debt-growth relation varies with the level of indebtedness. Using data on a sample of 40 countries (both advanced and developing) over the 1965-2010 period, they find no evidence for a universally applicable threshold effect in the relationship between public debt and economic growth, once they account for the impact of global factors and their spillover effects. Still, they find significant negative long-run effects of public debt build-up on

output growth. Interestingly, they find that if public debt is on a downward trajectory, a country with a high level of debt can still grow just as fast as its peers in the long run.

Naturally, this negative relationship between the level of the public debt and growth suggests that public issuance crowds out private issuance, with interest rates increasing and reducing investment and growth. But, in this study we are examining the interactions between international private and public issuance. Shouldn't the crowding out effect be lower when a country taps international capital markets? In this section, we examine whether episodes of high levels of international debt fuel crowding out effect of public issuance.

We estimate the following model separately for advanced and emerging economies at different horizons: $h = 0, 1, 2, 3, 4, 5$ (years).

$$PRI^{i}_{t+h} = \alpha_h + \delta^{i}_{h} + [\beta^{high}_{h} \cdot PUI^{i}_{t}] \cdot I^{high}_{t} + [\beta^{low}_{h} \cdot PUI^{i}_{t}] \cdot I^{low}_{t} + \theta^{pull}_{h}(L) \cdot Z^{pull,i}_{t-1} + \theta^{push}_{h}(L) \cdot Z^{push}_{t-1} + \varepsilon^{i}_{t,h} \tag{3.3}$$

As before, the coefficient β_h gives the response of internationals private issuance at time $t+h$ to a shock to international public issuance at time t. We allow the coefficient β_h to vary between episodes of high/low levels of international debt (as share of exports). $I^{high}(I^{low})$ is a dummy variable that indicates the state of international public debt when the shock hits and it is equal to 1 during high levels of international public debt (low levels of international public debt) period. Advanced economies have better access to international capital markets and can sustain larger levels of debt (share of exports). Thus, we examine the effects of debt/exports threshold of 0.90 for advanced economies and 0.50 for emerging economies.

Figure 3.5 shows the responses of private issuance to public issuance shocks in episodes of high and low public international indebtedness. The top panels show the responses in advanced economies and the bottom panels show the responses in emerging economies. Interestingly, an increase in public issuance in advanced economies does not crowd out private issuance either in the short or in the longer run. In contrast, an increase in public issuance in emerging economies during episodes of high indebtedness of the public sector crowds out private issuance. During episodes of low indebtedness of the public sector triggers crowding in effects, with private issuance increasing with increases in public issuance. The crowding-in effect and the crowding-out effect during episodes of low and high public debt (in response to one-standard deviation shock to public issuance) are about 19 percent of one-standard deviation shock to private issuance.

3.4.2.3 Crowding-in and Crowding-out: Does Sovereign Risk Matter?

Finally, we also examine whether the extent of sovereign risk affects the interactions between public and private issuance in international capital markets. Reinhart et al. (2003) discuss whether there are Debtors' Clubs. They study whether some economies have continuous access to capital markets, others have intermittent access to capital markets, and others do not have access to capital markets. They relate those clubs to history of defaults that are mainly reflected in country ratings. In this section we examine whether those rating thresholds capture changing interactions of international public and private issuance. We use the International Investors Ratings and the Moody's Credit Ratings. Both ratings have a minimum of zero, when the countries are in default, and have a maximum of 100.[17] As in Reinhart et al. (2003), we create three clubs. The club with high

[17] Moody's sovereign credit rating scale runs from a high of Aaa to a low of C and comprises 21 notches. We

sovereign risk has ratings lower than 25, the club with medium sovereign risk has ratings higher than 25 but lower than 70, and the clubs with low risk has ratings higher than 70.

As before, we estimate the following model just for emerging economies at different horizons: $h = 0, 1, 2, 3, 4, 5$ (years).

$$PRI^i_{t+h} = \alpha_h + \delta^i_h + [\beta^{high}_h \cdot PUI^i_t] \cdot I^{high}_t + [\beta^{medium}_h \cdot PUI^i_t] \cdot I^{medium}_t + [\beta^{low}_h \cdot PUI^i_t] \cdot I^{low}_t + \theta^{pull}_h(L) \cdot Z^{pull,i}_{t-1} + \theta^{push}_h(L) \cdot Z^{push}_{t-1} + \varepsilon^i_{t,h} \quad (3.4)$$

As before, the coefficient β_h gives the response of international private issuance at time $t+h$ to a shock to international public issuance at time t. We allow the coefficient β_h to vary between episodes of high, medium, and low sovereign risk. $I^{high}, I^{medium},$ and I^{low} are the dummy variables that indicate the state of sovereign risk when the shock hits and they are equal to 1 during high, medium, and low sovereign risk, respectively. Figure 3.6 shows the results. We find that in states of high sovereign risk, increases in international public issuance crowd out international private issuance, with a one-standard deviation shock to international public issuance triggering a crowding-out effect equal to one-standard deviation shock to international private issuance.

3.5 Conclusions

Our results indicate that the interactions of public and private international issuance are non-linear with crowding-out effects only present in times of adverse conditions, with public issuance crowding out private issuance in episodes of low liquidity in international capital markets, high indebtedness in emerging markets, and high sovereign risk. In contrast, states with bonanzas in the financial center reinforce cycles of public and private

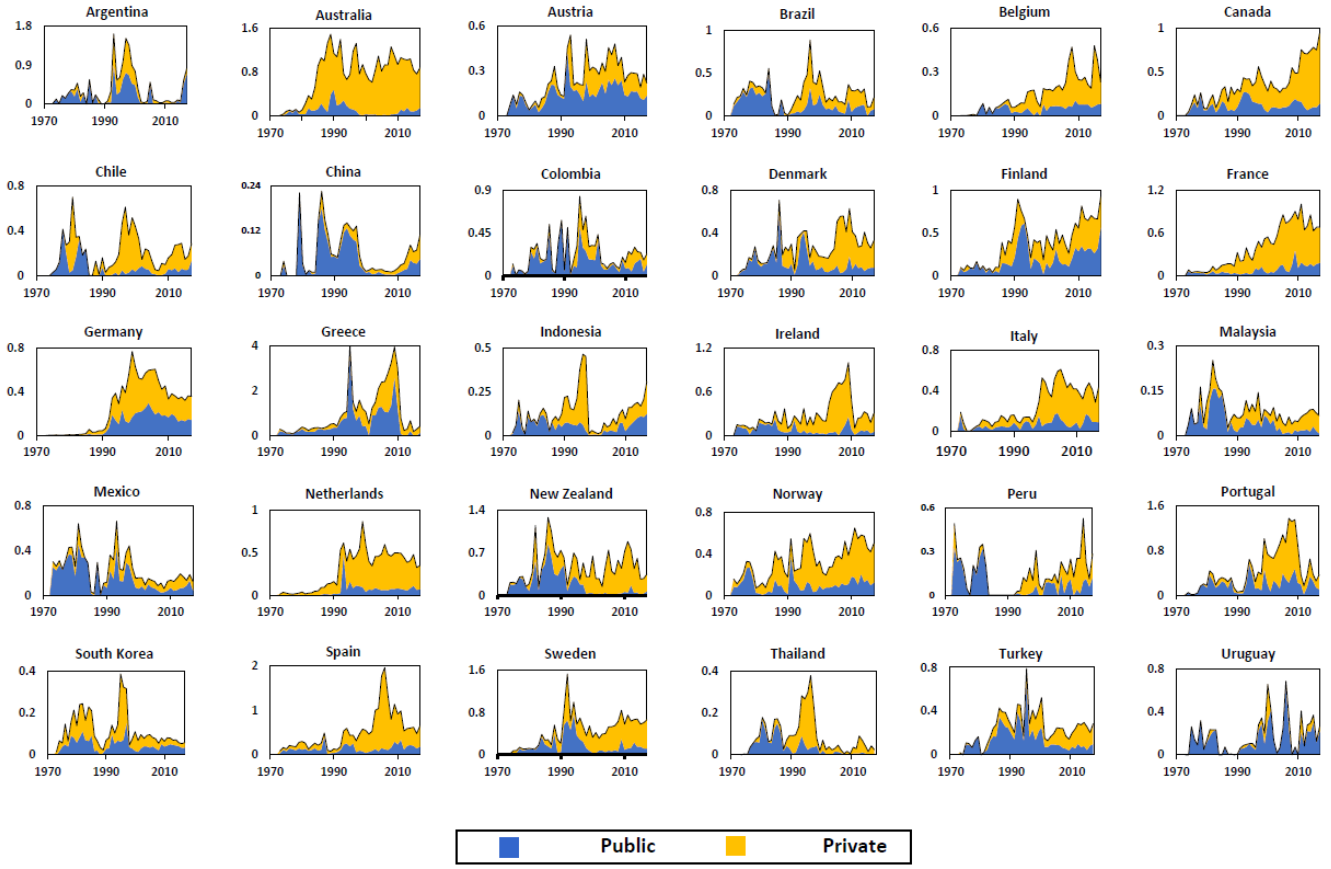
create a numerical rating with Aaa equal to 100, declining by 5 points for each of the next lower rating scales. The numerical rating reaches 0 for Moody's C rating scale.

international issuance in advanced economies and in emerging economies when their levels of indebtedness are low.

Our work just focuses on the interactions between private and public issuance in international capital markets. Starting in the 1990s, domestic markets started to develop around the world, with both sovereigns and the private sectors starting to borrow domestically. It is important to examine whether domestic markets reinforce or diminish the crowding-out (in) effects observed in international capital markets.

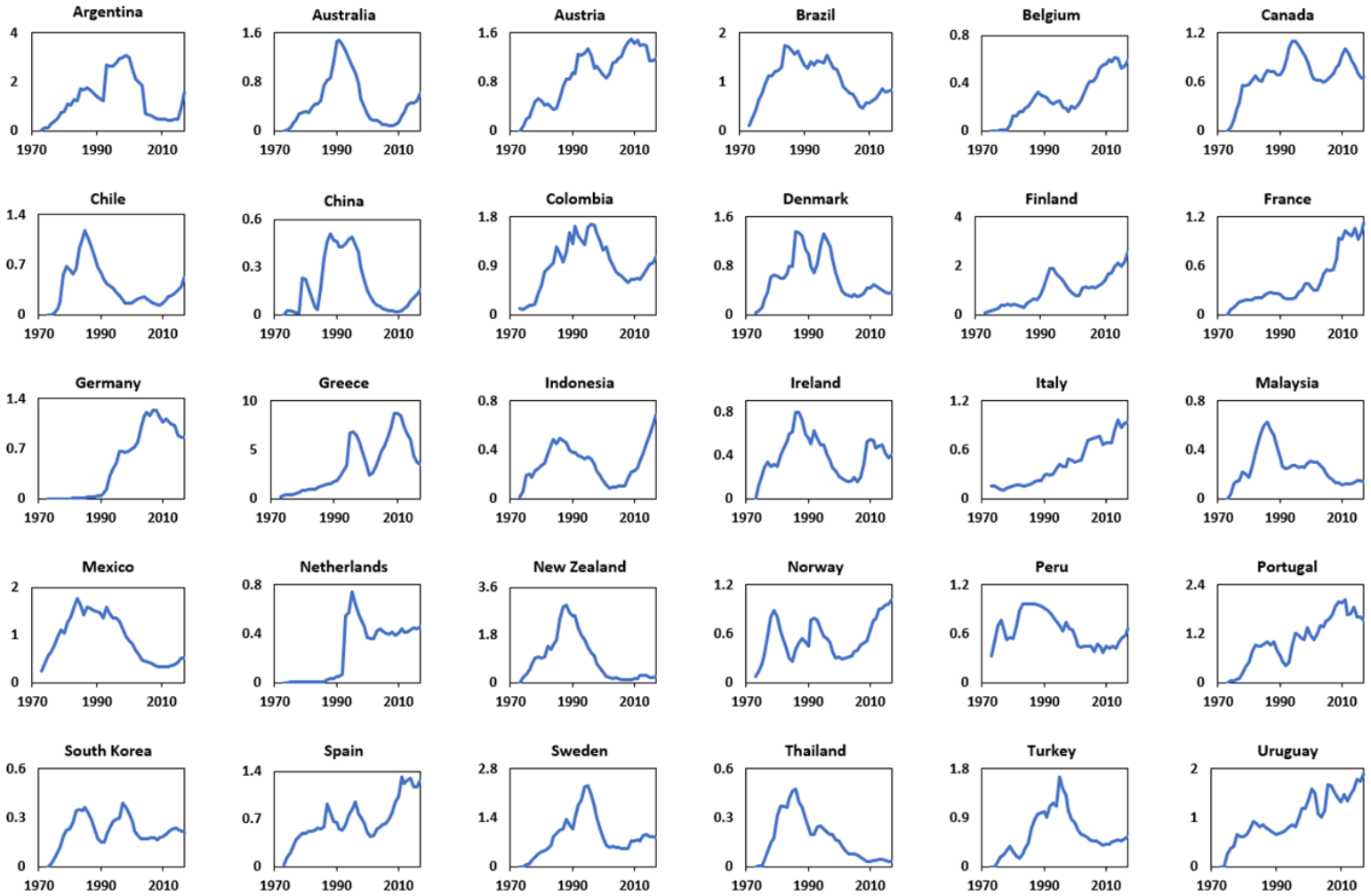
3.6 Figures

Figure 3.1: Capital Flows (Share of Exports)



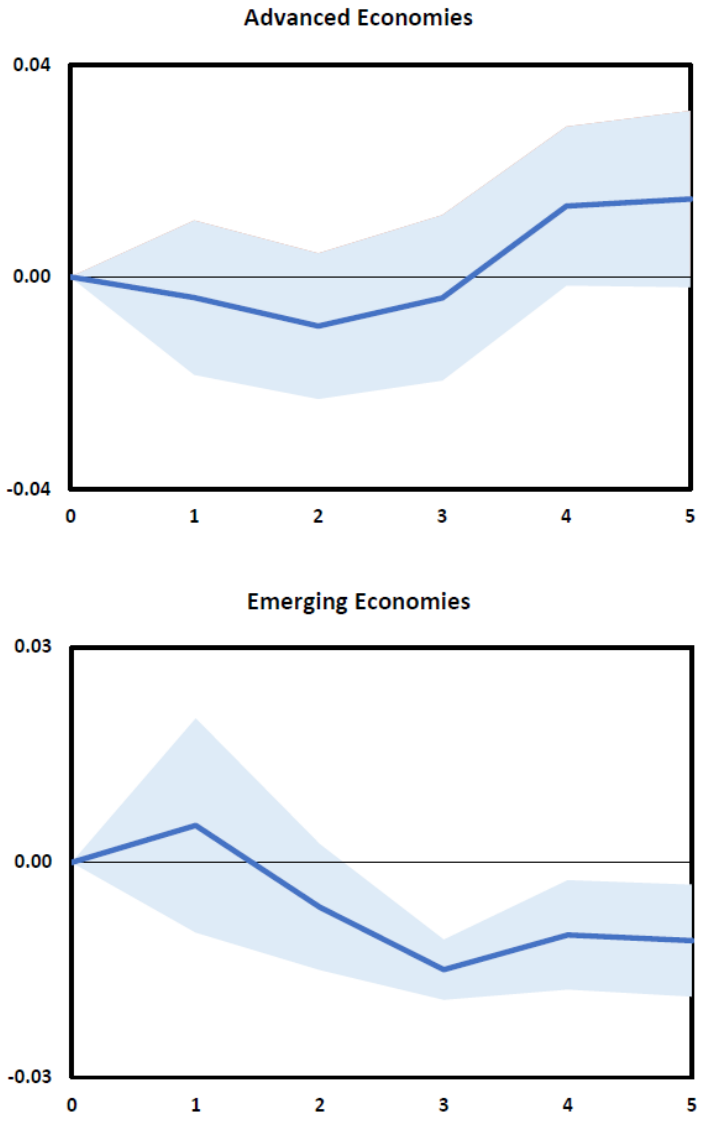
Notes: Capital flows are captured with International Gross Primary Issuance of Bonds, Equites, and Syndicated Loans. Total capital flows are divided into capital flows to the public sector and capital flows to the private sector.

Figure 3.2: International Public Debt (Share of Exports)



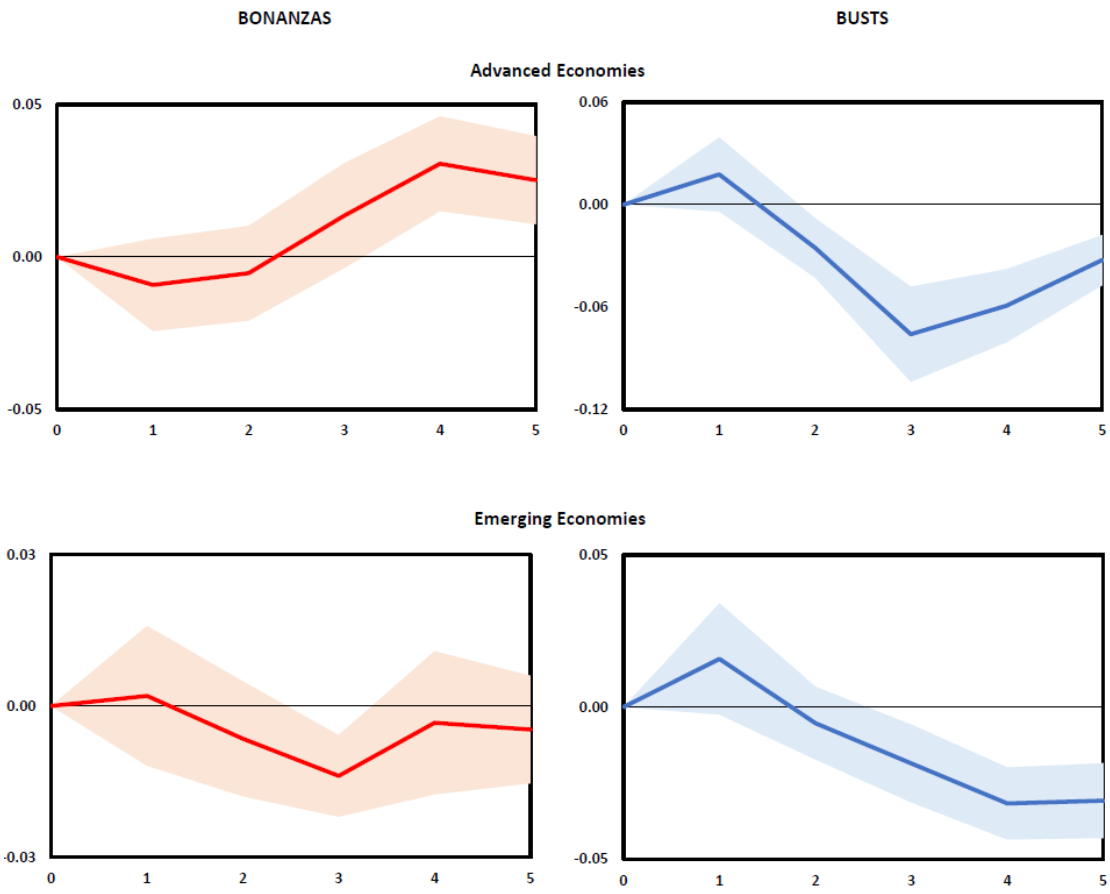
Notes: International Public Debt is estimated with information on maturity and types of repayments of bonds and syndicated loans issued in international capital markets. For those countries with defaults and restructurings, the original repayment characteristics of bonds and loans are modified to reflect the new characteristics of bonds and loans.

Figure 3.3: Crowding in and Crowding Out: Are Advanced and Emerging Economies Different?



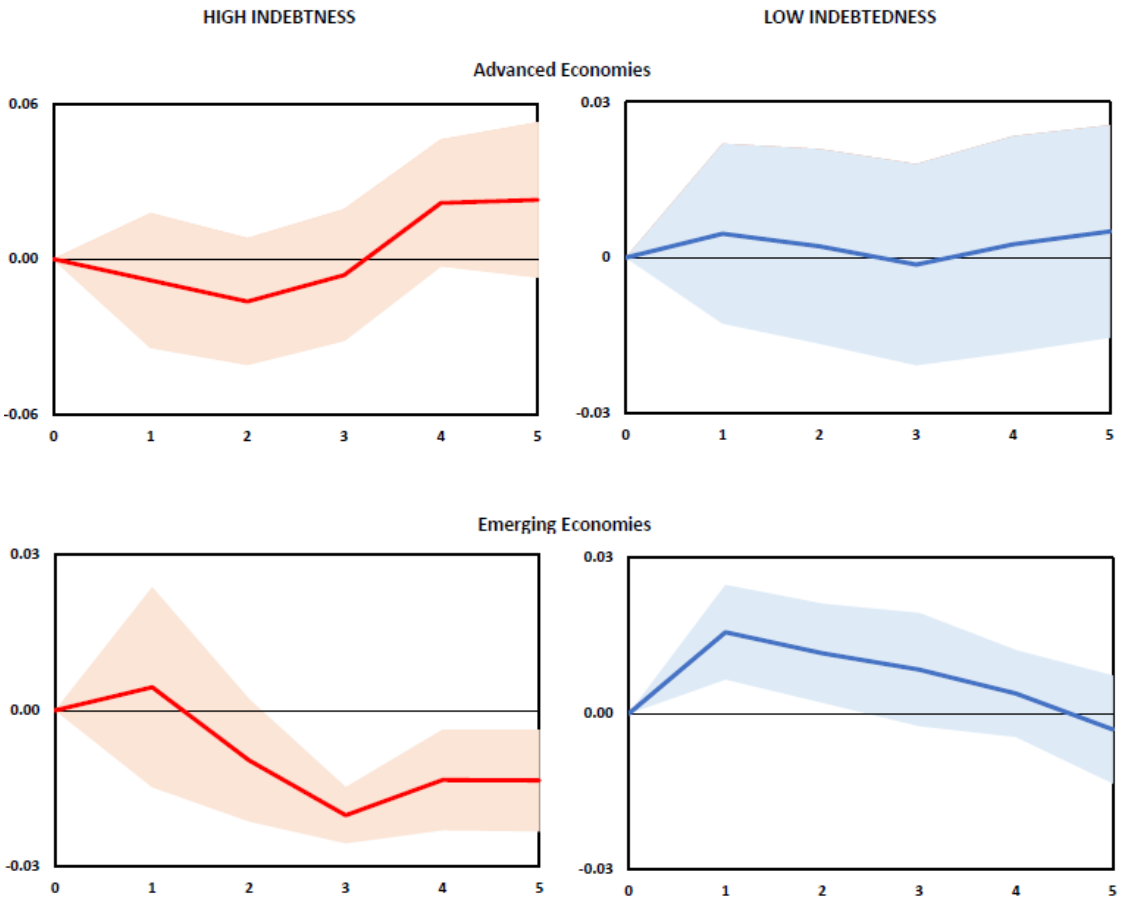
Notes: This Figure shows the response of International Private Issuance to one-standard deviation shock to International Public Issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) for Advanced and Emerging Economies. The shaded region is the 90% confidence interval.

Figure 3.4: Crowding In and Crowding Out in Bonanzas and Busts



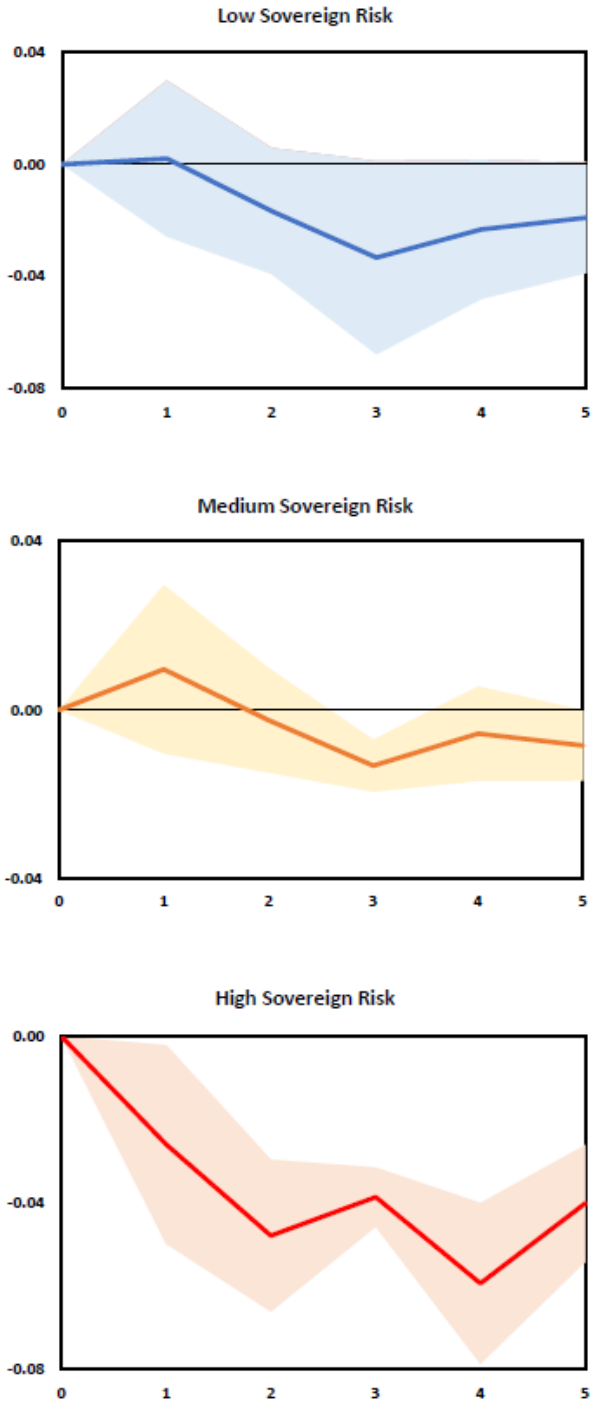
Notes: This Figure shows the response of International Private Issuance to one-standard deviation shock to International Public Issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of global capital flow bonanzas and busts. Episodes of global capital flow bonanzas and busts are identified using the U.S. Broker Dealer Leverage Cycle. The shaded region is the 90% confidence interval.

Figure 3.5: Crowding In and Crowding Out in High and Low International Public Indebtedness



Notes: This Figure shows the response of International Private Issuance to a one-standard deviation shock to International Public Issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of high and low international public indebtedness in advanced and emerging economies. Episodes of high international public indebtedness for advanced economies (emerging economies) are identified as those episodes when international public debt is higher than 90 percent of exports (50 percent of exports). The shaded region is the 90% confidence interval.

Figure 3.6: Crowding in and Crowding Out in Emerging Economies in the Episodes of Low, Medium, and High Sovereign Risk



Notes: This Figure shows the response of International Private Issuance to a one-standard deviation shock to International Public Issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of Low, Medium, and High Sovereign Risk. High, Medium, and Low Sovereign Risk Episodes are respectively identified as episodes with Country Ratings below 25, between 25 and 70, and higher than 70. Country Ratings oscillate between zero and 100. The shaded region is the 90% confidence interval.

3.7 Tables

Table 3.1: Number of Bonds, Equities, and Syndicated Loans Issued

Country	Private			Public	
	Bonds	Equities	Loans	Bonds	Loans
Argentina	361	105	761	325	147
Australia	10010	3086	5545	1258	270
Austria	1880	293	293	1582	68
Brazil	1195	561	2257	354	811
Belgium	2951	393	1052	375	120
Canada	4837	6439	7527	2559	395
Chile	235	197	785	74	169
China	840	4156	2127	917	2215
Colombia	68	63	314	123	148
Denmark	1382	342	633	1085	138
Finland	1090	386	929	1483	164
France	14532	1864	5310	2432	297
Germany	13797	1941	4590	13472	156
Greece	815	350	618	193	217
Indonesia	213	375	1972	120	475
Ireland	3159	297	864	304	181
Italy	4863	997	3855	659	541
Malaysia	184	342	933	137	222
Mexico	590	380	1571	513	680
Netherlands	8948	750	3026	2602	67
New Zealand	421	168	1446	248	274
Norway	1902	985	1857	3549	123
Peru	116	41	298	42	106
Portugal	1140	159	484	326	207
South Korea	906	943	2612	1950	465
Spain	3998	643	4186	1159	834
Sweden	4257	1131	1602	3639	181
Thailand	82	362	1404	77	199
Turkey	281	151	1644	267	537
Uruguay	14	3	49	54	33

Notes: This Table shows the number of bonds, equities, and syndicated loans, included in the construction of international primary issuance and international debt.

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Appendices

Appendix 1.A: Country List and Sample Periods of Capital Flow Data

Advanced Economies	From	To	Emerging Economies	From	To
Australia	2000Q1	2017Q4	Argentina	2000Q1	2017Q4
Austria	2005Q1	2017Q4	Brazil	2000Q1	2017Q4
Belgium	2002Q1	2017Q4	Bulgaria	2000Q1	2017Q4
Canada	2000Q1	2017Q4	Chile	2000Q1	2017Q4
Czech Republic	2000Q1	2017Q4	China	2005Q1	2017Q4
Denmark	2000Q1	2017Q4	Colombia	2000Q1	2017Q4
Spain	2000Q1	2017Q4	Hungary	2000Q1	2017Q4
Finland	2000Q1	2017Q4	India	2000Q1	2017Q4
France	2000Q1	2017Q4	Indonesia	2005Q1	2017Q4
Greece	2000Q1	2017Q4	Mexico	2000Q1	2017Q4
Ireland	2000Q1	2017Q4	Malaysia	2000Q1	2017Q4
Israel	2000Q1	2017Q4	Peru	2000Q1	2017Q4
Italy	2000Q1	2017Q4	Philippines	2000Q1	2017Q4
South Korea	2000Q1	2017Q4	Poland	2000Q1	2017Q4
Netherlands	2000Q1	2017Q4	Russia	2000Q1	2017Q4
Norway	2000Q1	2017Q4	Thailand	2000Q1	2017Q4
New Zealand	2000Q2	2017Q4	Turkey	2000Q1	2017Q4
Portugal	2000Q1	2017Q4	Vietnam	2000Q1	2017Q4
Sweden	2000Q1	2017Q4	South Africa	2000Q1	2017Q4

Notes: These sample countries are classified into Advanced Economies and Emerging Economies based on IMF Country Composition of WEO Groups. Sample periods listed above indicate the start and end date of gross capital flows of this country. For some countries, start dates of the disaggregate capital flows vary.

Appendix 1.B: Capital Flow Data Fixing Records

Capital Flow Series	Changes and Fillings Made
India Portfolio Outflow	Replace 0 and data from Q1 2000 to Q1 2006 with a missing value
Indonesia FDI Outflow	Replace 0 from Q1 2000 to Q4 2003 with a missing value
Indonesia Other Outflow	Replace 0 and data with the missing value from Q1 2000 to Q4 2003
Indonesia Portfolio Outflow	Replace 0 from Q1 2000 to Q4 2003 with a missing value
Mexico FDI Outflow	Replace 0 from Q1 2000 to Q4 2000 with a missing value
Peru FDI Outflow	Replace 0 and data from Q1 2000 to Q4 2006 with a missing value
Portugal FDI Outflow	Replace Q3 2009 with an average of Q2 2009 and Q4 2009
Portugal Portfolio Outflow	Replace Q1 2008 with an average of Q4 2007 and Q2 2008
Sweden Other Outflow	Replace Q2 2000 with an average of Q1 2000 and Q3 2000
Vietnam FDI Outflow	Replace 0 and blanks with the missing value from Q1 2000 to Q3 2005
Vietnam Portfolio Inflow	Replace 0 and blanks with the missing value from Q1 2000 to Q4 2005 Replace Q4 2012 with an average of Q3 2012 and Q1 2013
Vietnam Portfolio Outflow	Drop

Notes: Follow the fixing method in Forbes and Warnock (2012) to deal with the samples' missing observations, zero inputs, and gaps of the capital flow data from IMF Balance of Payments Statistics (BOPS) Database.

Appendix 2: Structural Shocks to International Public Issuance

As we discussed before, fluctuations in public issuance are in general endogenous and react to current and expected economic conditions, making it difficult to identify truly exogenous shocks to public issuance. One possible methodology to address endogeneity is to identify exogenous shocks to public issuance as the difference between observed levels of public issuance and those predicted by a VAR model. We estimate those exogenous shocks using a Structural VAR for each country with two indicators: International Public Issuance (share of exports) and GDP growth rate. In our estimations, GDP growth rate is the exogenous variable (responding immediately to shocks to growth but not to international public issuance) and international public issuance (as a share of exports) is the endogenous variable responding instantaneously to shocks to GDP growth and international public issuance. With this identification, we estimate the structural shocks to International Public Issuance that we use in the local projections.

The local projections in (A1), (A2), (A3), and (A4) respectively substitute the Local Projections shown in (3.1), (3.2), (3.3), and (3.4).

$$PRI^i_{t+h} = \alpha_h + \delta^i_h + \beta_h \cdot \mu^{PUI,i}_t + \theta^{pull}_h(L) \cdot Z^{pull,i}_{t-1} + \theta^{push}_h(L) \cdot Z^{push}_{t-1} + \varepsilon^i_{t,h} \tag{A1}$$

$$\begin{aligned} PRI^i_{t+h} = {} & \alpha_h + \delta^i_h + [\beta^{boom}_h \cdot \mu^{PUI,i}_t] \cdot I^{boom}_t + [\beta^{bust}_h \cdot \mu^{PUI,i}_t] \cdot I^{bust}_t \\ & + \theta^{pull}_h(L) \cdot Z^{pull,i}_{t-1} + \theta^{push}_h(L) \cdot Z^{push}_{t-1} + \varepsilon^i_{t,h} \end{aligned} \tag{A2}$$

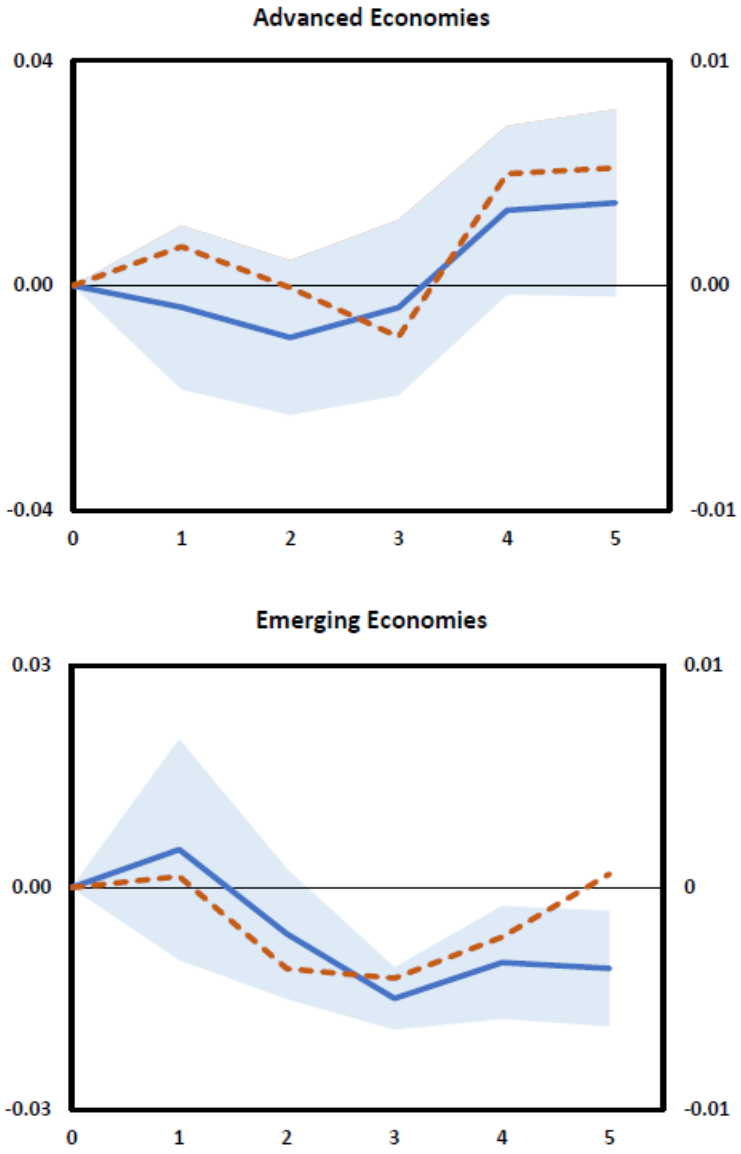
$$\begin{aligned} PRI^i_{t+h} = {} & \alpha_h + \delta^i_h + [\beta^{high}_h \cdot \mu^{PUI,i}_t] \cdot I^{high}_t + [\beta^{low}_h \cdot \mu^{PUI,i}_t] \cdot I^{low}_t \\ & + \theta^{pull}_h(L) \cdot Z^{pull,i}_{t-1} + \theta^{push}_h(L) \cdot Z^{push}_{t-1} + \varepsilon^i_{t,h} \end{aligned} \tag{A3}$$

$$\begin{aligned} PRI^i_{t+h} = {} & \alpha_h + \delta^i_h + [\beta^{high}_h \cdot \mu^{PUI,i}_t] \cdot I^{high}_t + [\beta^{medium}_h \cdot \mu^{PUI,i}_t] \cdot I^{medium}_t \\ & + [\beta^{low}_h \cdot \mu^{PUI,i}_t] \cdot I^{low}_t + \theta^{pull}_h(L) \cdot Z^{pull,i}_{t-1} + \theta^{push}_h(L) \cdot Z^{push}_{t-1} + \varepsilon^i_{t,h} \end{aligned} \tag{A4}$$

where $\mu^{PUI,i}_t$ is the structural shock to International Public Issuance. Figures A2.1, A2.2,

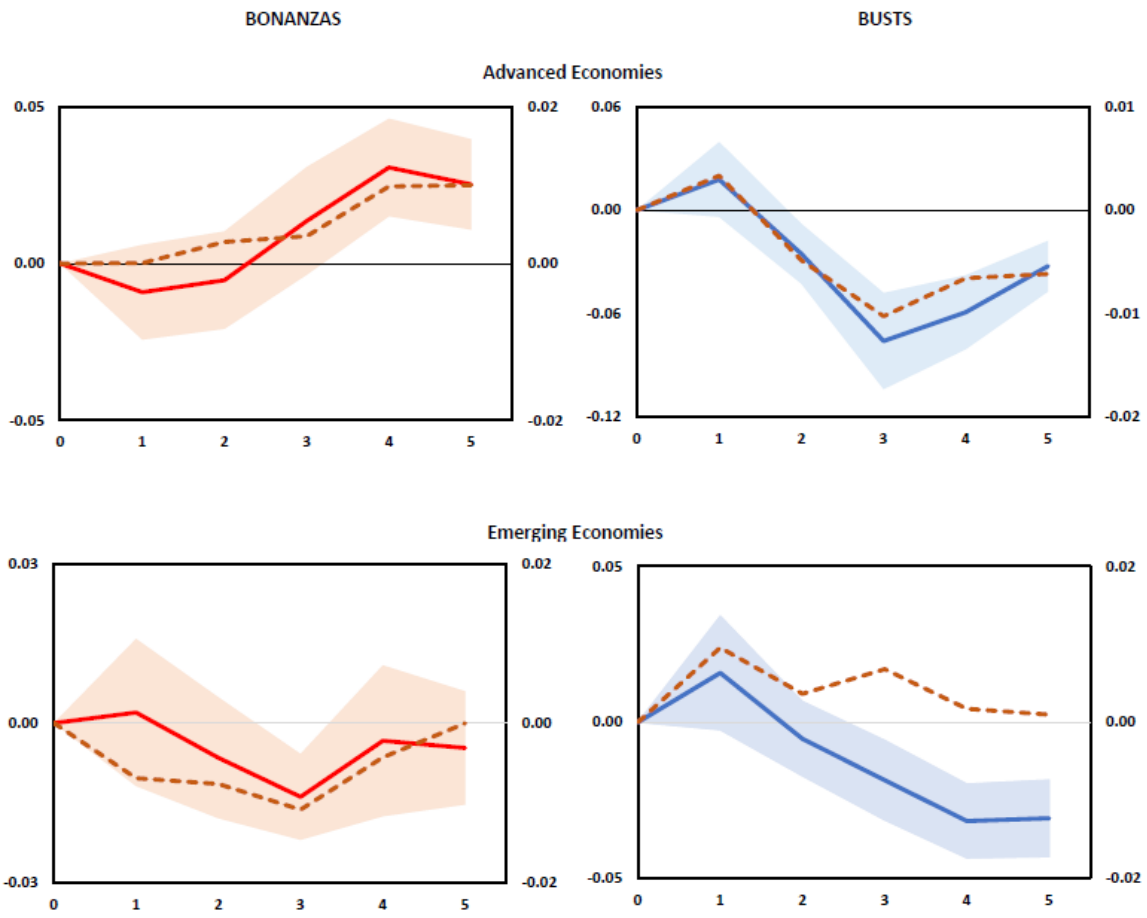
A2.3, and A2.4 compare the local projections estimated in the text to those of the structural shocks to international public issuance. Interestingly, most of the results in the Appendix are not statistically different from those in the main text.

Figure A2.1: Crowding in and Crowding Out: Are Advanced and Emerging Economies Different?



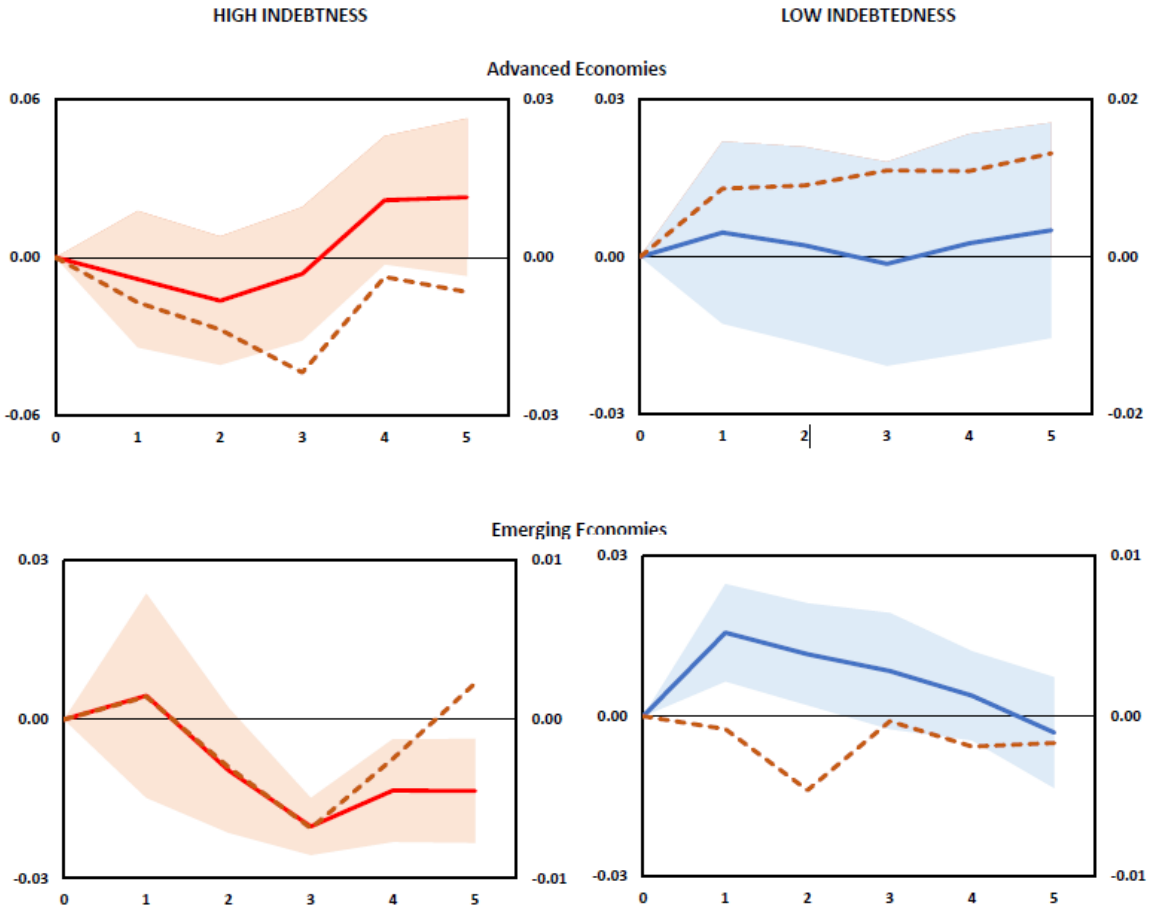
Notes: This Figure compares the response of International Private Issuance to two different shocks to International Public Issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) for Advanced and Emerging Economies. The solid (dotted) line shows the response to the observed (structural) one-standard deviation shock to International Public Issuance. The shaded region is the 90% confidence interval.

Figure A2.2: Crowding In and Crowding Out in Bonanzas and Busts



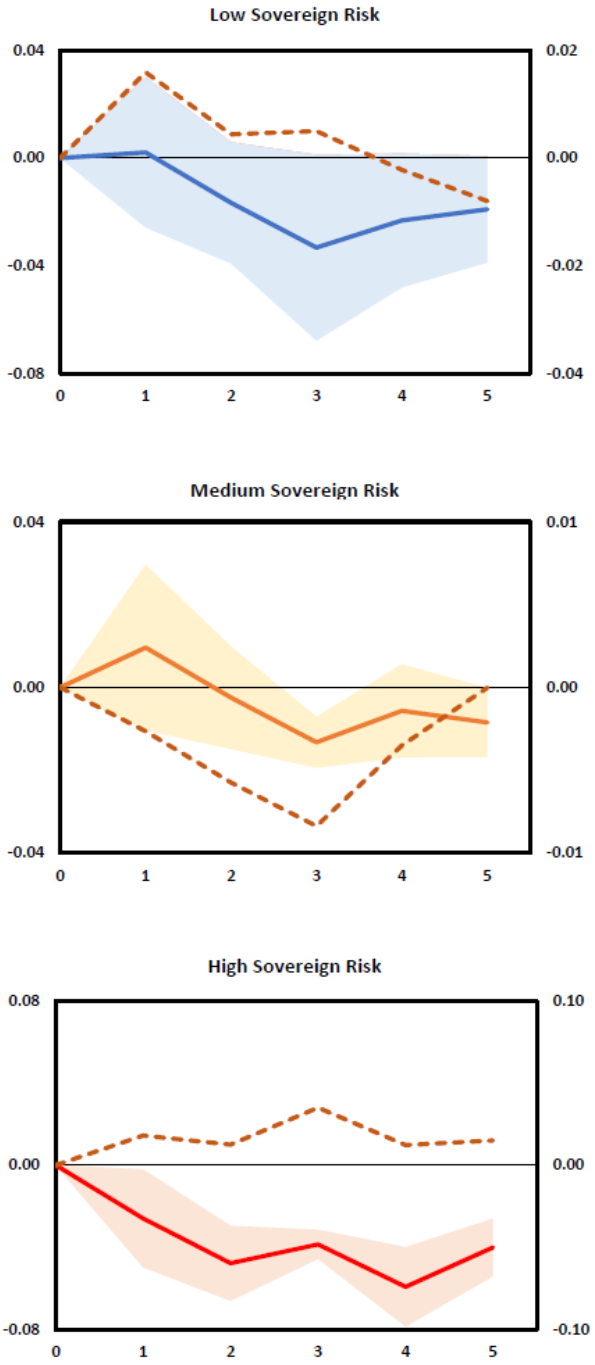
Notes: This Figure compares the response of International Private Issuance to two different shocks to International Public Issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) for Advanced and Emerging Economies during episodes of global capital flow bonanzas and busts. The solid (dotted) line shows the response to the observed (structural) one-standard deviation shock to International Public Issuance. Episodes of global capital flow bonanzas and busts are identified using the U.S. Broker Dealer Leverage Cycle. The shaded region is the 90% confidence interval.

Figure A2.3: Crowding In and Crowding Out in High and Low International Public Indebtedness



Notes: This Figure compares the response of International Private Issuance to two different shocks to International Public Issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of high and low International Public Indebtedness in Advanced and Emerging Economies. The solid (dotted) line shows the response to the observed (structural) one-standard deviation shock to International Public Issuance. Episodes of high international public indebtedness for advanced economies (emerging economies) are identified as those episodes when international public debt is higher than 90 percent of exports (50 percent of exports). The shaded region is the 90% confidence interval.

Figure A2.4: Crowding in and Crowding Out in Emerging Economies in the Episodes of Low, Medium, and High Sovereign Risk



Notes: This Figure shows the response of International Private Issuance to two different shocks to International Public Issuance (at different horizons: 0, 1, 2, 3, 4, 5 (years)) during episodes of Low, Medium, and High Sovereign Risk. The solid (dotted) line shows the response to the observed (structural) one-standard deviation shock to International Public Issuance. High, Medium, and Low Sovereign Risk Episodes are respectively identified as episodes with Country Ratings below 25, between 25 and 70, and higher than 70. Country Ratings oscillate between zero and 100. The shaded region is the 90% confidence interval.