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Dynamic Capital inflow transmission of monetary policy to emerging markets

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Abstract

This paper analyzes the dynamic and size effects of the U.S. monetary policy shock, a proxy for advanced economies' monetary policy shock, as well as domestic monetary and exchange rate shocks on gross foreign direct and portfolio investment inflows to emerging markets. It uses panel and country-specific structural vector auto-regressions to analyze and compare the dynamic, size, and differential impacts of the shocks on each inflow category. Foreign direct investment inflow's response to policy shocks is weak but persistent while that of foreign portfolio investment is strong and on impact. The implication is that macro-prudential and capital control policies may be more effective when they are directed at portfolio inflows. In addition to providing a richer dynamic structure, the use of structural vector auto-regressions provides a clearer comparison of "push" and "pull" factors on financial flows via forecast error variance decomposition. Although the U.S. monetary policy explains a significant variation in both gross inflows, this paper does not find a consistent evidence of "push" over "pull" factors in either capital inflow type or across the countries.

Key Words: Monetary policy, Capital Flow, Emerging Market, Exchange Rate, Interest Rate
JEL classification codes: E52 F32 E43 E58 F37

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1 Introduction

This paper provides an empirical analysis of the effect of the U.S. monetary policy (MP) as well as domestic monetary and exchange rate shocks on the dynamics, size, and composition gross capital inflows to emerging markets (EMs). Increased cross-border gross asset and liability positions in the last two decades have potentially improved risk-sharing of the EMs with the rest of the world (Lane and Milesi-Ferretti, 2007). On the other hand, adverse shocks can be transmitted through financial flows to EMs. However, the dynamic and size effects of policy changes on cross-border capital inflow categories have been less explored. This paper seeks to increase our understanding in this aspect.

Specifically, this paper has a threefold purpose. First, it uses panel and country-specific structural vector auto-regression (SVARs) to show the differential dynamic and size effects of the U.S. conventional MP, a proxy for advanced economies' MP, on gross foreign direct investment (FDI) and foreign portfolio investment (FPI) inflows.[1] Secondly, it analyses the dynamic and size effects of domestic monetary and exchange rate policies on the two categories of inflows. Thirdly, it revisits the domestic pull versus external push factors debate for the two categories of capital inflows. Pull factors are domestic factors that attract a foreign investor to invest in EMs while push factors are factors in the home country of the foreign investor that induces her to invest in the EMs. SVARs allow quantitative comparison of the push and pull factors via forecast error variance decomposition which is not generally available in cross-country panel data regressions.

Recent and previous studies, mainly due to data limitations, used panel data regressions to analyze the effect of policies on capital flows. With few exceptions, they mainly used the total or net capital inflows data to multiple countries. A few examples are Rey (2015), Bruno and Shin (2015) Lim et al. (2014), MacDonald (2015), Ahmed and Zlate (2014), Gourinchas and Rey (2013), Gourinchas and Jeanne (2013), Forbes and Warnock (2012),

[1] Foreign Direct Investment (FDI) is defined as investment involving at least 10% ownership in EMs firms. It reflects investment relationships based on control and influence. On the other hand, Foreign Portfolio Investment (FPI) involves cross-border transactions and positions involving debt or equity securities. The main differences between the two are in ownership (the degree of managerial control), liquidity, and reversibility.

Fratzscher (2012). However, panel data regressions, unlike vector auto-regressions, are unable to provide the dynamics of capital flows and their time series characteristics after shocks to macroeconomic policies.

In this paper, using panel data and country-specific SVARs, I provide a richer dynamic and size effects of policies on the categories of capital inflows to EMs. SVAR estimations also have a readily available tool to compare the push and pull factors. Understanding the categories of gross capital inflows, instead of the total or net flows, is important because the different categories of flows are imperfect substitutes and are different in their nature and purposes. Similarly, understanding the responses of each inflow category in each country is important as there may be heterogeneity across countries. Therefore, I compare and contrast the two categories of inflows to EMs, and examine the differences and similarities in their responses to policy shocks across the EM countries.

The U.S. conventional MP can be used as a proxy for the advanced economies' monetary policy.[2] Particularly, I use the federal fund's shadow rate (ffs) by Wu and Xia (2016) as a monetary policy stance of the U.S. The federal fund's rate (ff) and the U.S. 3-Month T-bill rates were essentially zero from December 16, 2008, to December 15, 2015. Due to this zero lower bound (ZLB) any coefficient estimate of the effect of conventional policy using the ff will be biased as the ff data is censored.[3] The ZLB will also affect the term-structure measure, since a compression in the yield spread may reflect either a genuine change in term structure, or simply the inability of the observed federal fund's rate to go below zero. The ffs is an approximation that makes a nonlinear term-structure model tractable for analysis of an economy operating near the ZLB for interest rates. For the period before the ZLB, both ffs and ff are identical.

Studying the transmission of advanced economies' MP shocks to EMs through capital inflows is paramount. Historically, the effects of advanced economies' MP shocks and their

[2]Detailed reasoning as to why this is the case is provided in Section 2.

[3]Liu et al. (2011) and Kilian (2013) provide reviews and explain the special challenges in the SVAR estimation associated with periods when the interest rate is pressed against the zero lower bound. Fernández-Villaverde et al. (2015) argues for the importance of explicitly considering nonlinearities with a zero lower bound (ZLB) on the nominal interest rate.

capital inflow consequences have been significant.[4] Recently, after the financial crisis of the 2008 and the implementation of unconventional MP in the U.S., the central banks of emerging economies have shown concern regarding the impact of quantitative easing (QE) and its tapering. For example, Rey (2015) contends that MP in the "center country" is an important determinant of capital flows, and greater MP coordination among central banks may be necessary.[5]

I analyze gross FDI and FPI inflows to EMs as they are different in nature and are imperfect substitutes, instead of focusing only on their aggregates or net-flows. In general, studying several disaggregates of financial flow variables is justified by many reasons. First, there are differences in the investors' behavioral decision-making process in investing in categories of inflows and outflows. Secondly, long term and short term investments are determined by different underlying factors. For example, Janus and Riera-Crichton (2013) finds studying net flows ignores that the causes and the effects of outflows from an economy may be distinct from those of inflows. Furthermore, international short-term investments in general and portfolio investments, in particular, are often called "hot money" because they can be reversed quickly. In contrast, foreign direct investments are a more stable flow of capital, which is linked more closely to the permanence of the physical capital and is induced by long-term prospects of the receiving country. Therefore, external or domestic shocks can affect these flows differently.

There are some more fundamental differences between FDI and FPI inflows. FDI is an illiquid investment whose determinants are more linked to microeconomic considerations than the macroeconomic environment. Information asymmetry between managers, owners, and potential buyers characterize FDI more than FPI. The political atmosphere of the host

[4] Alejandro (1983) emphasizes the importance of global monetary policy (MP) during the 1930s and 1940s in Latin-American countries' capital inflows and outflows. Eichengreen (1990) relates the historical trend in capital inflows before 1914 to the operation of the international gold standard. Calvo et al. (1996) documents that in Latin America episodes of capital inflows during the 1920s and 1978-1981 were related to global factors such as cyclical movement in interest rates. According to Adelman (1998) and Calvo (1998) the Mexican balance-of-payments crisis of December 1994, also called the Tequila crisis, was related to activities at "world money centres."

[5] The importance of global monetary policy shocks have been documented in theoretical models such as Aguiar and Gopinath (2007) Mendoza (1991) and which discuss that in economies with a high debt-service ratio, fluctuations in the world interest rate plays a significant role.

country is more critical in FDI decisions than in FPI (Ahlquist, 2006). For example, the standard deviations (St.dev.) of FDI and FPI inflows to eight large EMs provided in Table 1 shows that FPI inflows are more volatile than FDI inflows in all the EMs considered.

Table 1: Quarterly mean and standard deviation FDI and FPI inflows (Source: International Financial Statistics (IFS))

	FDI			FPI			Corr
	Mean	St.dev.	CV	Mean	St. dev	CV	Corr(FDI,FPI)
Brazil	2.632	1.284	0.488	1.064	2.013	1.892	-0.133
India	1.536	0.929	0.605	0.935	1.189	1.272	-0.071
Indonesia	1.084	1.755	1.619	0.937	3.046	3.251	0.431
Mexico	0.714	0.327	0.458	0.391	0.814	2.082	-0.314
Philipp.	1.148	1.178	1.026	1.340	2.458	1.834	0.239
Russia	2.258	1.717	0.760	0.633	3.932	6.212	-0.067
South Africa	0.332	0.638	1.922	0.681	1.03	1.512	-0.283
Thailand	3.100	1.942	0.626	1.281	2.398	1.872	-0.162

Notes: Generally, quarterly mean inflow of FDI is larger than that of FPI while the volatility of FPI is greater than that of FDI. Their correlation coefficient (corr) is generally negative (substitutes). CV denotes the ratio of St.dev. to Mean

I use panel and country-specific structural vector auto-regressions (SVARS) to examine the differential effects of U.S. conventional MP as well as EMs' domestic monetary and exchange rate shocks on the dynamics and size of the categories gross capital inflows to EMs. The panel and country-specific SVARs suggest three main findings. First, in response to tightening of U.S. MP, as the term-structure in the U.S decreases, FPI inflows increase on impact (dynamics) and strongly (size) while FDI's increase is persistent but weak. Secondly, the results indicate that domestic monetary and exchange rate shocks have less impact on FDI while FPI's response to the same shocks are on impact and are larger in size. Thirdly, although the U.S. conventional MP is an important variable in explaining the dynamics of both categories of capital inflows to EMs, I do not find a strong push over pull factor across countries in either type of gross inflow. These results are robust to extensive robustness checks.

The main contributions of this paper are the following. First, unlike previous studies on cross-border capital flows, it applies panel and country-specific SVARs to provide a richer dynamics in identifying the effects of MP shocks on the components of gross capital inflows using a newly constructed dataset. Secondly, it contributes to the debate in "push" and "pull" factors for the categories of capital inflows quantitatively using the forecast error variance decomposition. Thirdly, it uses the inflows data as a ratio of nominal GDP, and alternatively, the capital inflow data as an index to arrive at qualitatively similar results.[6]

The structure of the paper is as follows. Section 2 presents the theoretical framework for identification and estimation. Section 3 discusses the data. Section 4 first presents the estimated results of the U.S. conventional monetary as well as domestic monetary and exchange shocks on the categories of gross capital inflows using SVARs and then discusses the implied forecast-error variance decomposition. Section 5 discusses robustness of the results. Section 6 provides concluding remarks, policy implications and suggestions for future works.

2 Theoretical Framework for Identification and Estimation

Let an SVAR in K variables that contemporaneously affect each other be defined as:

$$B_0 Y_t = B_1 Y_{t-1} + ... + B_p Y_{t-p} + \varepsilon_t \tag{1}$$

where Y_t is a $K \times 1$ vector of endogenous variables and ε_t is a $K \times 1$ vector of error terms, B_i's are a $K \times K$ matrices of parameters for $i = 0, 1, ...p$, $E(\varepsilon_t) = 0$, and $E(\varepsilon_t \varepsilon_t^{'}) = \Sigma_\varepsilon$. ε_t is assumed to be uncorrelated orthogonal structural shocks. Deterministic regressors have been suppressed for notational convenience. The coefficients in B_i's cannot be directly estimated. However, we can recover them from the estimation of reduced form VARs of the variables whose error terms are denoted as vector e_t in Equation 2.

$$Y_t = A_1 Y_{t-1} + ... + A_p Y_{t-p} + e_t \tag{2}$$

[6]Using both data series and checking the consistency helps to avoid a spurious increase in the inflows ratio during recessions as GDP decreases. The analysis using the index data is reported as a robustness check in the appendix.

where $A_1 = B_0^{-1}B_1$, ... $A_p = B_0^{-1}B_p$, $e_t = B_0^{-1}\varepsilon_t$. Then the contemporaneous matrix B_0 is identified and recovered from the variance-covariance matrix of the reduced form estimation by imposing recursive restrictions based on economic theories.

The variables used in the estimations below are the U.S. federal funds shadow rate (ffs_t), the logarithm of the domestic industrial production index (y_t), the logarithm of the domestic consumer price index (p_t), the domestic short-term interest rate (r_t), the logarithm of the nominal exchange rate (in domestic currency per the U.S. dollar, (e_t)), and the capital inflow variable as a ratio of GDP. Alternatively, I will also estimate the SVAR by replacing ffs_t by the term structure. The term-structure ($term_t$) is the U.S. 10-Year T-Bill minus the ffs_t.

The ordering of the benchmark recursive structure is a vector Y_t where the order of the variables is given as

$$Y_t = ffs_t, y_t, p_t, r_t, e_t, FDI_t, \text{ and } Y_t = ffs_t, FPI_t, y_t, p_t, r_t, e_t \tag{3}$$

In the estimations of the system for FDI, denoting the K^2 elements in B_0 by b_{ij}, the relationship in Equations 1 and 2 can be written as:

$$\begin{bmatrix} \varepsilon_{ffs} \\ \varepsilon_y \\ \varepsilon_p \\ \varepsilon_r \\ \varepsilon_e \\ \varepsilon_{FDI} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 & 0 \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & 1 \end{bmatrix} \times \begin{bmatrix} e_{ffs} \\ e_y \\ e_p \\ e_r \\ e_e \\ e_{FDI} \end{bmatrix}$$

For FPI, the order is reorganized as denoted in Equation 3.

I use theoretically plausible identification conditions to order the variables in the benchmark recursive structure. The block recursive SVAR is ordered such that the least endogenous variable (ffs) comes first and the most endogenous (FDI) later in the order. For FPI, as changing the portfolio investment position of the foreign investor is a little more than clicking computer keys away (Calvo et al., 1996), it is ordered as the second variable immediately after ffs.

The first identification condition is the assumption of a small open economy: a small open economy does not have a significant effect on the U.S. MP (ffs), a proxy for advanced economies' MP, while the U.S. MP can affect the macroeconomic variables of the small open economy. Each EM is a small open economy because the U.S. MP influences the macroeconomic conditions of EMs. Therefore, the first variable in the ordering is the U.S. MP, ffs or $term$, and it is the least endogenous.

The second identification condition is the ordering of y, p, r which is suggested by the Taylor Rule: central banks target the output gap and inflation in determining the interest rate. To capture the output gap and inflation, I include a constant and a trend in the estimation. The trend captures the trend in output data to estimate the output gap while the constant contains information about the target inflation rate. The Taylor Rule, using the coefficients in the B_0 above and ffs, is given as:

$$\begin{aligned} r_t &= \kappa_1 + \kappa_2(ffs_t) + b_{42}(p_t - p^*) + b_{43}(y_t - \bar{y}) + e_{rt} \\ r_t &= \kappa_3 + \kappa_4(trend) + \kappa_5(ffs_t) + b_{42}(p_t) + b_{43}(y_t) + e_{rt} \end{aligned} \tag{4}$$

where $\kappa_i's, b_{42}$, and b_{43} are constants, while p^* and $\bar{y}$ are respectively the target inflation rate and potential output, and e_{rt} is the error-term in the respective equation. In addition, the ordering is plausible because there are delays in the impact of MP on the domestic economy. Furthermore, a central bank has at its disposal monthly data on aggregate employment, industrial output, and other indicators of aggregate real economic activity to make interest rate decisions. It also has substantial amounts of information regarding the price level (Christiano et al., 1999). The ordering of p_t after y_t is that contemporaneous feedback from price to output has a delay as changing output levels may take more time relative to changing prices. The fourth row is, therefore, a world interest rate augmented Taylor Rule equation.

The third identification condition is that the exchange rate (e_t) follows r_t as suggested by the uncovered interest rate parity and empirical evidence by Eichanbaum and Charles (1995). Uncovered interest parity entails risks and elements of speculation in the determination of exchange rate. The exchange rate is affected by the domestic interest rate. The uncovered interest rate equation is given as:

$$E(\Delta e_t) = F(\Delta r_t) \Longrightarrow E(e_t) = F(r_t) \tag{5}$$

where E denotes the expectation operator and F denotes the functional relationship.

The fourth identification condition follows a narratiive approach in a similar sense to Romer and Romer (2004) identification. The narrative is that the FDI inflow must be the most endogenous variable. FDI inflows are the most endogenous variable because investors take into account the macroeconomic environment of the small open economy in making the investment decision. Though I need the contemporaneous feedback effects only, Brooks et al. (2004) and Bakardzhieva et al. (2010) show that the backward feedback from inflows to the exchange rate is weak. That is, FDI has no significant effect on exchange rates. Also, in studies that focus on monetary transmission through financial variables in the domestic economy caution that the domestic output is affected by the financial variables because the central banks may be indirectly responding to the effects financial variables. However, categories of capital flows influence output at different speeds. Thus, because changing the FPI position can be clicking computer keys away while that is not the case for FDI, I place FPI after ffs. This ordering is a plausible and simpler identification for *cross-border* capital flows.[7]

Given the above theoretically plausible identification conditions, I use other orderings to check robustness of the results. In particular, I present a result from an alternative ordering of ffs, FDI, y, p, r, e and ffs, y, p, r, e, FPI for FDI and FPI, respectively.

The estimated coefficients of the SVARs with possibly non-stationary variables are consistent, and the asymptotic distribution of individual estimated parameters is the standard normal distribution (See Sims et al. (1990)).[8] Phillips (1998) indicates that the results from such an estimation are consistent estimators of the true impulse responses. In addition, I get around the potential limitation in data points by estimating the panel as well as country-specific SVARs with degrees of freedom adjusted coefficients. Phillips and Spencer (2011) finds that for small samples, as shown in the estimations, degrees of freedom adjustment will eliminate bias and the bootstrap confidence intervals exhibit improved coverage accuracy. In

[7]To deal with such problems, Gertler and Karadi (2015) use high-frequency identification (HFI) to investigate *domestic* MP transmissions. However, in an international capital flow set up, I assume a sufficient lag after a shock to monetary policy that endogeneity of FDI may not be an issue because such investments take the time to plan and implement. Furthermore, the effect of capital inflow on domestic output is sluggish.

[8]See also Hamilton (1994) page 557 for further discussion.

the estimated models, Schwarz Bayesian Information Criteria is used to select the maximum lags to be included in the model.

3 Data

I analyze the two major gross capital inflows: gross FDI and FPI inflows to EMs using quarterly time-series data from 1990 to 2014, data permitting.[9] I analyze quarterly data on gross FDI and FPI inflows to eight EMs: Brazil, Russia, India, South Africa, Indonesia, Mexico, the Philippines, and Thailand. Country choice and the length of data was made based on the availability of data. The data for Brazil, Russia, India, and South Africa span 1995Q1-2013Q4, 1995Q1-2014Q2, 1996Q4-2014Q1 and 1990Q1-2014Q2, respectively.[10] The data for Indonesia, Mexico, Philippines and Thailand span 1993Q1-2014Q2, 1995Q1-2014Q2, 1990Q1-2014Q2 and 1993Q1-2014Q1, respectively.

The primary source of the data is the analytic presentation of the IMF's Balance of Payments Statistics Yearbooks (BOP) and International Financial Statistics (IFS) complemented with the countries' central bank statistics. The presentation of the capital flow data (in U.S. dollars) for the time series up to 2004Q4 is from BPM5 while the data after 2005Q1 is from BPM6.[11] The data is complemented and cross checked with reports of the central banks of each country as well as the data from Federal Reserve Bank of St. Louis. Each of the financial flow variables is used as a ratio to nominal GDP (NGDP) in the same quarter,

[9] Foreign direct investment is a category of cross-border investment associated with a resident in one economy having control or a significant degree of influence on the management of a company that is resident in another economy. Portfolio investment involves cross-border transactions and positions involving debt or equity securities. Thus, the main differences between the two are in ownership (the degree of managerial control), liquidity, and reversibility. The IMF and the World Bank define FDI as "investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments")

[10] Seven of these countries, except the Phillippines, account for more than 80% of the inflows receipt. The Philippines was included because its data was available. China's data was not available, and it may be difficult to assume China is a small open economy.

[11] Until 2004Q4, gross direct and portfolio investment inflows (FDI and FPI) were recorded as a liability (negative number to show the increase in debt of the recipient country) account in the BOP statistics, (BPM5). The data after 2005Q1 is recorded as a positive number. So I changed the sign of the data earlier than 2005Q1 to be consistent while checking for accuracy. Therefore, the liability account dynamics could be due to changes in the real flows or changes in the asset prices and exchange rates.

a commonly used measure. The financial flows and NGDP are in the U.S. dollars.[12]

I use seasonally adjusted FDI and FPI inflows to NGDP ratios, alternatively, their respective indices calculated from the ratio of each inflow to its 2005Q1 value for robustness, and the logarithms of y, p, and e. At the beginning of the project, I used both the nominal and real effective exchange rates, and they did not change the result because of a close to unity correlation coefficient of the nominal, real, and real-effective exchange rates. Here, the nominal exchange rates are used for the analysis. The 3-Month T-bill rate or the respective country's central bank's short-rate of is the measure of domestic monetary policy. I use domestic consumer price index (p) as a measure of the domestic price level. The industrial production index is our measure of output (y) for Brazil, India, Mexico and Russia. For Indonesia, I use the manufacturing production index and the real GDP indices for Philippines, South Africa, and Thailand. All the time-series variables except the interest rates are seasonally adjusted. I use the ffs by Wu and Xia (2016) for the U.S. monetary policy as indicated in the Introduction section of this paper.

Monetary Policy (MP) shocks that originate from the U.S. can be used as a proxy for the global MP condition or the advanced economies monetary policy environment. Using the U.S. MP shock, specifically a shock to the U.S. federal funds shadow rate (ffs) and the difference between the 10-Year T-Bill and ffs (term-structure), can be a proxy for the advanced economies' monetary policy stance. A related literature discusses the justification for taking the U.S. MP as a proxy for global MP. For example, Gourinchas and Rey (2013)'s reasoning is that: first, the U.S. is the largest economy in the world and after the Second World War the U.S. has been a global liquidity provider. Secondly, as the center country, the U.S. issues the currency used in most international exchanges whether in goods markets or financial markets. Finally, the role of the center country is not only as a liquidity provider but also a global insurer. Therefore, the U.S. is usually considered as a source of global MP or macroeconomic shock. Also, the U.S. dollar is the most liquid international means of exchange and the currency denomination of U.S. Treasuries, which are held as a reserve

[12]For further details of the method of recording and differences between BPM5 and BPM6, please see: `http://www.imf.org/external/pubs/ft/bop/2014/pdf/GuideFinal.pdf` especially, see Box 10.5 of the financial account recording for the consistent use of the exchange rate

asset across the globe.

The other reason why the U.S. MP can be a proxy for the global MP is that the interest rates of other advanced economies follow similar trends (are co-integrated and fractionally co-integrated) to that of the U.S.. Papanyan (2010) empirically verifies that the U.S. is not affected by the country-specific permanent shocks of Europe or Japan, which further supports the assumption that U.S. is not a small open economy. Therefore, other advanced economies are also affected by an exogenous shock that arises from the U.S.

Table 2: Correlation coefficients of advanced economies interest rates

	U.K. rate	Euribor	U.S. 3M	U.S. ff	US 10Y
U.K. rate	1.0	0.87	0.88	0.89	0.88
Euribor		1.0	0.76	0.79	0.76
U.S. 3-Month T-Bill			1.0	1.0	0.87
U.S. ff				1.0	0.86
U.S. 10-Year T-Bill					1.0

Notes: Using the observations 1997:1–2013:4, Table 2 presents that the U.K. short-term interest rate, the Euro Area interest rates (Euribor), the U.S. Federal Funds Rate (ff), the U.S. 10-Year T-Bill rate the and 3-Month rate are strongly correlated.

Finally, to justify that the U.S. monetary policy can be used as a proxy for advanced economies monetary policy environment, Table 2 provides the correlation between the interest rates of advanced economies. Furthermore, Gruber and Kamin (2009) find that real long-term interest rates in the U.S. and other industrial countries follow a similar trend. Using panel regressions that include 21 industrial countries, they show that in recent years, U.S. long-term interest rates have neither averaged significantly below those of other industrial countries nor have they declined by a significantly larger extent. Therefore it is compelling to use the U.S. MP as a proxy for advanced economies' MP.[13]

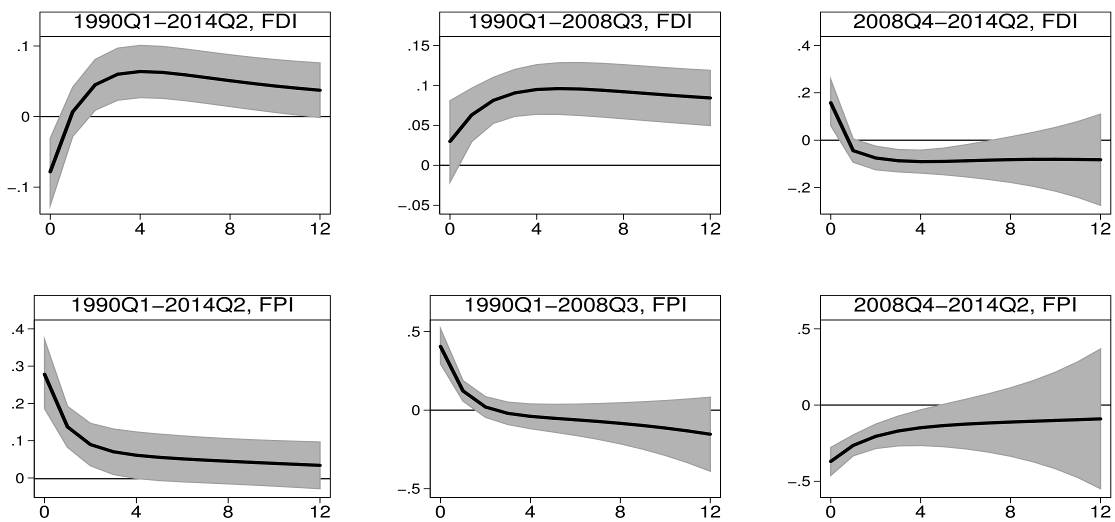
[13]Further evidence on the relationships of advanced economies' MP includes Barassi et al. (2001) that shows that there are structural causal linkages and an irreducible cointegrating relationship between the G-7 long-term interest rates. Barkoulas et al. (1997) show a very slow mean-reverting dynamics (fractional cointegration) in the system of five long-term interest rates of U.S., Canada, Germany, U.K., and Japan. Furthermore, Kiran (2012) presents the result that long-term interest rates are fractionally cointegrated for bivariate subsystems of paired advanced economies as well as for Canada–USA–France–UK. Therefore, by representing global MP shock with the U.S. interest rates, we can study the effect of global MP shocks on capital inflows to EMs. By using the U.S. interest rate as a representative, we are studying the general spill over of global MP shocks, specifically of the large advanced economies, to the EMs through the capital inflows.

4 Results

4.1 Results from panel data structural vector auto-regressions

I first present general results from panel data structural vector auto-regressions. Figure 1 presents FDI (top panel) and FPI (bottom panel) IRFs to unexpected permanent federal funds shadow rate (ffs) shock. The first, second and third columns present IRFs the period 1990Q1 to 2014Q2, 1990Q1 to 2008Q3, and 2008Q4 to 2014Q2, respectively.

Figure 1: FDI and FPI IRFs to ffs shock

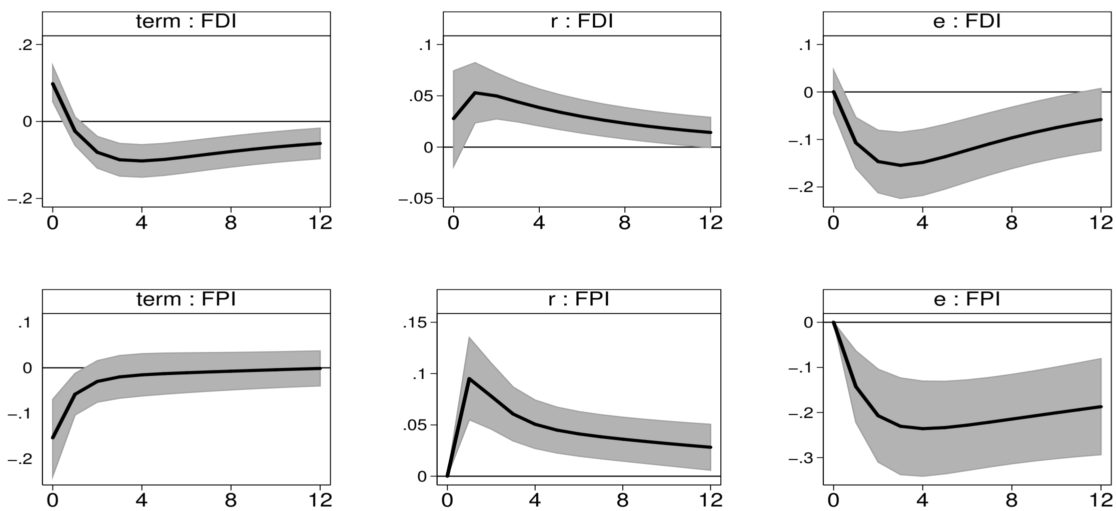


Notes: This figure presents IRFs from panel data structural vector auto-regressions. For the period 2008Q4-2014Q2, Philippines and Russia are dropped in FDI model. For the period 2008Q4-2014Q2, Philippines and Thailand are dropped in FPI model. These countries are dropped because they render the system unstable. The shaded area represents a 68% confidence interval from 1000 monte-carlo simulations.

Three points can be noted from the graphs. First, the dynamics of the response in FDI is a weaker but persistent relative to that of FPI's which is stronger and on impact. Unlike FDI, FPI responds on impact and subsides in the first four quarters. Secondly, considering the sizes of the IRFs as a ratio of NGDP, FDI responses are weak relative to that of FPI. Thirdly, we observe some differences in the IRFs for the pre- and post the great recessions.

The first two points will generally continue to hold in the country-specific analyses. However, because of degrees of freedom loss (few data points to analyze), the third point is difficult to show for each country.

Figure 2: FPI IRFs to term-structure (term), domestic short-term interest rate (r), and exchange rate (e) shocks



Notes: This figure presents IRFs from panel data structural VAR for the period 1990Q1-2014Q2 estimated with one lag. The impulse responses to term structure shock are calculated from the estimations of $term, y, p, r, e, FDI$ and $term, FPI, y, p, r, e$ for FDI and FPI respectively. The impulse responses to r and e shocks are calculated from the estimation ffs, y, p, r, e, FDI, and ffs, FPI, y, p, r, e for FDI and FPI respectively. The shaded regions represent one standard deviation confidence band from 1000 Monte-Carlo simulations.

In Figure 2, the U.S. monetary policy (MP) stance, a proxy for advanced economies MP, is the difference between long-term and short-term interest rate. Therefore, the term-structure ($term$), which equals the 10-Year U.S. T-Bill rate minus the federal fund's shadow rate (ffs) is the relevant MP. Contractionary MP shock is defined as a direct increase in the ffs, which decreases $term$ in the U.S. and/or a direct increase in the long-term interest such as the increase in the 10-Year U.S. T-Bill rate. Term-structure ($term$), the difference between the 10-Year U.S. T-Bill rate and the federal fund's shadow rate (ffs), is typically used to understand investors expectation about how the interest rate unfolds (Campbell, 1996).

Unexpected permanent positive shock to the U.S. short-term interest rate (ffs) increases cost of borrowing and decreases the margin between long-term and short-term interest rate ($term$) in the U.S. making an investment in the emerging markets attractive (Figure 1). In other words, as the long-term interest rate in the U.S. (U.S. 10-Year T-Bill) increases, the term-structure in the U.S. increases and capital inflows to the emerging markets decreases (Figure 2). In addition, an increase in the U.S. short-term interest rate (ffs) typically takes place when the U.S. economy booms which induce optimistic investors' investment in EMEs to increase. Both Figures 1 and 2 show that an unexpected contractionary U.S. conventional MP, which increase the ffs and/or decrease $term$, influence FPI on impact and strongly while the effect is persistent but weak for FDI. In Figure 2 strong response of FPI IRFs to the domestic interest and exchange rate shocks will generally hold when country-specific IRFS are considered.

4.2 Results from country-specific structural vector auto-regressions

4.2.1 The dynamic effects of the U.S. monetary policy shocks on FDI and FPI

I continue to use unexpected permanent shocks to the U.S. federal funds shadow rate (ffs) and the term-structure ($term$) as a proxy for advanced economies monetary policy shocks. Here, I analyze the impulse responses of FDI and FPI following the shocks to ffs and $term$ for each country. I then compare and contrast the two categories of inflows.

Figures 3 and 4 present the impulse response functions (IRFs) to an unexpected increase in ffs. Both figures show that FDI and FPI increase after an unexpected shock to ffs. Therefore a decrease in term-structure ($term$) in the U.S. induces investors to invest in EMEs. Figure 3 shows that FDI inflow increases persistently after two-quarters (except in the Philippines). The most important point of this paper is showing that the response of FDI to the shock is persistent and is weaker relative to that of FPI. The point estimates of Figure 4 shows that FPI also increases on impact in all the countries except Mexico. In contrast to FDI, the response of FPI dies after the strongly increased response in the first two-quarters. As a percent of NGDP, the impulse responses of FPI are stronger relative to that of FDI (sizes on the vertical axes).

Figure 3: FDI IRFs to ffs shock

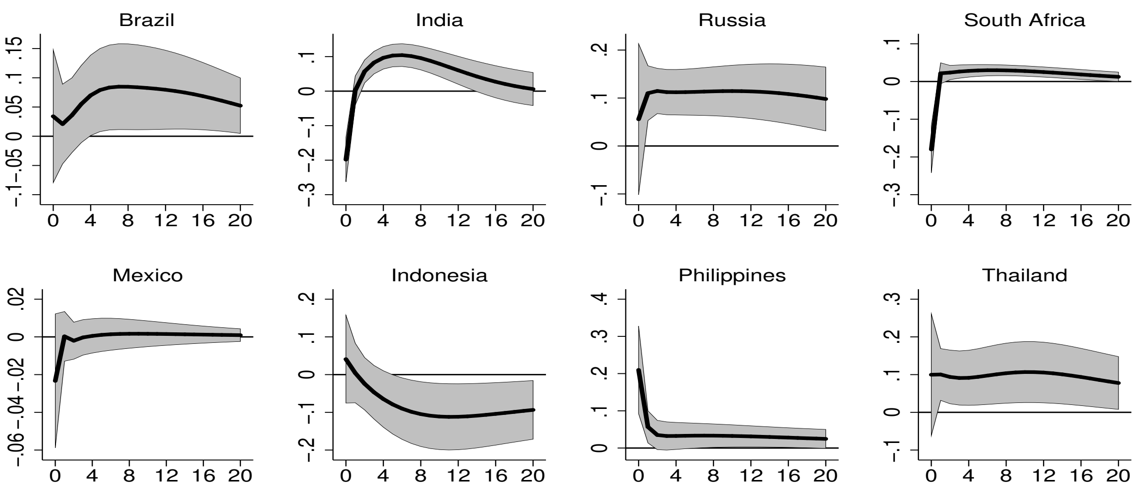
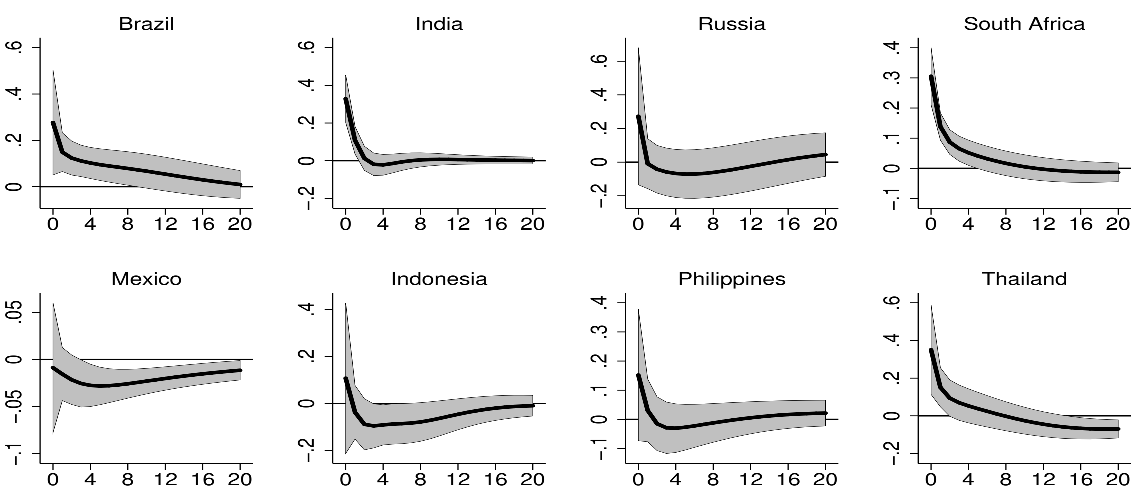


Figure 4: FPI IRFs to ffs shock



Notes: Figures 3 and 4 present the IRFs of FDI and FPI to ffs shock in a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e) respectively. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend.

Although there is heterogeneity in the dynamics and sizes of responses, the impulse responses of FDI and FPI display a clear disparity. The impact of the contractionary monetary policy shock is on impact for FPI while is after two quarters and is persistent for FDI. On average, the point estimate on impact of FPI inflow to an unexpected one percent increase in ffs is an increase of more than 0.15% as a ratio of NGDP (per quarter) in all countries. On the other hand, as a ratio of NGDP, the persistent response of FDI is much less than 0.1%. Therefore, FDI's response to U.S. MP policy shock is weak but persistent while that of FPI's is strong and on impact.

Term-structure ($term$ = U.S. 10-Year T-Bill rate minus ffs): an unexpected permanent positive shock in the term-structure shows a relatively stronger return from investments in the U.S. Figure 5 and 6 show the IRFs of FDI and FPI to the term-structure shock. In response to the term-structure shock, FDI decreases weakly and persisitently while FPI's response is on impact and stronger. FDI's response is almost zero in Mexico while it is surprisingly positive in Indonesia. Figure 6 does not show a consistent negative response of FPI across all the countries in response to the term-structure shock. However, all the responses are on impact.

One can use the term-structure as a predictor of the long-term economic activity in the U.S. Analyzing the responses of capital inflows to EMs following a shock in the term-structure is tantamount to analysing how capital inflow responds to the expectation of economic activity in the U.S. Term-structure is interesting because of its long-term nature similar to that of FDI – that the motive to invest in FDI is driven by the longer-term return instead of the short-term return. Term structure is a good predictor of the future economic activity in the U.S. (Campbell (1996), Estrella and Hardouvelis (1991)). If the term structure is a good predictor of the economic activity in the U.S., then investors should take potential opportunities in EMs if they expect a higher return in the future in those markets relative to that of the U.S. An increase in the term-structure predicts an improvement in the U.S. economic activity, and thus, a decrease in capital inflow to EMs as the investors may as well invest the U.S. This suggests some substitutability of investment in the U.S. and EMs.

Figure 5: FDI IRFs to $term$ shock

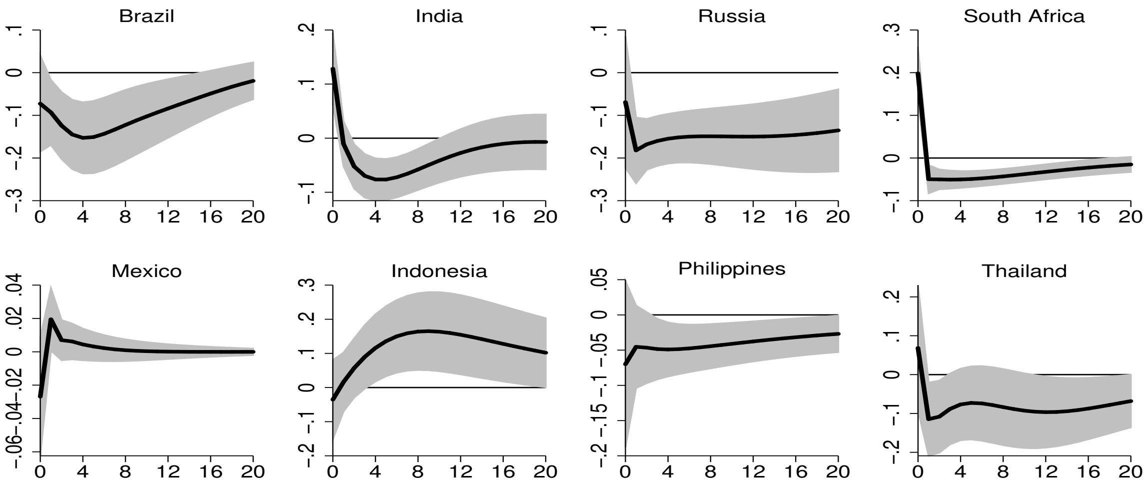
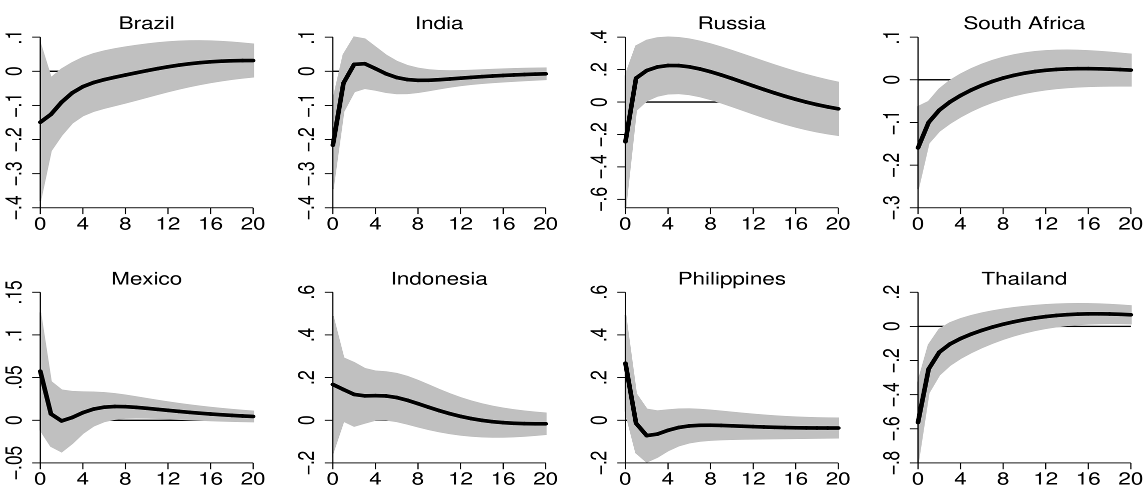


Figure 6: FPI IRFs to $term$ shock



Notes: Figures 5 and 6 present the IRFs of FDI and FPI to $term$ shock for a recursive VAR $(term, y, p, r, e, FDI)$ and $term, FPI, y, p, r, e, FDI)$ respectively. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend.

As a long-term investment, FDI is sensitive to long-term prospects of the U.S. economic activity. Its response is persistent though not as strong as FPI's response. Surprisingly,

FPI's direction of response is positive in Mexico, Indonesia, and Philippines but the response remains to be on impact and stronger.

In summary, in response an unexpected permanent shock to the U.S. short-term interest rate (ffs), as the U.S. term-structure decreases, both FDI and FPI increase. FDI's response is weak but persistent while that of FPI is stronger and on impact. In response to an increase in term-structure, FDI decreases weakly but persistently. FPI's response to unexpected permanent shock is strong and on impact eventhough it is positive in three of the countries. These results are consistent with the panel IRFs presented above.

Eventhough the dynamics of the responses to FDI and FPI have not been explored, some explanations have been provided in the literature about the direction of the responses. For example, Mody and Taylor (2013) argue that an increase in the U.S. interest rate typically signals expansionary phase of the U.S. business cycle. This, in turn, creates an environment in which many investors experience a high degree of exuberance to invest in both the U.S. and EMs. The high demand for investment and the positive signal of the economic condition allows investors to take risk in both the U.S. and cross-border countries. On the other hand, Engel (2014) has pointed that an unexpected increase in the U.S. short-term interest rate leads to an appreciation of the U.S. dollar and thus a depreciation in the EMs currency because of exchange rate and interest rate parity. According to Dornbusch (1976), the monetary contraction in the U.S. leads to a real appreciation of the dollar and the monetary expansion to depreciation. Thus, an unexpected increase in the U.S. short-term interest rate makes the purchase of EMs investment cheaper. Furthermore, Calvo et al. (1996) discusses that a sustained decline in the U.S. interest rate (term-structure) which reached its lowest level in late 1992 since 1960's attracted investors to high investment yields in Latin America and Asia.

4.2.2 The dynamic effects of EMs monetary and exchange rate shocks on FDI and FPI

In this subsection, I compare and contrast the dynamic and size effects of an unexpected, permanent, positve shocks to the EMs' short-term interest rate on FDI and FPI. I then analyze the dynamic and size effects of an unexpected, permanent, positive shocks to the exchange rate on FDI and FPI. The central result is that while FDIs' response to the domestic monetary policy (short-term interest rate) shock and exchange rate shock are weak (smaller in size) and mostly insignificant, FPIs' response are stronger (larger in size) and on impact. Generally, FPI inflow responds positively the monetary policy shock while its response is negative to the exchange rate shock.

Domestic interest rate (r): Figures 7 and 8 display FDI and FPI IRFs, respectively, to an unexpected domestic interest rate shock. The impulse responses of FDI are smaller in size and insignificant in most of the countries while they are positive in India, Indonesia, and Thailand in the span of a year. In contrast, the responses are stronger for FPI. Particularly in Brazil, the Philippines, and Thailand FPI's responses are significantly large and positive. The on impact median impulse responses of FPI are generally positive though not significant in most of the countries while they are negative in Russia and Indonesia. Therefore, FPI inflow generally increase as the domestic interest rate increases while it is not necessarily the case for FDI inflow.

As the domestic short-term interest rate rises, EMs' domestic investors cost of borrowing relative to that of foreign investors increases, which in turn makes it cheaper for foreign investors to invest in EMs assets. However, this relationship is not straightforward. An increased real interest rate (rate of return on investment in EMs) may cause capital inflow slow down because it may signal an increase in expected default rates (Calvo, 1998). In other words, as Stiglitz and Weiss (1981) put it, borrowers offering to pay high rates may signal that they are the least creditworthy.

Figure 7: FDI IRFs to r shock

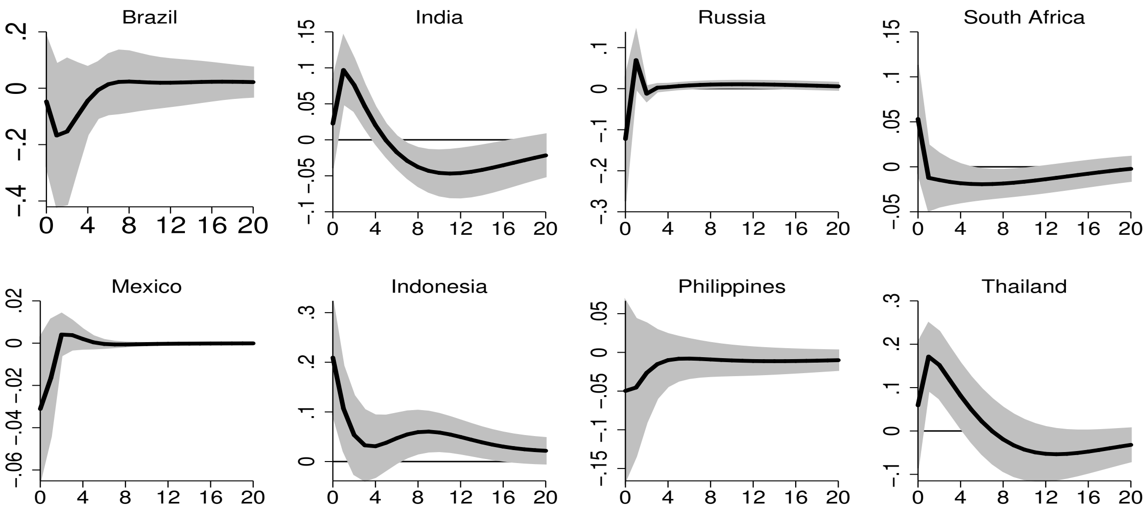
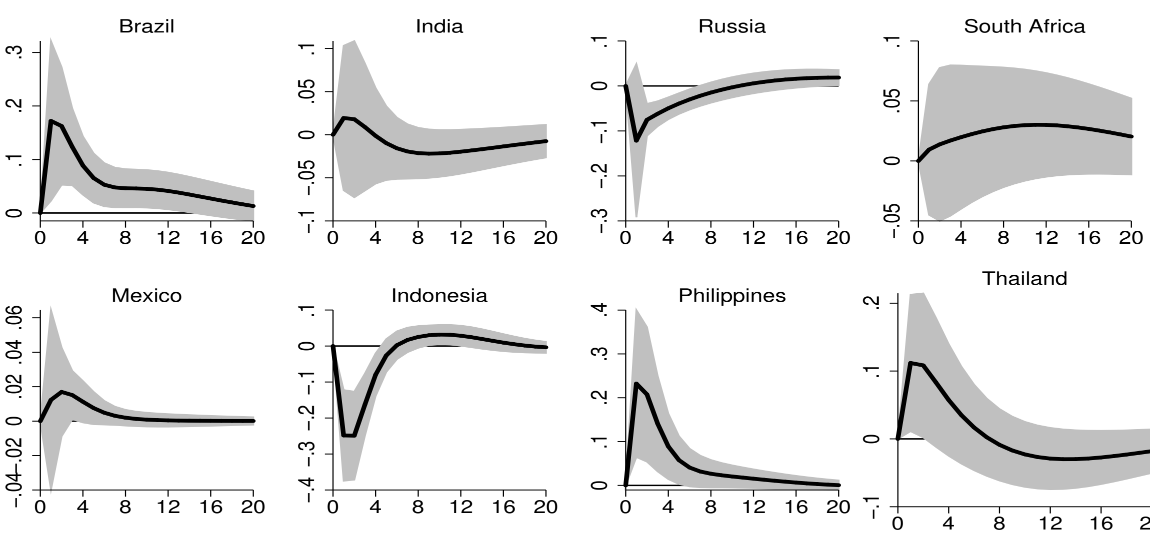


Figure 8: FPI IRFs to r shock



Notes: Figures 7 and 8 present FDI and FPI IRFs to r shock for a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e), respectively. The shaded regions represent the one standard deviation bootstrap confidence bands based on 1000 replications estimated with degrees of freedom adjustment, one lag, time trend.

Exchange rate (e): Figures 9 and 10 display the IRFs of FDI and FPI following unexpected positive shock to the exchange rate, respectively. FDI responses to the exchange rate shocks are mixed. In Brazil, India, Russia, and the Philippines the FDI responses cannot be differentiated from zero. In South Africa, Mexico, and Indonesia FDI decreases after the shock but the size of the response is small. In Thailand, it is positive and large. In contrast, Figure 10 shows that in response to an unexpected exchange rate shock FPI decreases on impact in Brazil, Russia, South Africa, Indonesia and the Philippines. In India and Mexico, the responses are positive on impact while it is close to zero in Thailand. One point stands out: the response of FPI to unexpected exchange rate shock is on impact and the size of the response is larger than that of FDI. The impact returns to zero within few quarters in most of the countries. Thus, the exchange rate is a more important determinant of FPI than it is for FDI at business cycle frequency.[14]

Overall, we see that FDI and FPI respond differently to an exchange rate shock. FPI decreases on impact while the effect on FDI is either insignificant or heterogeneous across countries. Exchange rate, as a macroeconomic shock, does not significantly influence FDI, while it is an important determinant of FPI inflow.

When an EM's portfolio is denominated in the EM's currency, investors are exposed to exchange rate risk or currency risk. Bartram and Dufey (2001) find that in advanced economies with monetary discipline, return on securities (FPI) exhibits positive correlation with the exchange rate. However, consistent with their result and as shown in Figure 10, in developing economies the correlation is negative. That means depreciation in our case, signals a high risk of investing in the portfolio of EMs as a result of which its inflow may decrease.

[14] Brazil adopted floating exchange rate since 1999. Mexico adopted floating exchange rate by the end of 1994. Thailand, India, Indonesia, Mexico, and the Philippines adopted floating exchange rate since July-1997, March-1993, August-1997, March-1998 respectively.

Figure 9: FDI IRFs to e shock

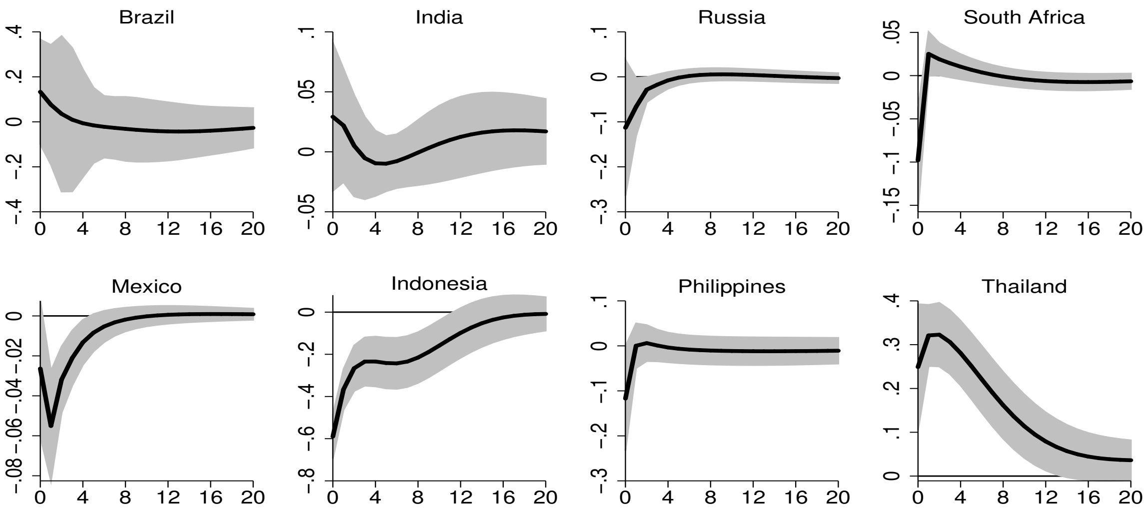
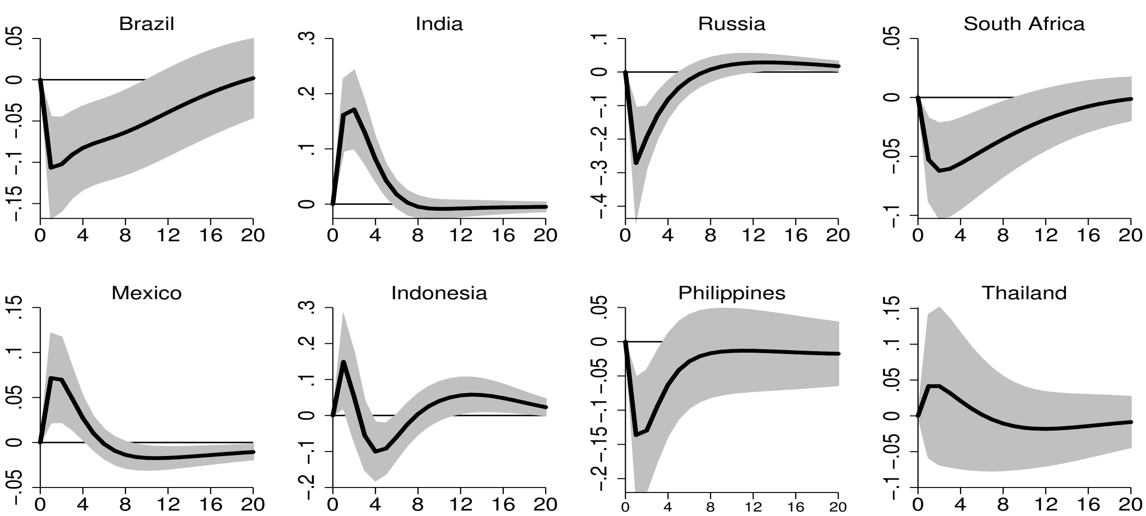


Figure 10: FPI IRFs to e shock



Notes: Figures 7 and 8 present FDI and FPI IRFs to e shock for a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e), respectively. The shaded regions represent the one standard deviation bootstrap confidence bands based on 1000 replications estimated with degrees of freedom adjustment, one lag, time trend.

There is no consensus either in theory or empirical studies about the effect of exchange rate on FDI. One possible reason for the disagreement is that the impact of exchange rate on FDI is different across industries. The effect of an exchange rate shock depends on whether the motive of the FDI inflow is to gain market access in EMs or to reduce production costs. Besides, whether a firm exports its product or imports its factors of production determines the effect of exchange rate on FDI expansion or contraction. In other words, an appreciation may increase profits through cheaper imported inputs or it may reduce profits through lower export receipts (Buch and Kleinert (2008)). Thus, the heterogeneous FDI IRFs across countries for after an unexpected shock to the exchange rate shown in Figure 9 is not surprising.

In summary of this subsection, I find that domestic monetary and exchange rate shocks have less impact on FDI. In contrast, FPI's response to domestic monetary and exchange rate shocks are on impact and are larger in size. Forbes and Warnock (2012) argue that domestic macroeconomic characteristics are less important in determining foreign capital inflows. Considering the dynamics, sizes, and composition of flows, the results of this paper is consistent with their findings in the case FDI but fails to share their conclusion in the case of FPI.

4.2.3 The dynamic effects of EMs' output and price level shocks on FDI and FPI

In this subsection, I analyze the impulse responses of FDI and FPI to domestic output and price shocks. I use domestic industrial production index for output and the EMs' consumer price index for the domestic price. I compare and contrast FDI and FPI IRFs to an unexpected positive shocks to the industrial production and the EMs consumer price indices.

Domestic industrial production index (y): Figures 11 and 12 show the IRFs of FDI and FPI respectively after an unexpected shock to y. In Figure 11, FDI's response to y is mixed. It responds positively in Russia, Indonesia, and Thailand while it is negative in Brazil and south Africa. In India, Mexico, and Philippines, FDI's responses to y shock cannot be differentiated from zero. In contrast, the on impact strong response of FPI to y shock is clear. However, in Figure 12, the direction of the responses are also mixed in the case of FPI.

Figure 11: FDI IRFs to y shock

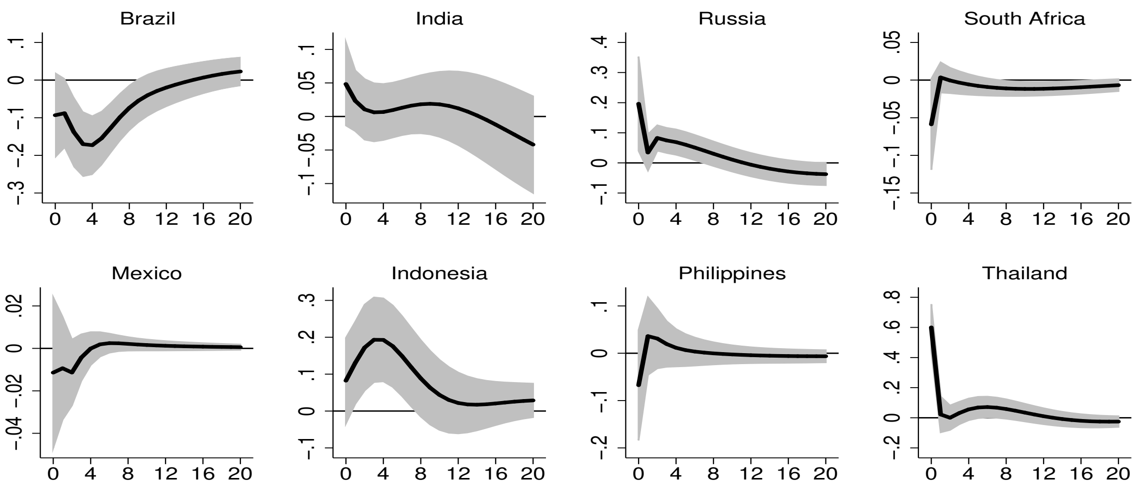
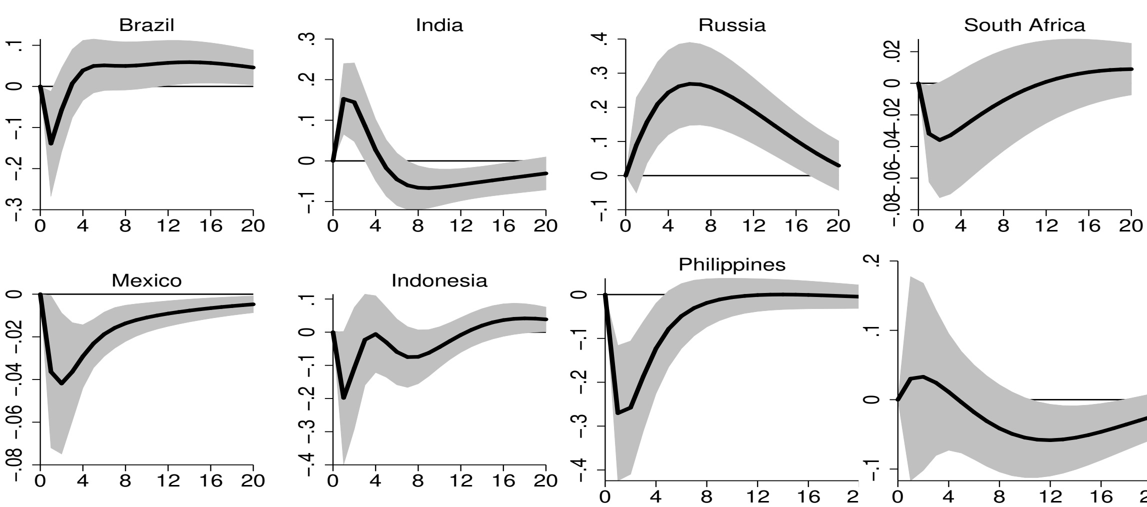


Figure 12: FPI IRFs to y shock



Notes: Figures 11 and 12 present FDI and FPI IRFs to y shock for a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e), respectively. The shaded regions represent the one standard deviation bootstrap confidence bands based on 1000 replications estimated with degrees of freedom adjustment, one lag, time trend.

FPI response is stronger and on impact relative to FDI's. A positive or negative response of capital inflow's in response to an expanding domestic economy has been documented in the literature. From the standard endowment model of the small open economy, because households smooth consumption, saving is procyclical. Therefore, capital inflows – borrowing from abroad, can be countercyclical. However, if the economy borrows during good times, as shown by Calvo et al. (1994) in the case of EMs, capital inflow can be procyclical and thus have a positive correlation with industrial production index. Furthermore, foreign investors respond to improving domestic economies of EMs and thus capital inflow can increase.[15]

Domestic price level (p): Figure 13 and 14 show the responses of FDI and FPI inflows to a positive domestic price shock, respectively. FDI's response to the consumer price index shock cannot be differentiated from zero in Brazil, South Africa, Indonesia and the Philippines. For FPI the responses are negative in India, Russia, Indonesia, and Thailand while they cannot be differentiated zero in Brazil, South Africa, and Mexico. In the Philippines, the responses are positive. In general, FPI's response is relatively stronger and on impact while the direction (sign) of the responses are mixed and weaker for both FDI and FPI. For net portfolio inflows, Fratzscher (2012) finds that the effect of domestic consumer price index was minimal for the short period before the financial crisis.

In summary, results from panel and country-specific SVARs presented is an improvement to the literature in terms of dynamics, size, and composition of gross capital inflows to EMs. The results can be summarizes as: 1) in response to an unexpected positive shock to the U.S. federal fund's shadow rate, as the term-structure in the U.S. decreases, FDI gross inflows to the EMs increases and the increase is persistent while the increase in FPI inflows is relatively stronger and is on impact; 2) domestic monetary and exchange rate shocks have less impact on FDI while FPI's response to domestic monetary and exchange rate shocks are on impact and are larger in size; 3) in response to shocks to the industrial production and the consumer price indices, the directions (signs) of both FDI and FPI inflows are mixed and inconsistent across countries. In the next section, I analyze the dynamic 'pull'

[15] For more explanation see Calvo et al. (1993), Calvo et al. (1994), and Calvo and Végh (1999).

and 'push' debate in capital flows.

Figure 13: FDI IRFs to p shock

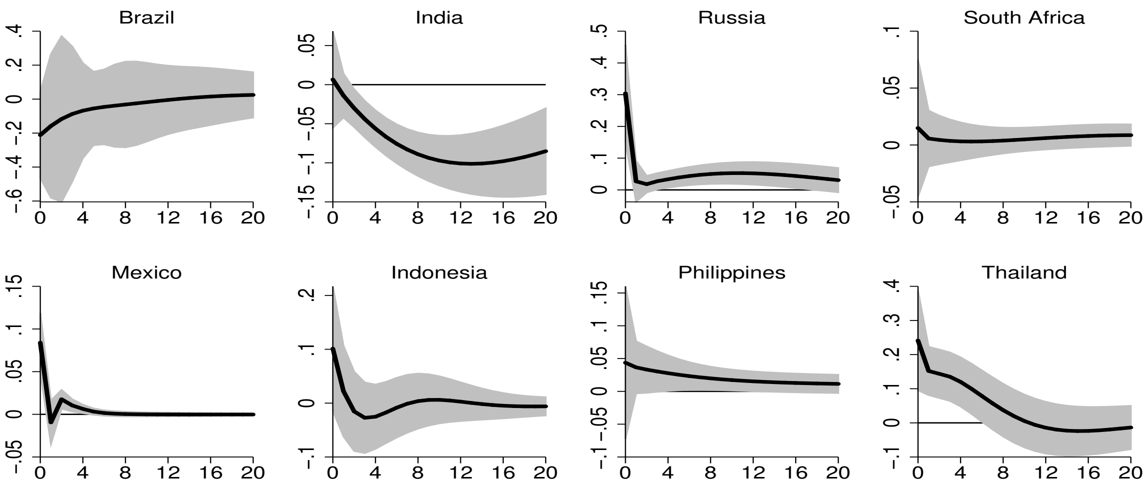
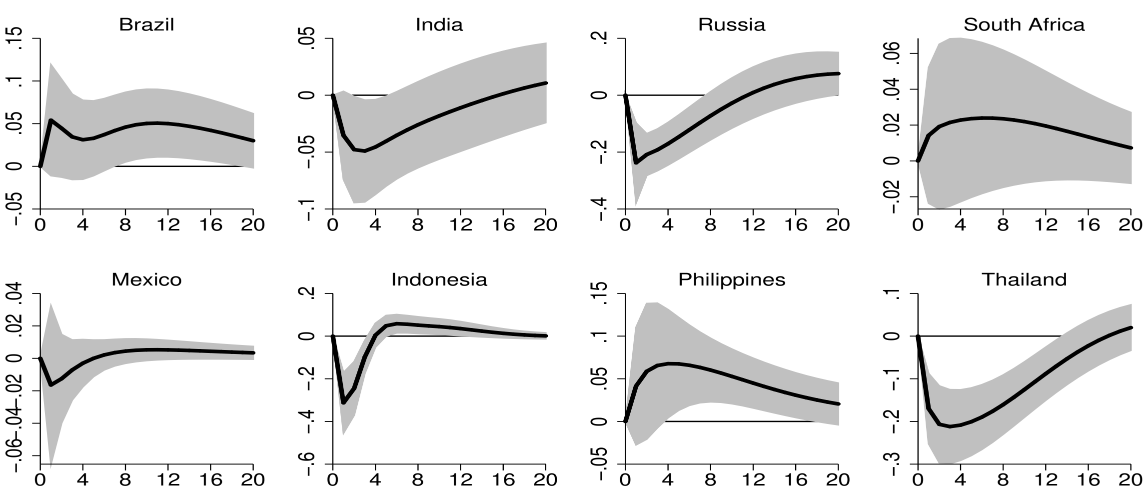


Figure 14: FPI IRFs to p shock



Notes: Figures 13 and 14 present FDI and FPI IRFs to p shock for a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e), respectively. The shaded regions represent the one standard deviation bootstrap confidence bands based on 1000 replications estimated with degrees of freedom adjustment, one lag, time trend.

4.3 The 'pull' and 'push' debate in capital flows

Global factors are push factors that influence capital flows to EMs' while EMs economic environment has a pulling effect on capital flows. Some research emphasizes common global external shocks in explaining capital flows; others underline country-specific macroeconomic policies, institutions, and risk. If the common external shocks explain the dynamics of capital flows, then the implication is that countries cannot shield themselves from these shocks. The opposite argument is that, because capital flows are heterogeneous across countries (for example, lesser inflows in Sub-Saharan Africa), then it is the country-specific factors that explain capital flows to those countries. This debate remains unresolved.

This paper attempts to quantify the dynamics and sizes of contributions of global (push) and domestic (pull) shocks on the composition of inflows to examine the relative importance of each factor for each country. Therefore, I analyze the quantitative contributions of the factors in influencing categories of capital inflows using structural forecast-error variance decomposition (FEVD) after the SVAR estimations. The important implication of using SVAR is that we can quantify and rank the percentage contribution of push versus pull factors to the dynamics and variations in capital flows. Unlike SVARs, this is generally not available for panel data regressions. That is, even though FDI inflow is not strongly responsive to domestic macroeconomic conditions, we can still quantify what percentage of its dynamics can be explained by the push and pull factors.

Figures 15 and 16 show the FEVD for FDI and FPI inflows, respectively. On the vertical axis (y-axis), I denote the percentage contribution of each variable to the variation in each inflow category. On the horizontal axis (x-axis), the 20 quarters after the shock are denoted. Each graph shows the percentage contribution of the variable at the specific quarter. For example, approximately 7% of the variation in FDI in South Africa is explained by the U.S. short-term interest rate (ffs). Domestic industrial production (y) is ranked in the top three of the ranking order in explaining the variation in FDI in Brazil, Russia, and Thailand. Exchange rate (e) explains large variation in FDI in Indonesia and Thailand. Despite the variations across the countries, ffs is not the most important variable across all the countries. It explains the largest share of the variation in FDI inflows in India, Russia, South Africa, and the Philippines.

Figure 15: FEVD of FDI

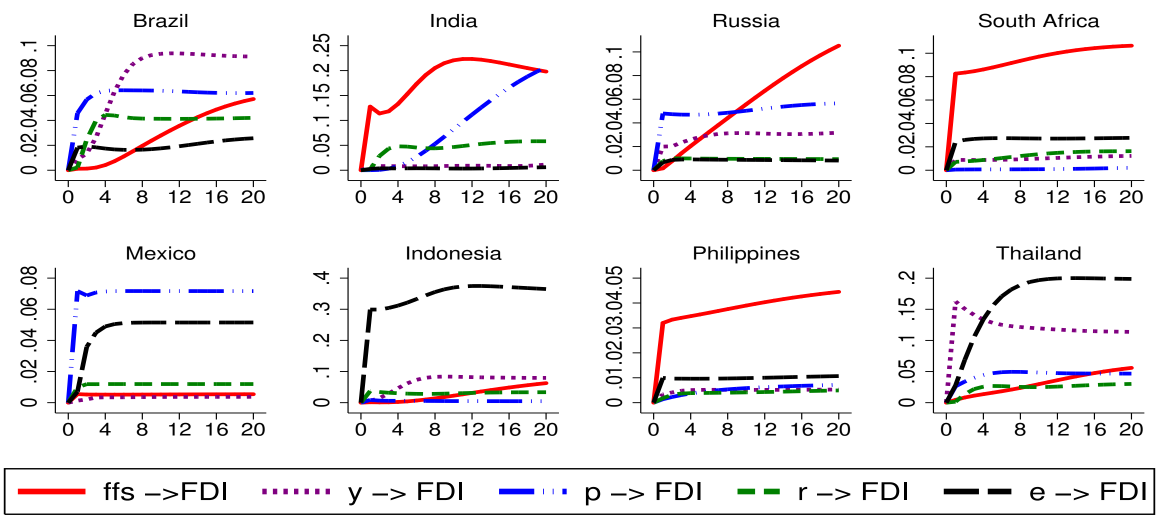
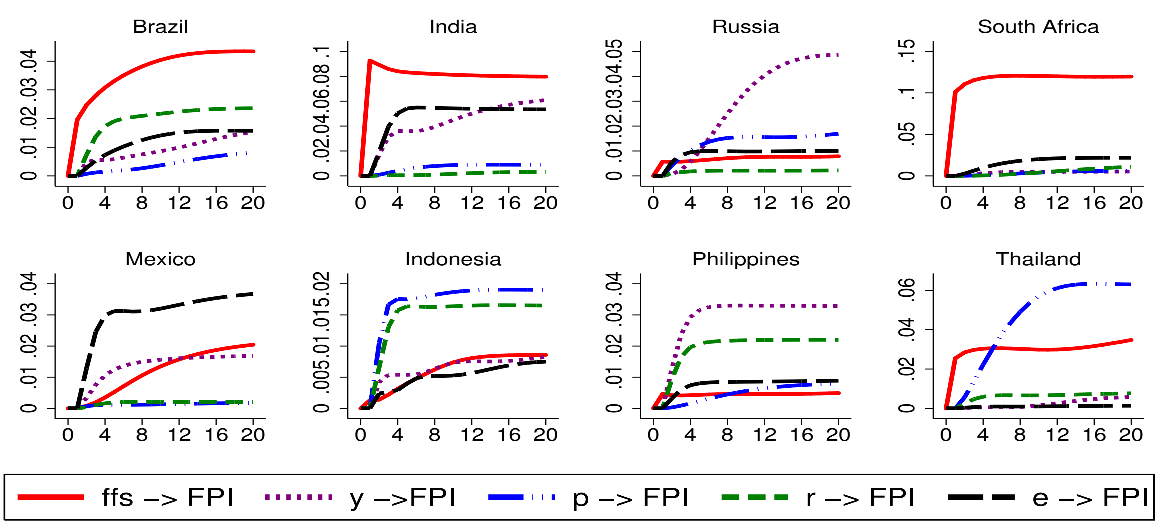


Figure 16: FEVD of FPI



Notes: Figures 13 and 14 present the FEVD of FDI and FPI for recursive SVAR orderedand estimated as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e), respectively. The SVAR is with degrees of freedom adjustment, one lag, time trend.

Figure 16 shows FEVD for FPI inflows. The U.S. short-term interest rate (ffs) explains the largest share of the variations in FPI inflow in Brazil, India, and South Africa while its contribution in the other countries is relatively smaller. The bottom line is that the U.S. short-term interest rate explains a large share of both inflows but it is not the largest explanatory variable of the inflows across the countries.

Fratzscher (2012) and Calvo et al. (1993) argue that global common factors are more important in explaining capital flows to EMs. However, Fratzscher (2012) focuses on net portfolio flows during the recent crisis while Calvo et al. (1993) use change in reserves as a proxy for capital inflows. On the other hand, Chuhan et al. (1998), Fernandez-Arias (1996), and Mody et al. (2001) emphasize the role of domestic factors to be at least as important as external factors in explaining portfolio inflows. Specifically, Mody et al. (2001) forecast net bond and equity flows to EMs and find that pull factors have a heavier weight in determining the net bond and equity flows. However, Chuhan et al. (1998) and Fernandez-Arias (1996) explain only equity and bond flows, which is only a portion of the total portfolio inflows. Baek (2006) finds that common global shocks are more important in Asia while domestic factors explain the dynamics of portfolio inflows in Latin America.

The results above do not suggest ffs to be the most important explanatory variable for the dynamics of gross capital inflows across countries. Instead, domestic variables are also important in explaining the dynamics of the gross inflows in some of the countries. In South Africa ffs seems to be the most important variable explaining both categories of inflows. Therefore, though ffs is important in explaining the dynamics of capital inflows to EMs, the results suggest that the domestic macroeconomic policies explain significant variation in gross capital inflows to EMs.

5 Robustness Analysis

I perform a series of extensive robustness checks of the SVAR model. The robustness checks include: 1) instead of using FDI and FPI as a ratio of NGDP, I used indices of each inflow as an alternative measure of gross inflows (each inflow divided b its 2005Q1 level);

2) various alternate orderings; 3) using only the data up to 2008Q3; and 4) the inclusion of U.S. industrial production index in the model.[16]

First, I used the indices of FDI and FPI using 2005Q1 as a base quarter and checked the results. The results are qualitatively unchanged whether the index of FDI and FPI, instead of using the respective inflow as a ratio of NGDP is used. This is a new robustness checking alternative that this paper introduces.

I examined the sensitivity of the result to various alternative orderings of the variables. A caveat here is that I can not alter the position of U.S. interest rate variables because of the small open economy assumption. Altering the position of U.S. interest rate variables is tantamount to assuming that they are influenced by EMs macroeconomic variables. However, the alternative orderings, leaving the first variable in the order (U.S. interest rate or term-structure) in its position, were used to check whether the results stand that scrutiny. From that exercise, the results presented continue to hold. I have provided an online appendix for the results of a recursive estimation in which I used $(ffs, FDI, y, p, r, e,)$ and $(ffs, y, p, r, e, FPI,)$, for FDI and FPI respectively.

At the beginning of this project, I started including the U.S. industrial production index as the second element in the ordering of the SVAR. However, focusing on the effect of the U.S. MP on capital inflows to the EMs, I dropped the U.S. industrial production. The results are not altered by the inclusion or dropping of the U.S. industrial production index. I followed Bruno and Shin (2015) that also used U.S. industrial production index for robustness check.

In summary, the results in this paper are robust to using indices of FDI and FPI, using data up to 2008Q3, various alternate orderings, and the inclusion of U.S. industrial production index in the model.

[16] To save space, the robustness analyses results using the indices of the inflows and an alternative ordering of the variables in a recursive VAR are provided in the online appendix.

6 Concluding Remarks

This paper examines the dynamic effects of the U.S. conventional monetary policy shocks as well as the domestic monetary and exchange rate shocks on gross categories capital inflows to emerging markets. The U.S. federal fund's shadow rate and the U.S. term-structure are used as a proxy for advanced economies' monetary policy stance. The paper explicitly compares FDI and FPI responses to the U.S. federal fund's shadow rate, emerging markets' interest rates and exchange rates empirically using panel and country-specific structural vector autoregressions. It also quantifies and compares the relative contributions of the "push" versus "pull" factors.

The results show that FDI inflows decrease persistently but weakly in response to unexpected increase in the spread between the U.S. 10-Year and federal funds rate (term-structure) while the response of FPI to the same shock is stronger and on impact. Gross FPI inflows to emerging markets increase on impact as the U.S. federal fund's shadow rate increases or as the term-structure in the U.S. decreases. FPI inflows are strongly responsive to the macroeconomic shocks of emerging markets in the first few quarters after a shock while the response of FDI is weaker. These results are consistent with the arguments in the literature that foreign direct inflow is weakly sensitive to macroeconomic variables. The suggested implication of these results is that macro-prudential and capital control policies of emerging markets are more effective when directed at portfolio inflows. Using forecast-error variance decomposition, the paper compares the contributions of the U.S. monetary policy with domestic macroeconomic shocks to the dynamics of both gross capital inflow types. Although the U.S. monetary policy explains a significant percentage of the variation in each category of gross inflow, the results do not suggest the dominance of the "push" over "pull" factors in either type of inflow or across the emerging market countries.

The conclusions suggest that a unifying theory of capital flow categories that takes into account the business cycle and monetary policies of both advanced economies and emerging markets may be necessary. Particularly, developing theoretical models which capture the differences in the characteristics of FPI and FDI is important.

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Online appendix not for publication

Appendix A: Analyses using the index of FDI and FPI

Figure 17: $FDIN$ IRFs to ffs shock

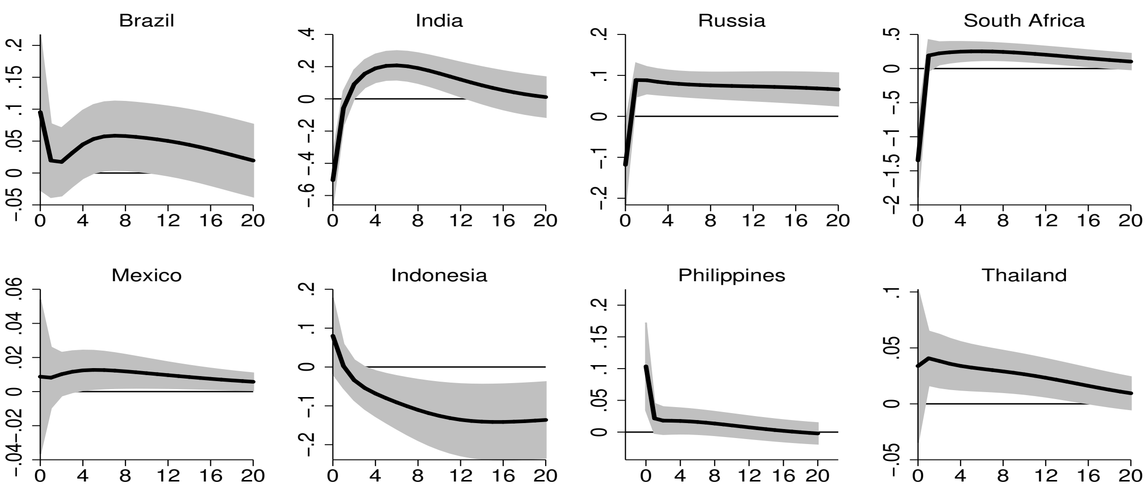
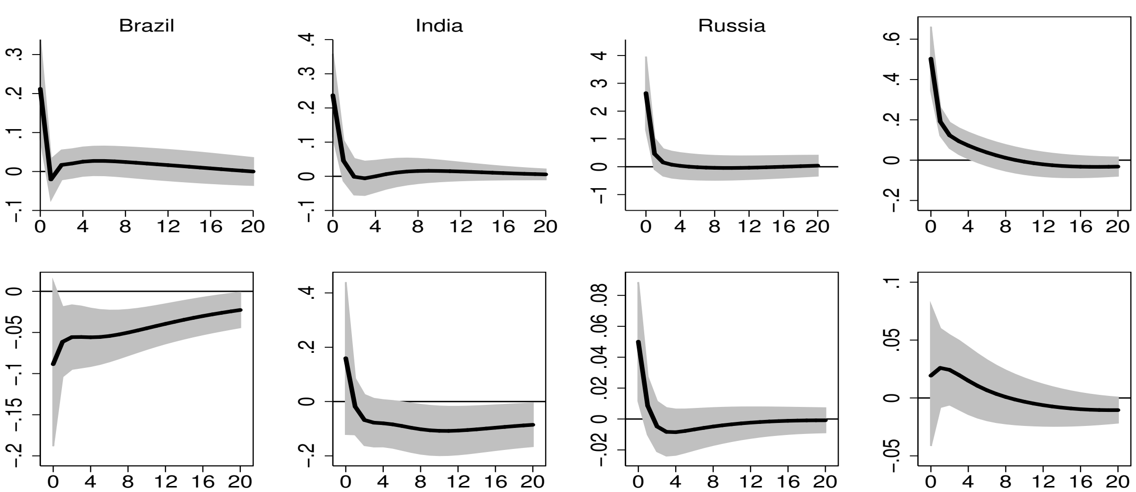


Figure 18: $FPIN$ IRFs to ffs shock



Notes: Figures 17 and 18 present the IRFs of the indices of FDI and FPI ($FDIN$ and $FPIN$) to ffs shock in a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e) respectively. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend. The index data is constructed as a ratio of each inflow to the level in 2005Q1.

Figure 19: $FDIN$ IRFs to r shock

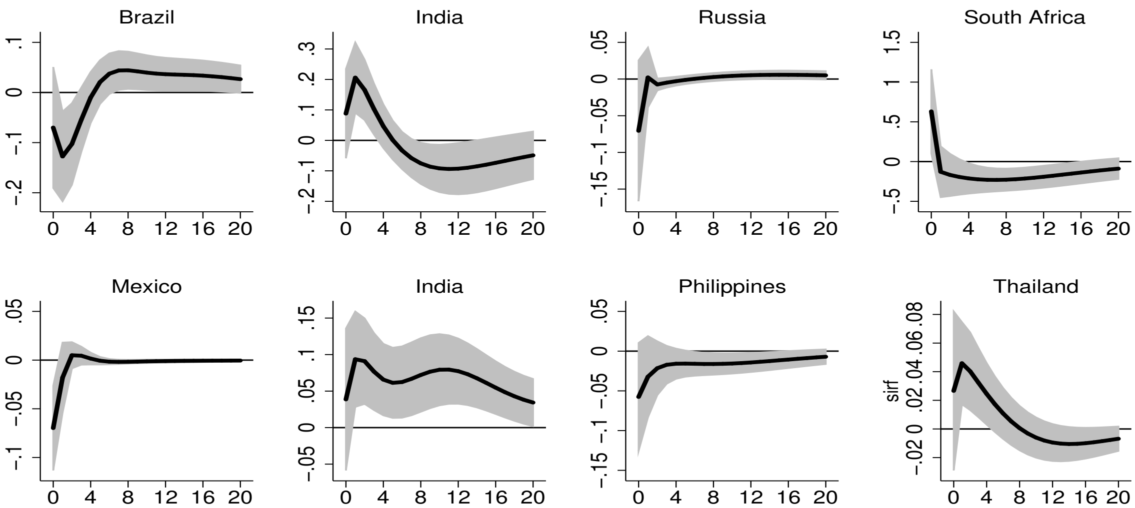
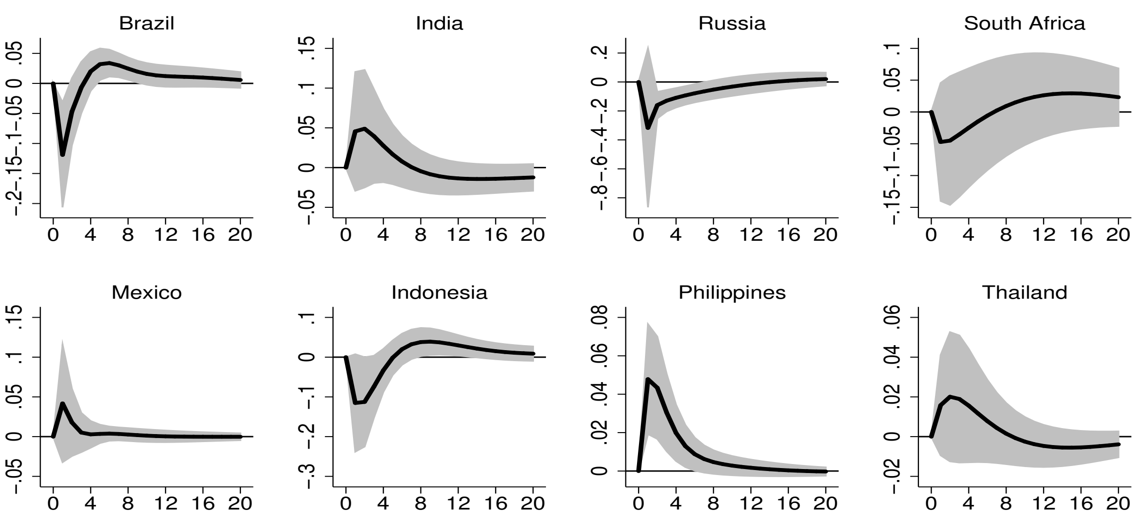


Figure 20: $FPIN$ IRFs to r shock



Notes: Figures 19 and 20 present the IRFs of the indices of FDI and FPI ($FDIN$ and $FPIN$) to r shock in a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e) respectively. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend. The index data is constructed as a ratio of each inflow to the level in 2005Q1.

Figure 21: $FDIN$ IRFs to e shock

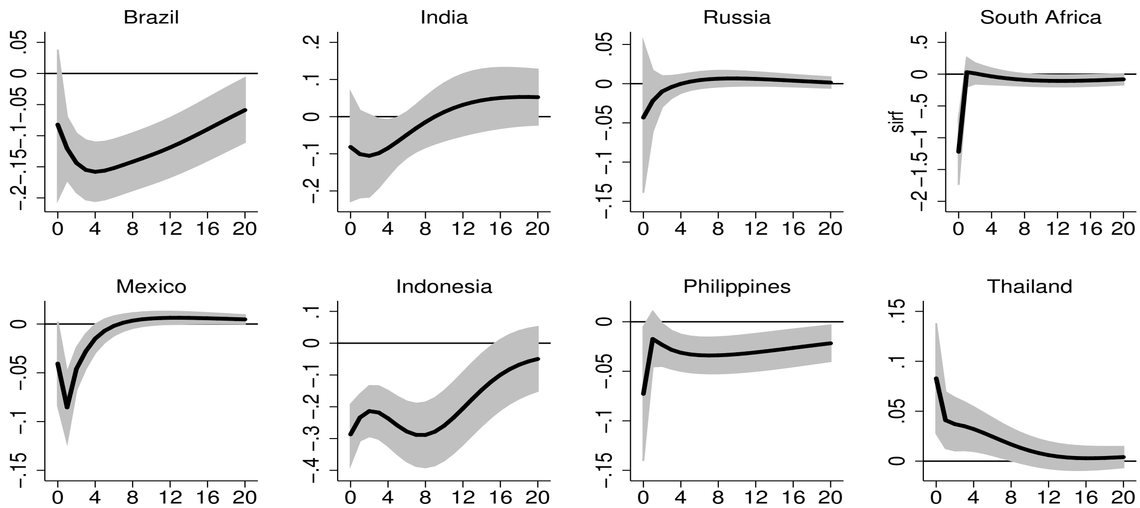
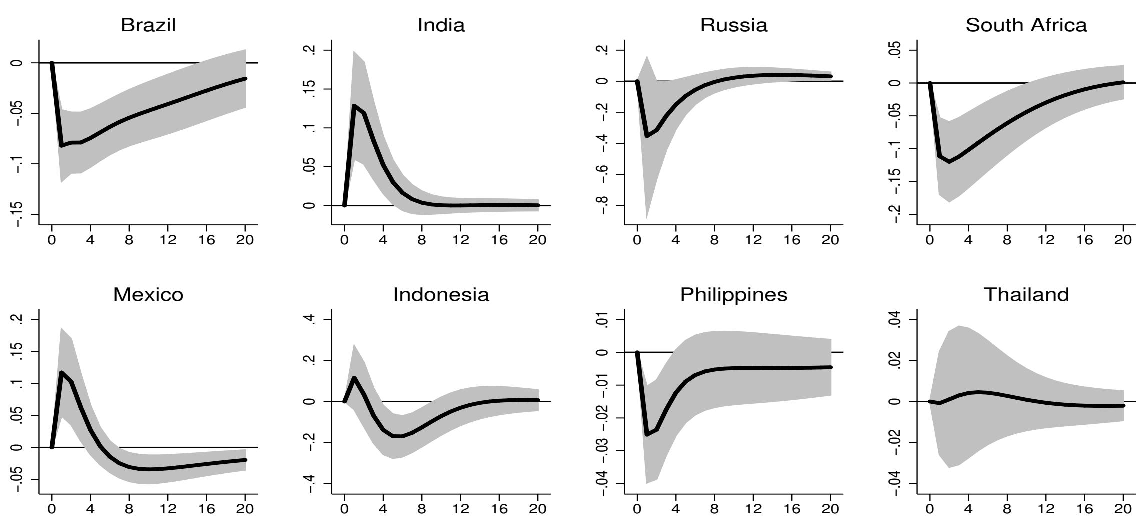


Figure 22: $FPIN$ IRFs to e shock



Notes: Figures 21 and 22 present the IRFs of the indices of FDI and FPI ($FDIN$ and $FPIN$) to e shock in a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e) respectively. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend. The index data is constructed as a ratio of each inflow to the level in 2005Q1.

Figure 23: $FDIN$ IRFs to y shock

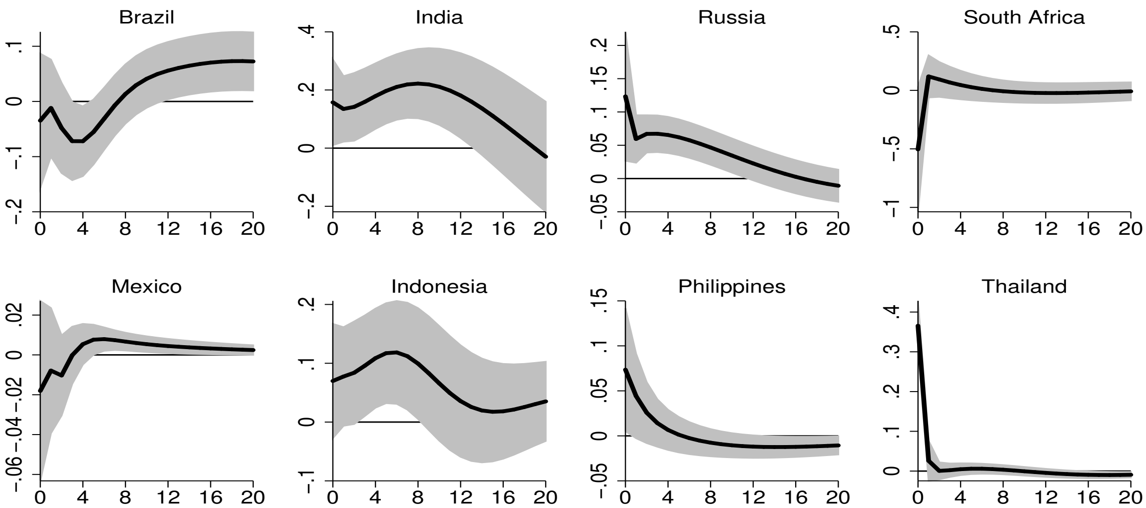
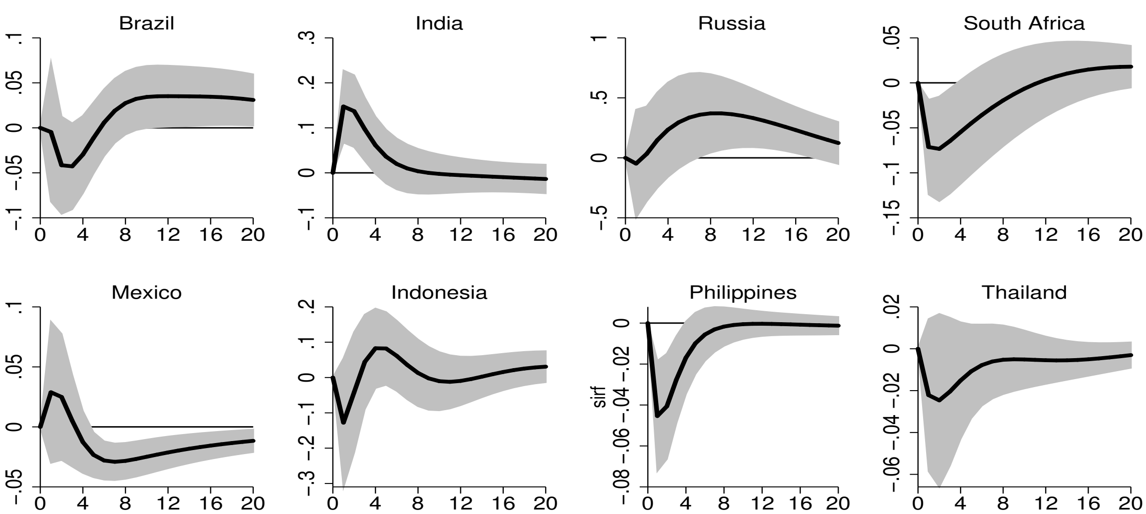


Figure 24: $FPIN$ IRFs to y shock



Notes: Figures 23 and 24 present the IRFs of the indices of FDI and FPI ($FDIN$ and $FPIN$) to y shock in a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e) respectively. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend. The index data is constructed as a ratio of each inflow to the level in 2005Q1.

Figure 25: $FDIN$ IRFs to p shock

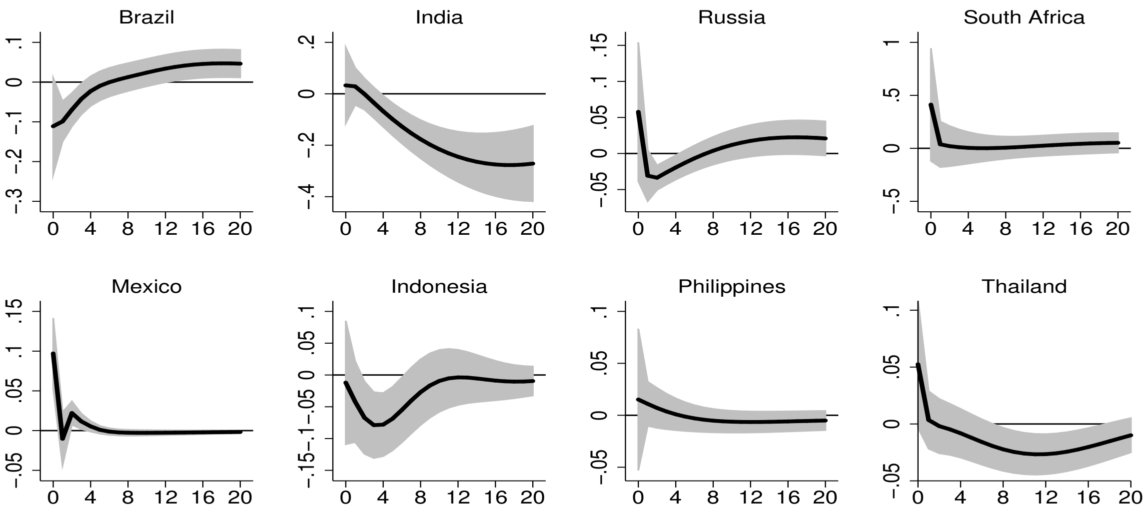
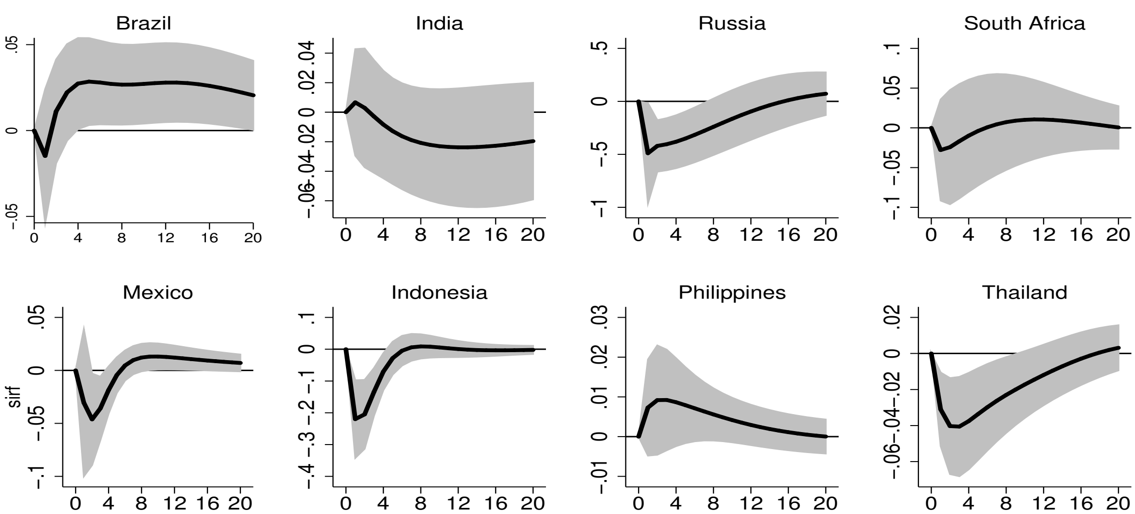


Figure 26: $FPIN$ IRFs to p shock



Notes: Figures 25 and 26 present the IRFs of the indices of FDI and FPI ($FDIN$ and $FPIN$) to p shock in a recursive VAR ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e) respectively. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend. The index data is constructed as a ratio of each inflow to the level in 2005Q1.

Figure 27: FEVD of $FDIN$

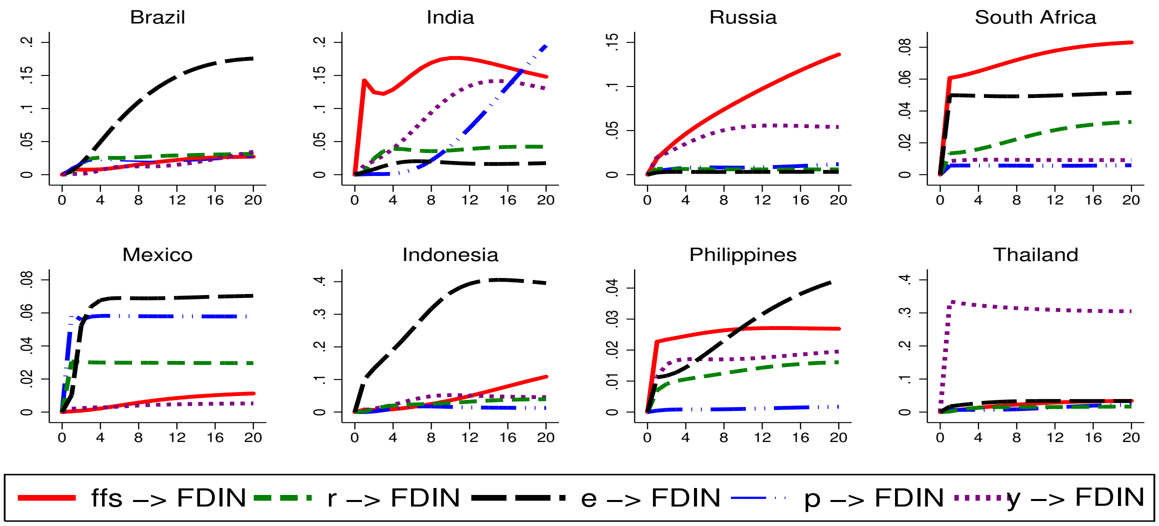
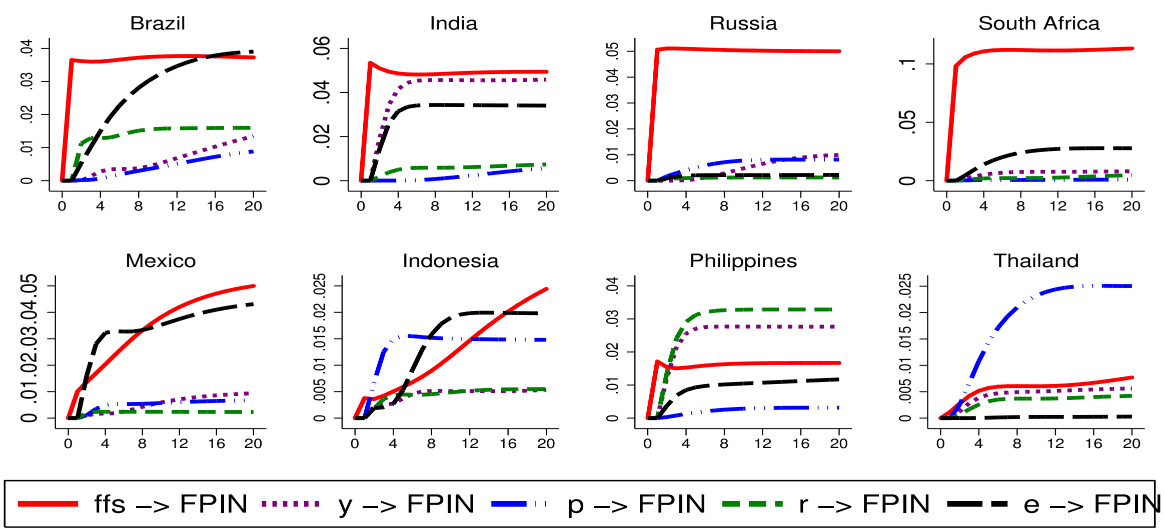


Figure 28: FEVD of $FPIN$



Notes: Figures 27 and 28 present the FEVD of the indices of FDI and FPI ($FDIN$ and $FPIN$). The recursive VAR estimation is ordered as (ffs, y, p, r, e, FDI) and (ffs, FPI, y, p, r, e) for $FDIN$ and $FPIN$ respectively. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend. The index data is constructed as a ratio of each inflow to the level in 2005Q1.

Appendix B: Analyses using alternative orderings

Figure 29: $FDIN$ IRFs to ffs shock

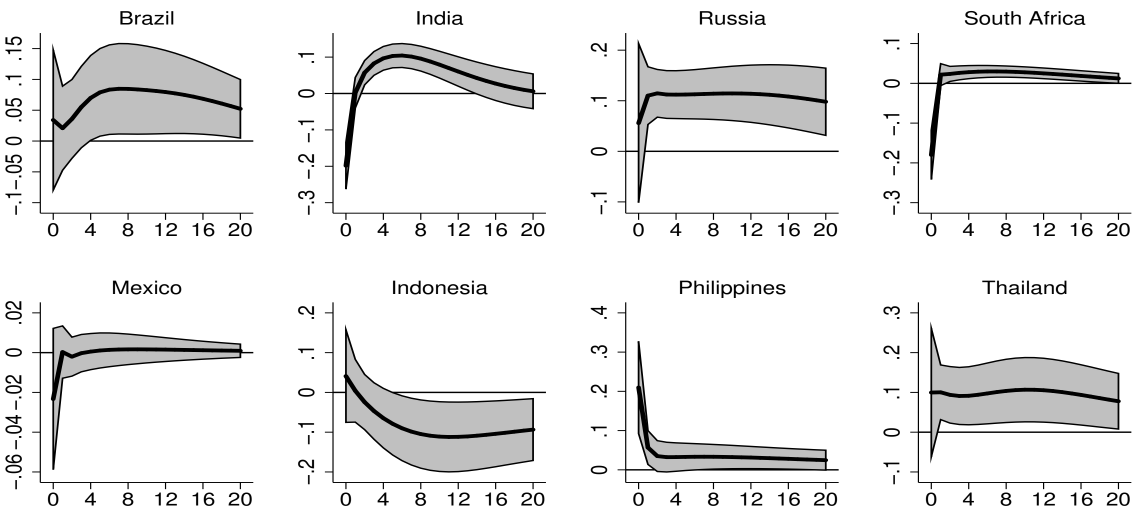
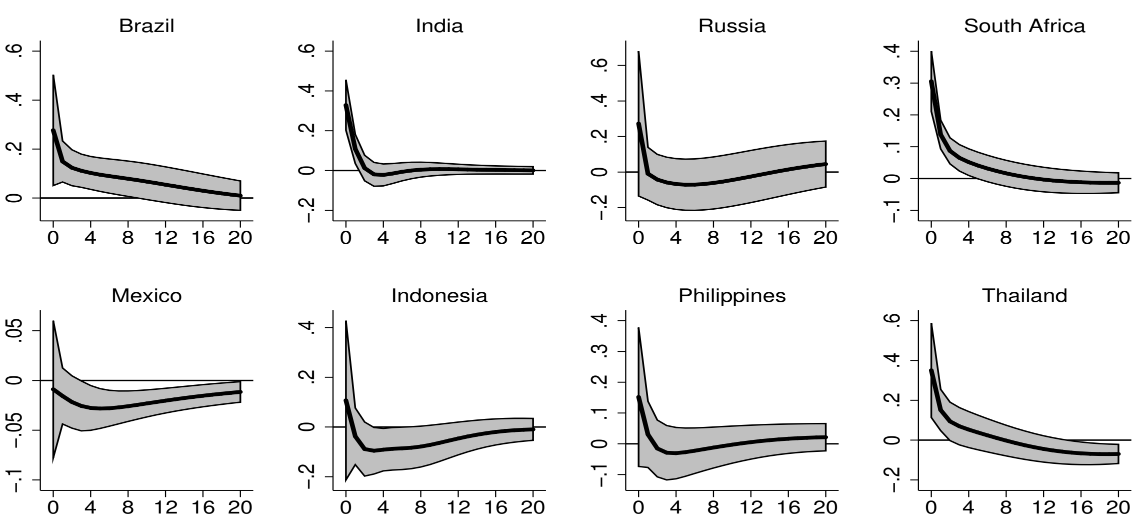


Figure 30: $FPIN$ IRFs ffs shock



Notes: Figures 29 and 30 present the IRFs of FDI and FPI to ffs shock in a recursive VAR ordered as (ffs, FDI, y, p, r, e) and (ffs, y, p, r, e, FPI) respectively. Note that this order is different from the order in the body of the paper. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend.

Figure 31: FDI IRFs to r shock

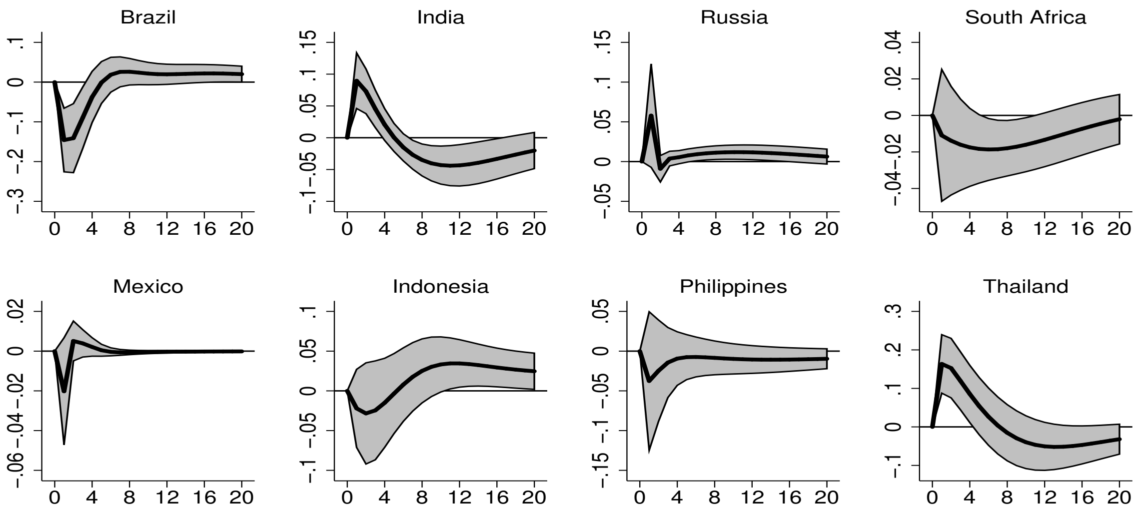
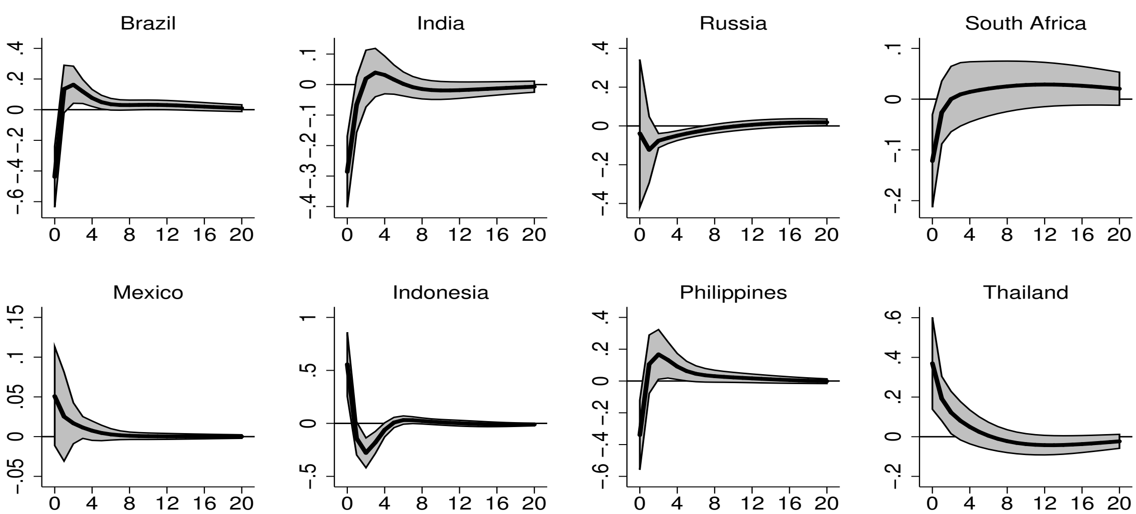


Figure 32: FPI IRFs to r shock



Notes: Figures 31 and 32 present the IRFs of FDI and FPI to r shock in a recursive VAR ordered as (ffs, FDI, y, p, r, e) and (ffs, y, p, r, e, FPI) respectively. Note that this order is different from the order in the body of the paper. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend.

Figure 33: FDI IRFs to e shock

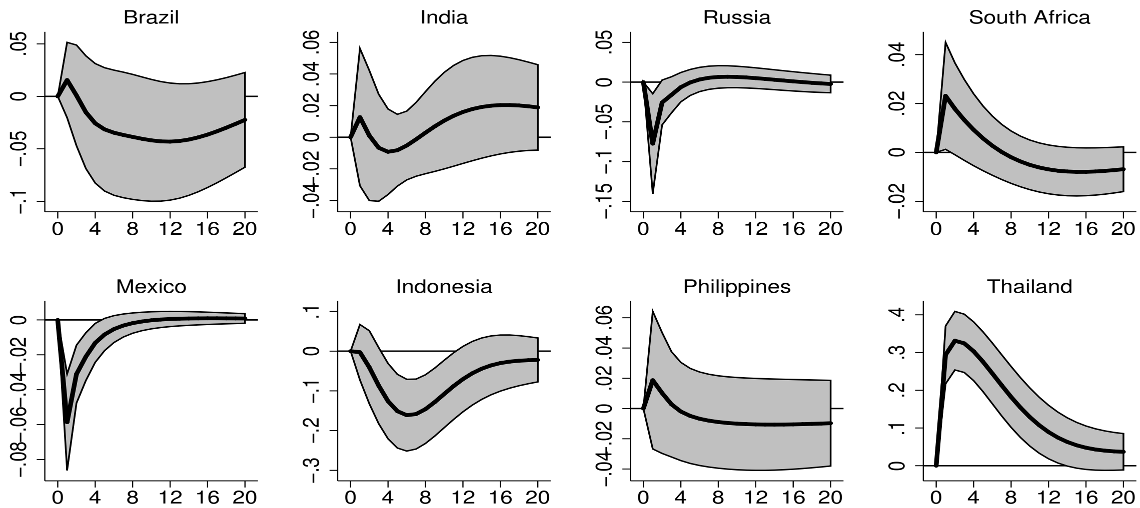
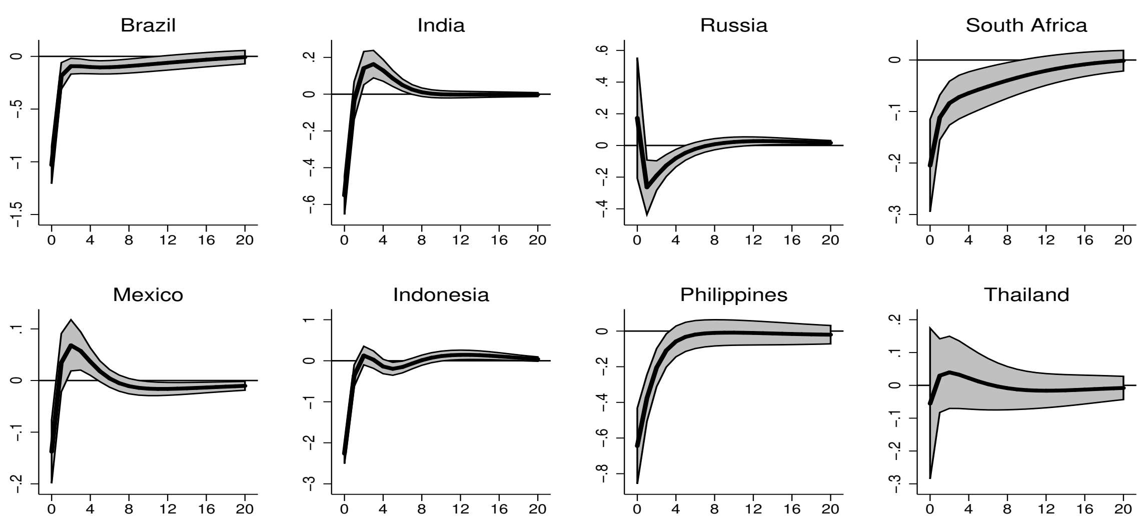


Figure 34: FPI IRFs to e shock



Notes: Figures 33 and 34 present the IRFs of FDI and FPI to e shock in a recursive VAR ordered as (ffs, FDI, y, p, r, e) and (ffs, y, p, r, e, FPI) respectively. Note that this order is different from the order in the body of the paper. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend.

Figure 35: FDI IRFs to y shock

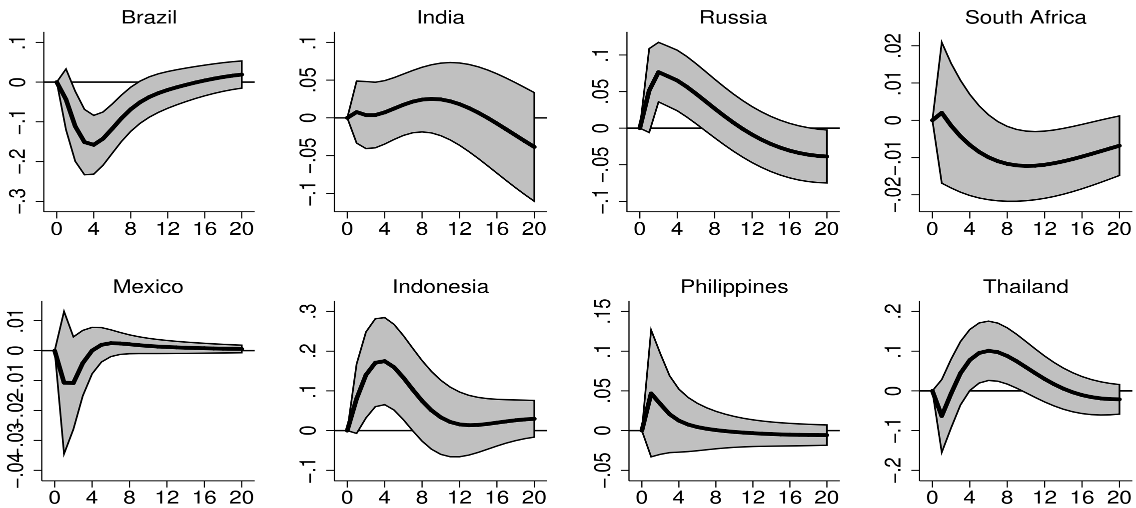
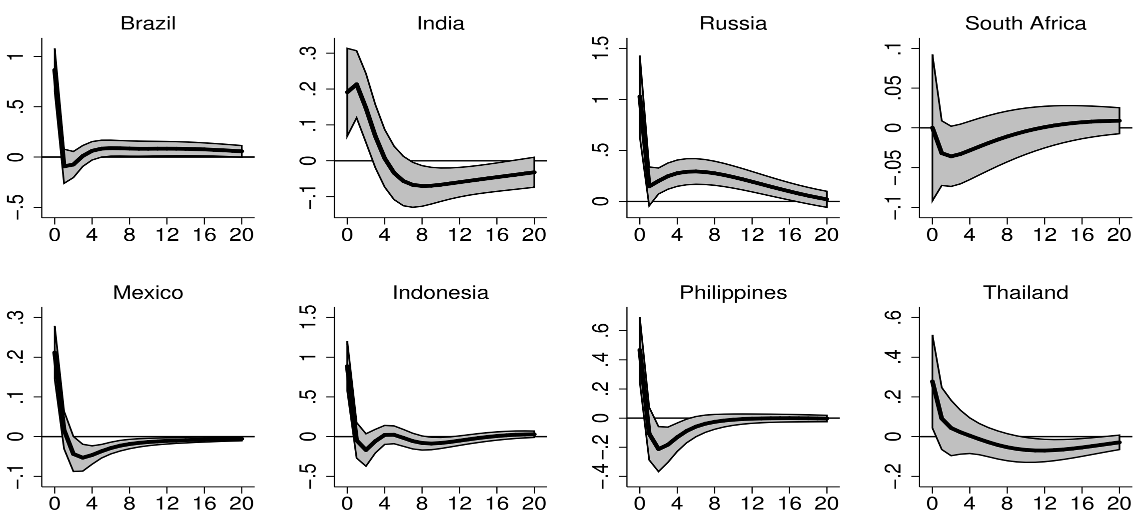


Figure 36: FPI IRFs to y shock



Notes: Figures 35 and 36 present the IRFs of FDI and FPI to y shock in a recursive VAR ordered as (ffs, FDI, y, p, r, e) and (ffs, y, p, r, e, FPI) respectively. Note that this order is different from the order in the body of the paper. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend.

Figure 37: FDI IRFs to p shock

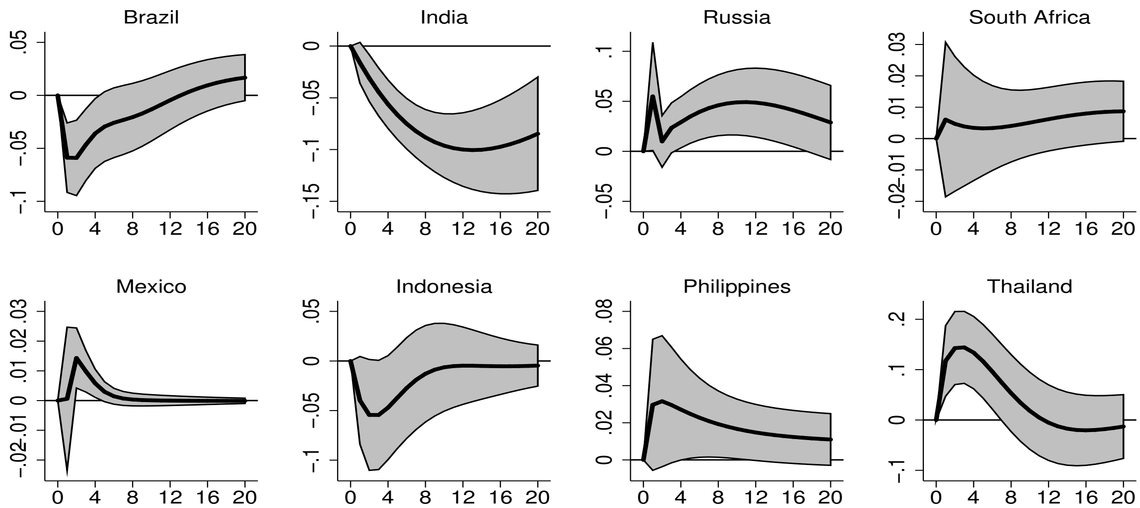
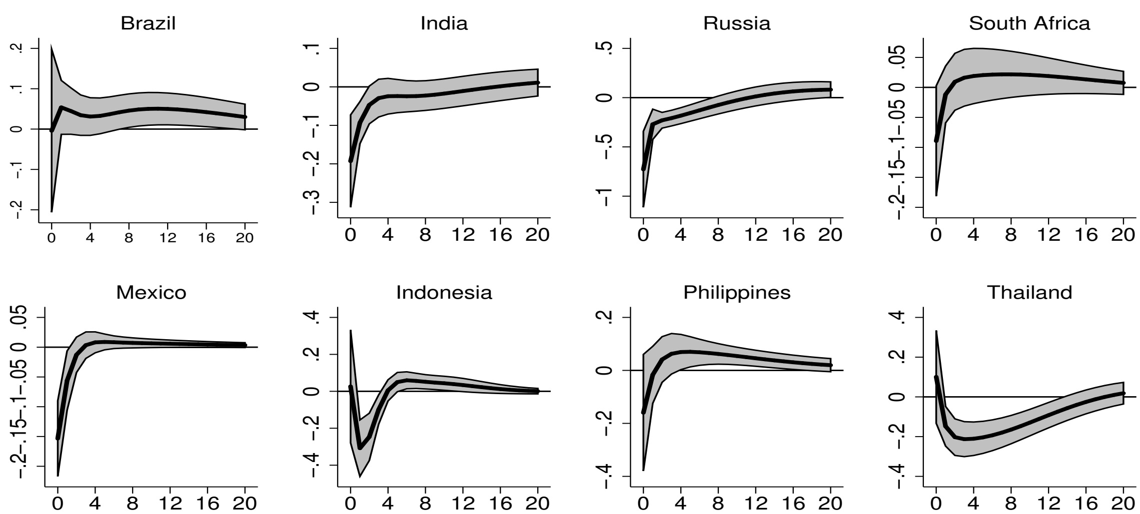


Figure 38: FPI IRFs to p shock



Notes: Figures 37 and 38 present the IRFs of FDI and FPI to p shock in a recursive VAR ordered as (ffs, FDI, y, p, r, e) and (ffs, y, p, r, e, FPI) respectively. Note that this order is different from the order in the body of the paper. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend.

Figure 39: FEVD of FDI

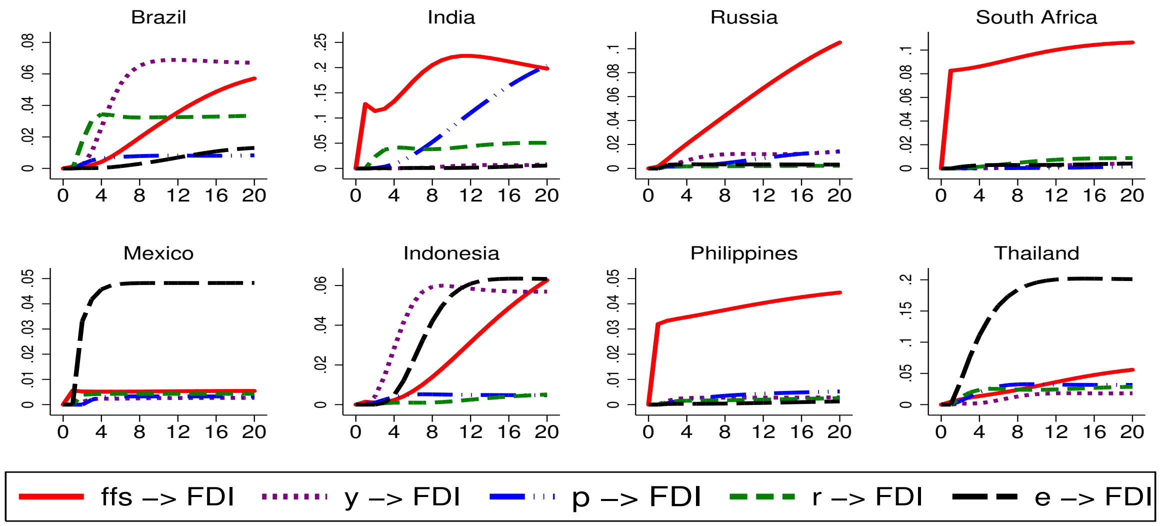
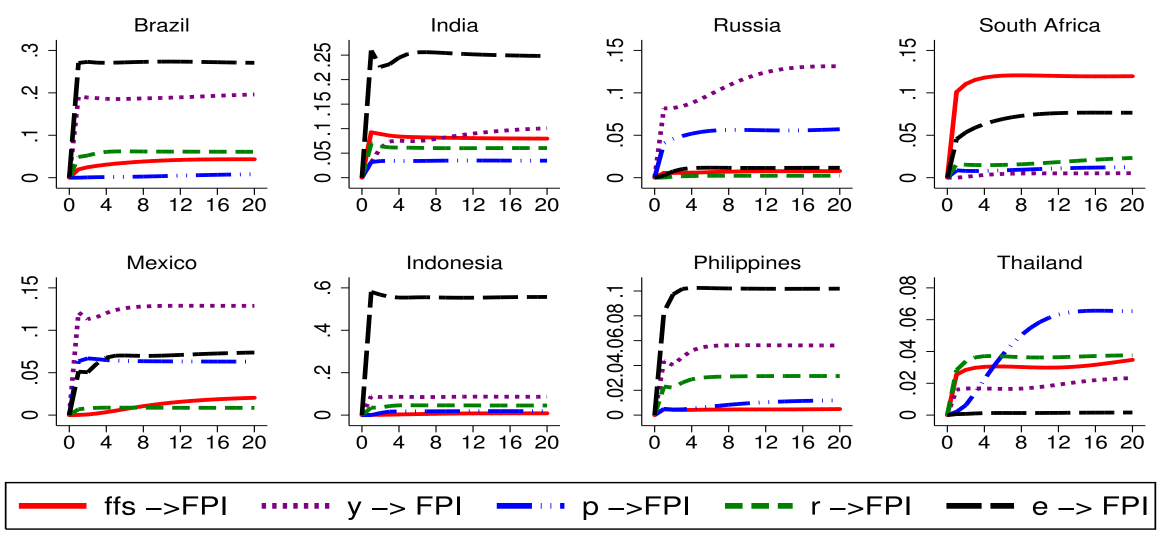


Figure 40: FEVD of FPI



Notes: Figures 27 and 28 present the FEVD of FDI and FPI. The recursive VAR estimation is ordered as (ffs, FDI, y, p, r, e) and $(ffs, y, p, r, eFPI)$ for FDI and FPI respectively. Note that this order is different from the order in the body of the paper. They are estimated with one standard deviation bootstrap confidence bands based on 1000 replications, degrees of freedom adjusted, one lag, and time trend.