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## Global Financial Shocks and Foreign Asset Repatriation: Do Local Investors Play a Stabilizing Role?

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## IMF Working Paper

Western Hemisphere Department

### Global Financial Shocks and Foreign Asset Repatriation: Do Local Investors Play a Stabilizing Role?

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#### Abstract

We study the dynamic response of gross capital flows in emerging market economies to different global financial shocks, using a panel vector-autoregressive (PVAR) setting. Our focus lies primarily on the potentially stabilizing role played by domestic investors in offsetting the response of foreign investors to global shocks. We find evidence of such role, but its existence and magnitude depend on the nature of the shock. Local investors play a meaningful stabilizing role in the face of global uncertainty shocks, as well as shocks to long-term U.S. interest rates. However, while in the former case, sizeable asset repatriation largely offsets the retrenchment of non-residents, in the latter case the extent of the offsetting is much more limited. Meanwhile, residents and non-resident behave alike in response to short-term U.S. interest rate shocks, pulling capital away from emerging markets, although magnitudes are not economically significant. The results shed light on the potential impact of the Fed's QE tapering on emerging market economies.

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Keywords: capital flows, gross capital flows, foreign assets, global financial shocks

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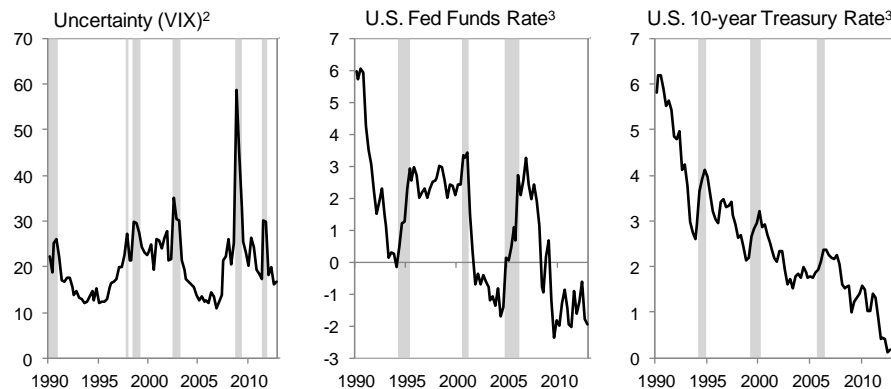
## I. INTRODUCTION

Global financial markets have been a source of sizeable shocks over the last decade, with broad repercussions across the emerging market world. The crisis triggered by the bankruptcy of Lehman Brothers in 2008, and the quantitative easing (QE) program in advanced economies in the aftermath of that crisis, are stark examples. And looking forward, new shocks are likely to come, as the reduction in the scale of bond purchases by the U.S. Federal Reserve—i.e., “QE tapering”—marks only the start of the normalization of U.S. monetary conditions. Against this background, understanding the implications of global financial shocks in terms of their effect on capital flows to and from EMEs remains a key issue.

EMEs have become increasingly financially integrated with the rest of the world in the last two decades, raising their exposure to global financial shocks (i.e., shocks in core financial markets). However, a key feature of higher financial integration has been that both sides of EMEs’ balance sheets—that is, foreign liabilities as well as foreign asset holdings—have increased. As a result, emerging markets have had at their disposal increasing resources to offset balance of payment pressures arising during episodes of retrenchment of foreign investors, often occurring at times of financial distress in global markets. Larger stocks of public sector foreign assets (primarily international reserves) are undoubtedly a source of resilience for these economies. But whether private foreign assets holdings are also a source of international liquidity, and the extent to which local investors play a stabilizing role following negative external shocks, remain open questions. Understanding the behavior of gross capital flows is, thus, critical, especially at the current juncture characterized by looming financial risks—including those stemming from uncertainty about the pace of U.S. monetary tightening.

A number of global financial shocks have taken place over the last two decades—some of them of sizeable magnitude—which are useful to assess the dynamics of gross capital flows to EMEs. These include global uncertainty shocks, as captured by the Chicago Board Options Exchange Market Volatility Index (VIX), sharp movements in the U.S. monetary policy (real) interest rates (the Federal Funds rate), as well as movements in the U.S. long-term (real) interest rates (e.g., the 10-year Treasury bond rate). Figure 1 illustrates the frequency and magnitude of some of these shocks.

**Figure 1. Global Financial Shocks, 1990–2012<sup>1</sup>**  
(Percent, unless otherwise stated)



Sources: Haver Analytics; and Cleveland Federal Reserve.

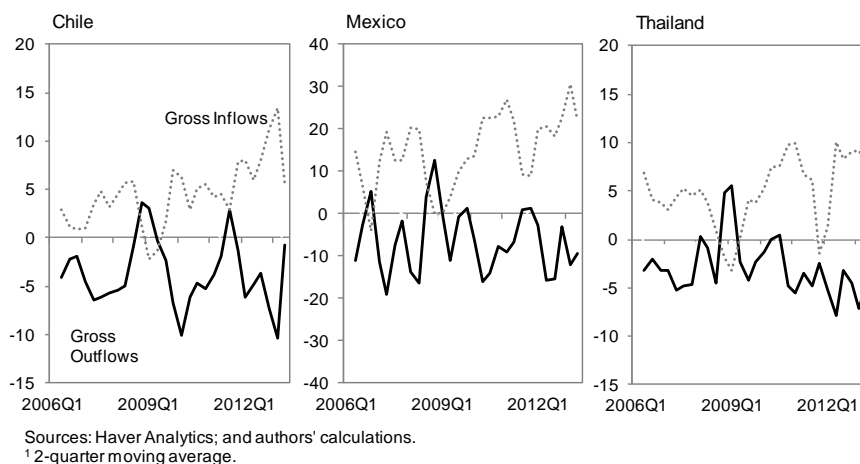
<sup>1</sup> Large negative shocks are highlighted in gray.

<sup>2</sup> Chicago Board Options Exchange Market Volatility Index.

<sup>3</sup> Real interest rates based on forward-looking (1 and 10 year) inflation expectations.

Global shocks have often had important effects on net capital flows to EMEs and, more broadly, on economic activity in these economies. These aspects have been addressed extensively in previous studies.<sup>1</sup> However, attention to the dynamics of gross capital flows—and specially to the potential stabilizing role played by local investors—has remained limited, despite some recent evidence of domestic investors playing such an offsetting role by repatriating foreign assets (Figure 2).

**Figure 2. Gross Capital Flows in Selected Countries, 2006–12**  
(Billions of U.S. dollars)<sup>1</sup>



For example, this phenomenon has been observed in the aftermath of large global uncertainty shocks—like the one experienced during the 2008–09 global financial crisis—as well as after the “QE tapering” shock in May 2013.<sup>2</sup> Whether this is a generalized phenomenon across EMEs and types of financial shocks, however, remains unclear.

Some recent studies have focused on gross flows, examining whether episodes of net capital flow reversals were driven by declines in gross inflows (foreign investors retrenching from EMEs), surges in gross outflows (local investors accumulating external assets), or a combination of both (see, among others, Powell et al., 2002; Cowan et al., 2008; Rothenberg and Warnock, 2011; Forbes and Warnock, 2012; Bruno and Shin, 2012; Calderón and Kubota, 2013; and Bluedorn et al, 2013). A few papers (for example, Cavallo et al., 2013) have also pointed to episodes of reversals of gross inflows that did not entail a reversal of net inflows (i.e., residents fully offsetting the behavior of non-resident investors). A common thread among these studies is the notion that the behavior of foreign and local investors may be driven by different factors and may respond differently to certain shocks. As a

<sup>1</sup> The vast literature on *Sudden Stops* comes to mind (e.g., Calvo, 1998; Dornbusch and Werner, 1994; Dornbusch et al., 1995; Calvo et al., 2004; Calvo and Reinhart, 2000; Edwards, 2004, etc.), although this strand of work has focused primarily on abrupt reversals in *net* capital inflows. More recently, Bluedorn et al. (2013), and IMF (2013) have also studied the impact of global financial shocks on net flows to EMEs. Finally, Adler and Tovar (2013) have studied the impact of global financial shocks on economic activity, and the role of financial integration in amplifying or mitigating such impact.

<sup>2</sup> On May 22, 2013, the U.S. Federal Reserve Chairman announced for the first time its intentions to start a process of gradually reducing in the scale of bond purchases (i.e., “QE tapering”). The mere announcement was followed by a sharp rise in long-term U.S. interest rates, and important repercussions on capital flows to EMEs.

result, domestic investors could potentially play a stabilizing role, for example by repatriating foreign assets when foreign investors are liquidating positions in EMEs (i.e., during episodes of *gross inflow reversals*). For instance, a recent study (Broner et al., 2013) finds a positive correlation between gross inflows and gross outflows, and that the behavior of domestic investors tends to offset that of foreigners during financial crises.<sup>3</sup> None of these studies, however, has explored the link between specific global shocks and gross flows, despite the fact that this is critical to assess EMEs' vulnerabilities to (likely) changes in global financial conditions.<sup>4</sup>

This paper contributes to this literature by examining the dynamic response of net and gross capital flows to key global financial shocks, including short and long-term U.S. interest rates. Specifically, we use a panel VAR setting, encompassing a group of 38 EMEs over the period 1990Q1-2012Q4, to study (i) the extent of the offsetting role played by domestic investors in response to adverse foreign shocks, and (ii) whether this depends on the specific nature of the shock (in particular, uncertainty or short-term and long-term interest rate shocks). We also examine differences across EM regions, across countries with different characteristics (e.g., financial integration and capital account openness), and across types of capital flows. Finally, we use the estimated model to discuss also the impact of shocks to U.S. economic activity on capital flows to EMEs.<sup>5</sup>

We follow the terminology used in recent papers, calling *gross inflows* the net movement in international liabilities of a country, and *gross outflows* the net movement in international assets.<sup>6</sup> While balance of payments accounting is based on doubly-entry, movements in the asset and liability sides of the financial account may differ as some operations involve an offsetting entry in the current account or a change in international reserves. As is standard in the literature, we base our analysis of gross flows on the notion that gross inflows (outflows) primarily reflect foreign (domestic) investors' behavior. That is, shocks to gross flows are primarily supply driven.<sup>7</sup>

We find that—after controlling for U.S. interest rates, U.S. GDP growth, and commodity prices—global uncertainty shocks lead to net capital outflows from EMEs, but the impact is, in general, short lived and relatively moderate. The response of net flows, however, hides sizeable dynamics in gross

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<sup>3</sup> Financial crises, however, are defined in an ad-hoc manner that makes it difficult to associate these events to specific external shocks.

<sup>4</sup> Forbes and Warnock (2012) and Calderón and Kubota (2013) study the impact of global financial shocks, but in probit settings that are not well-suited to grasp the impact on capital flows and their dynamic responses outside 'sudden stop' events.

<sup>5</sup> The net effect of this type of shock is of particular interest at the current juncture and, a priori, ambiguous. Positive economic shocks to activity in the U.S. would normally lead to a tightening of monetary conditions in this country, pushing flows away from EMEs. At the same time, better economic prospects could attract flows to these economies, especially to U.S. trading partners.

<sup>6</sup> Specifically, a positive gross capital inflow is an accumulation of net foreign liabilities, while a positive gross capital outflow entails an accumulation of net foreign assets.

<sup>7</sup> While this could be controversial in the analysis of idiosyncratic shocks, it is less likely to be so in the context of global financial shocks studied in this paper. Results confirm that movements in gross inflows and outflows are not symmetric.

flows. In fact, we find evidence that while foreigners retrieve from EMEs during adverse shocks events, residents repatriate foreign assets, playing a meaningful offsetting role. In the case of (pure) U.S. interest rate shocks, we find important differences between the impact of short-term and long-term interest rate shocks. Domestic investors do not appear to play a mitigating role in the case of short-term interest rate shocks. In fact, a positive shock to the Federal Funds rate is associated with statistically significant outflows by both foreign and local investors, although the magnitudes are relatively moderate. In the case of shocks to long-term U.S. interest rates, in contrast, we find evidence of asset repatriation, but this offsetting force falls short of balancing the retrenchment of non-residents (thus, implying non-trivial net capital outflows).<sup>8</sup> Table 1 summarizes the main results.

**Table 1. Impact of Global Financial Shocks on Capital Flows to EMEs<sup>1</sup>**

	Uncertainty (VIX)	U.S. interest rates	
		Short-term rate	Long-term rate
<b>Net Flows</b>	Limited net impact	Moderate net outflows	Larger net outflows
<b>Gross Inflows</b>	Sizeable retrenchment	Limited retrenchment	Sizeable retrenchment
<b>Gross Outflows</b>	Sizeable repatriation of foreign assets	Limited accumulation of foreign assets	Moderate repatriation of foreign assets

<sup>1</sup> General results for emerging markets economies. Magnitudes vary somewhat for different analytical groups (as discussed below).

These results suggest that, while increased financial integration has raised EME's exposure to global financial shocks, increased foreign asset holdings are likely to play an important—although not complete—stabilizing role. The results also shed light, in the current juncture, on how EMEs are likely to react to the U.S. Fed's exit from QE, as the latter is likely to entail higher longer-term U.S. interest rates.

The rest of the paper is organized as follows: Section II discusses the empirical approach. Section III presents the main results, their robustness, and extensions. Section IV concludes with a summary of the key takeaways.

## II. EMPIRICAL APPROACH

Our objective is to examine the dynamic effect of global financial shocks on net and gross capital flows into EMEs. Since financial shocks are often accompanied by other shocks—for example, to U.S. output growth and commodity prices), and the latter may, by themselves, have important implications for capital flows to and from EMEs, a multivariate approach is critical to disentangle the pure effect of each of the shocks.<sup>9</sup>

<sup>8</sup> Although not the main focus of our analysis, we also find that positive growth disturbances in the U.S. lead to net capital inflows to EMEs, despite the associated rise in U.S. interest rates.

<sup>9</sup> In fact, a simple event analysis confirms that even in episodes of sizable global financial shocks, their impact on flows to EMEs is often not visible in a bivariate setting (see Appendix 1).



### A. Panel VAR model

A panel vector autoregressive (PVAR) model is employed to quantify the dynamic impact of global financial shocks on both net and gross capital flows to EMEs. Specifically, we estimate a first-order PVAR model that treats all the variables in the system as endogenous and allows for unobserved country heterogeneity. Two versions of the model are estimated, focusing on net capital flows and gross capital flows separately.<sup>10</sup> In both cases the specification takes the following reduced form:

$$\mathbf{y}_{i,t} = \boldsymbol{\alpha} + \boldsymbol{\gamma}_i + \boldsymbol{\beta}' \mathbf{y}_{i,t-1} + \boldsymbol{\varepsilon}_{i,t} \quad (1)$$

with time index  $t = 1, \dots, T$ ; and country index  $i = 1, \dots, N$ , where  $\mathbf{y}_i$  is a vector of six variables for country  $i$   $\{G, VIX, INT, INT\_10Y, COMMP, NKF_i\}$  in the specification using net capital flows ( $NKF_i$ ) or a vector of seven variables  $\{G, VIX, INT, INT\_10Y, COMMP, GKI_i, GKO_i\}$  in the specification using gross capital flows ( $GKI_i$  and  $GKO_i$ );  $\boldsymbol{\gamma}_i$  is a vector of country specific fixed effects, and  $\boldsymbol{\varepsilon}_{i,t}$  denotes a vector of reduced form errors. As mentioned before, we follow the terminology used in the recent literature, calling *gross capital inflows (outflows)* the (net) change in international liabilities (assets). Both net and gross flows are expressed in annualized terms and in percent of trend GDP (expressed in U.S. dollars) to properly normalize the flows while avoiding the measure to be contaminated by contemporaneous movements in GDP. Our measures of international financial conditions include global uncertainty (proxied by the Chicago Board Options Exchange Market Volatility Index,  $VIX$ ), changes in the short-term U.S. real interest rate (the Federal Funds rate,  $INT$ ), and changes in the long-term U.S. real interest rate (the 10-year Treasury bond rate,  $INT\_10Y$ ).<sup>11</sup> Real interest rates are computed using forward-looking inflation expectations at 1 and 10-year horizons, and first differences are used to ensure series stationarity.<sup>12</sup> U.S. real output growth ( $G$ ) and (the log difference of) a broad index of commodity prices ( $COMMP$ ) are also included, mainly as control variables. Table A2.1 in Appendix 2 describes the variables used in the empirical exercise in detail.

Our main objective is to identify the dynamic response of capital flows to EMEs to global uncertainty and U.S. interest rate shocks. Two features of the selected specification are critical to estimate such effects. First, controlling for (as well as allowing feedback through) movements in U.S. real output and commodity prices is key to ensure that the estimated effects reflect those of pure global financial developments and not the response of financial variables to real shocks. Second, as there is significant cross-section heterogeneity in terms of the level of capital flows (especially with regard to gross flows), the model includes country fixed effects ( $\boldsymbol{\gamma}_i$ ) that capture the countries' unobserved time-

<sup>10</sup> We follow the recent literature in studying overall flows, excluding international reserve flows. A known shortcoming of this approach is that both private and public flows are included, because of data limitations, despite the fact that they may not behave in the same way in the face of global financial shocks. Bluedorn et al. (2013) show that official flows can play an important offsetting role in some cases—although this is a relevant feature for only a small number of countries in our sample that experienced crises (i.e., were impaired from borrowing in external financial markets).

<sup>11</sup> The VIX index has recently been used as a measure of global uncertainty or financial stress. Bloom (2009), for instance, shows that this volatility index is highly correlated with measures of micro- and macro-level uncertainty, including from financial variables. More recently, Carriere-Swallow and Cespedes (2011), Adler and Tovar (2013), and Adler and Sosa (2013) also used the VIX to measure global uncertainty shocks.

<sup>12</sup> Although we rely on real interest rates, shocks to them are primarily driven by nominal innovations, as inflations expectations tend to be highly stable for the sample period and countries under study.

invariant idiosyncratic characteristics. However, to avoid the bias associated with the fact that fixed effects would be correlated with the regressors due to the lags of the dependent variables, we use forward mean-differencing, also referred to as the ‘Helmert procedure’, following Love and Zicchino (2006) and Arellano and Bover (1995).<sup>13</sup>

Once the panel VAR is estimated, we compute impulse response functions to examine the effect of global financial shocks on capital flows. Since only the reduced form version of the model is estimated, imposing additional structure to the error variance-covariance matrix is required, so that the structural shocks can be identified. We use a standard Choleski decomposition to orthogonalize the reduced form errors. Our selected ordering (where the more exogenous variables of the model precede the endogenous ones), is as follows:  $\{G, VIX, INT, INT_{10Y}, COMMP, NKF\}$  and  $\{G, VIX, INT, INT_{10Y}, COMMP, GKI, GKO\}$  for the specifications using net flows and gross flows, respectively. Within the global variables, this order assumes, primarily, that financial conditions and commodity prices respond contemporaneously to U.S. output shocks but the latter only responds to these variables with a lag. This assumption is consistent with the notion that interest rates and prices are forward-looking variables.<sup>14</sup>

Confidence intervals around the impulse responses are generated with Monte Carlo simulations, by randomly generating a draw of the coefficients of the model and re-calculating the impulse-responses. This procedure is repeated 700 times to compute the 5<sup>th</sup> and 95<sup>th</sup> percentiles of the impulse responses.

## B. Data

Our sample encompasses quarterly data for a group of 38 emerging market economies, over the period 1990Q1-2012Q4. Table A2.2 in Appendix 2 presents the list of countries and the time coverage for each of them. The data sources are primarily the IMF’s *Balance of Payments Statistics* (version BP6TS) and *World Economic Outlook*, Haver Analytics, and the Federal Reserve Bank of Cleveland database. Table 2 reports key summary statistics for the variables of the model.

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<sup>13</sup> This transformation is an orthogonal deviation, where each observation is expressed as a deviation from the mean of all the future observations. Each observation is weighted so the variance is standardized. The procedure preserves homoscedasticity and does not induce serial correlation (Arellano and Bover, 1995). Moreover, by preserving the orthogonality between transformed variables and lagged dependent variables, this technique allows the use of the lagged values of regressors as instruments, and to estimate the coefficients by the generalized method of moments (GMM).

<sup>14</sup> Nonetheless, the main results are robust to alternative orderings within the group of international variables, as discussed later.

Table 2. Descriptive Statistics

Variables		Mean	Std. Dev.	Min	Max	Observations
NKF	overall	3.77	7.65	-62.24	62.96	N = 2639
	between		3.60	-5.43	9.53	n = 38
	within		6.87	-68.01	57.19	T-bar = 69.45
GKI	overall	6.84	8.96	-37.89	75.25	N = 2755
	between		3.79	1.05	15.62	n = 38
	within		8.15	-45.59	67.91	T-bar = 72.5
GKO	overall	3.02	6.65	-39.20	62.60	N = 2663
	between		2.99	-0.36	12.02	n = 38
	within		6.02	-42.81	58.99	T-bar = 70.08
VIX	overall	20.46	7.49	11.03	58.74	T = 92
INT	overall	-0.087	0.706	-1.932	2.017	T = 91
INT_10Y	overall	-0.062	0.271	-0.860	0.775	T = 91
COMMP	overall	0.012	0.090	-0.380	0.358	T = 91

Source: Authors' calculations.

### III. RESULTS

#### A. Benchmark specification

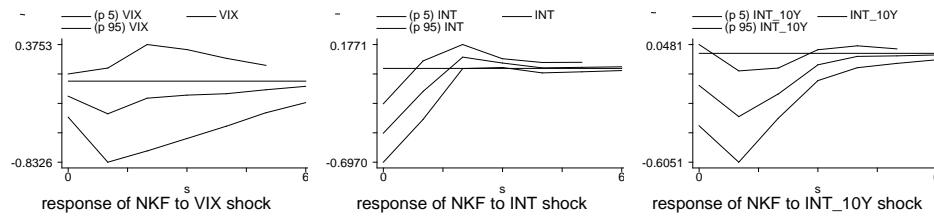
Figures 3 and 4 illustrate the dynamic response of capital flows to EMEs to external shocks in our benchmark model, using net and gross flows respectively. The full set of responses of capital flows to global shocks, as well as a characterization of the magnitude and persistence of the shocks, is presented in Figure A2.1 in Appendix 2.

We find that increases in global uncertainty (first column in panels of Figures 3 and 4) have a very limited negative impact on net capital flows to EMEs. This result largely reflects the marked response of gross capital outflows. Indeed, while a VIX shock leads to a sizable and sustained reversal in gross inflows, such impact is largely offset by a decline in gross outflows (i.e., asset repatriation by local investors). Specifically, a one standard deviation shock to the VIX (about 5 points) leads to an average decline in gross inflows of about 1½ percent of annual GDP over six quarters and to a decline in gross outflows of broadly similar magnitude.

A shock to the U.S. short-term (real) interest rate also leads to a decline in net flows to EMEs (second column in Figures 3 and 4), although the economic significance is relatively small. Indeed, a one standard deviation shock (about 0.7 percentage points) leads to a cumulative decline in net capital inflows of about 0.2 percent of annual GDP over two quarters. This fall in net inflows reflects both a decline in gross capital inflows and an increase in gross capital outflows. These results suggest that domestic investors do not play a meaningful stabilizing role in the context of short-term foreign interest rate shocks.

A shock to the 10-year Treasury bond rate, in turn, appears to have a significant—and distinct—impact on capital flows to EMEs (third column in Figures 3 and 4). This finding is especially relevant in the current juncture, since the main effect of the Fed's exit from QE will be, at least in the short run, and upward drift in the longer-term interest rates in the U.S. Gross inflows decline markedly after an increase in the 10-year rate, with the impact being significantly larger than in response to short-term interest rate shocks. Furthermore, the estimated effect is economically meaningful, pointing to a cumulative decline of gross inflows of 1.8 percent of GDP over six quarters in response to an increase

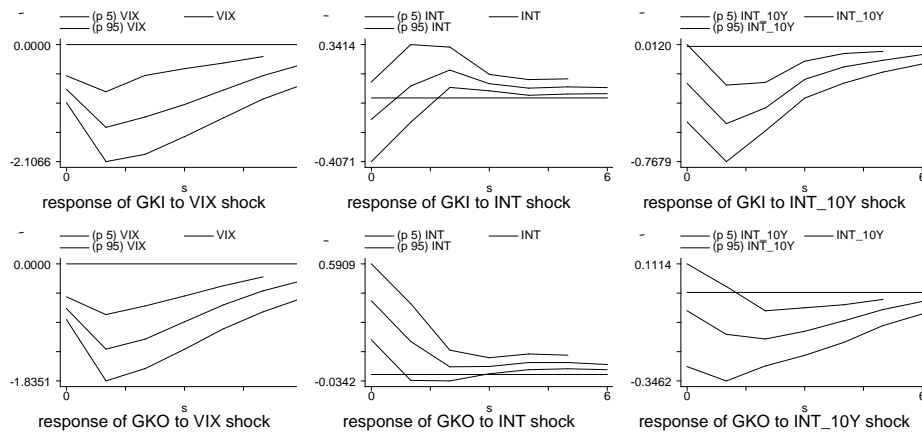
Figure 3. Response of net capital flows to global financial shocks



Source: Authors' calculations.

<sup>1</sup> Response to a one standard deviation shock to a shock to the VIX (5 units), the Federal Fund interest rate (0.66 percentage points), and the 10-year Treasury bond interest rate (0.23 percentage points). Time horizon in quarters.

Figure 4. Response of gross capital flows to global financial shocks



Source: Authors' calculations.

<sup>1</sup> Response to a one standard deviation shock to the VIX (5 units), the Federal Fund interest rate (0.66 percentage points), and the 10-year Treasury bond interest rate (0.23 percentage points). Time horizon in quarters.

of 100 basis points in the 10-year Treasury bond rate. In contrast to the case of short-term rate shocks, we find that domestic residents play a stabilizing role by repatriating foreign assets. The extent of the latter, however, is substantially smaller than the fall in gross inflows. Therefore, the impact on net capital inflows is negative, as in the case of the short-term rate shock.<sup>15</sup> These results appear broadly in line with the anecdotal evidence on capital flows following the “QE tapering” shock of May 2013, which showed that, in many EMEs, the retrenchment of foreign investors was partially offset by asset repatriation by residents.

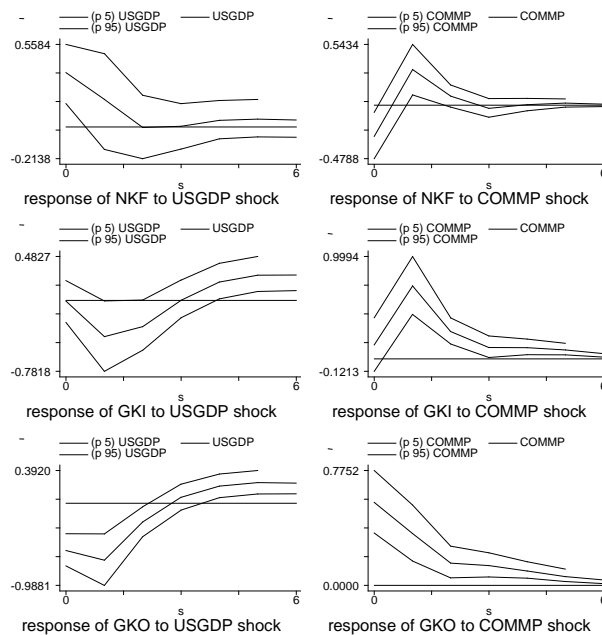
<sup>15</sup> Interpreting this result is not straightforward and goes beyond the scope of this paper. The decline in gross inflows is as expected, as foreign investors pull off from EMEs in light of the change in interest rate differentials. Why local investors behave asymmetrically reducing their holdings of net foreign assets is less clear. While home bias or heterogeneity in investors’ assessments of asset valuations may be possible explanations, it is not obvious why they do not play a role in case of a short-term rate shock. A glance at the dynamics of the responses may shed some light. While the decline in gross outflows occurs with a lag (starting two quarters after the shock), the drop in gross inflows starts in the same quarter of the shock. This may be consistent with foreign investors reacting promptly to the change in interest rate differentials, typically associated with local currency depreciation and drops in the price of local assets, which may subsequently induce local investors—focused on the domestic purchasing power of their wealth—to repatriate foreign assets in order to ‘lock-in’ valuation gains.

Controlling for U.S. GDP growth in the model ensures that the estimated effects discussed above reflect those of pure U.S. interest rate shocks, rather than the endogenous response of interest rates to U.S. output shocks. These can be interpreted as unexpected changes in markets' expectations about the path of monetary policy rates, either because of surprises in inflation or changes in perceptions about the Fed's 'reaction function'. This is a key point, especially in assessing the effect of QE tapering on capital flows in the current juncture. In this context, whether the rise in interest rates reflects improved economic conditions in the U.S. or a pure monetary policy shock could have very different implications in terms of the impact on capital flows to EMEs. In this regard, although not the main focus of the paper, an interesting result from the estimated PVAR model is that net capital inflows to EMEs respond positively to a positive disturbance to U.S. GDP growth. This occurs despite the associated increase in the U.S. interest rate (Figure 5), suggesting that the effect through real linkages outweighs the impact through financial channels. Furthermore, a positive response of net flows reflects a repatriation of external assets by residents that is larger than the fall in non-resident capital inflows. This finding suggests that a normalization of U.S. monetary policy that occurs primarily as a result of an improving growth outlook would have only a moderate impact on EMEs.

Finally, we also find that a positive shock to international commodity prices tends to have a positive impact on gross capital inflows (foreign investors increase their net purchases of domestic assets). Net inflows also increase, though to a lesser extent than gross inflows, owing to the positive response of gross outflows (residents increase their net purchases of external assets).

The results discussed above are robust to alternative specifications of the model (not presented here). Specifically, we check the results in a model with additional lags, as well as changing the ordering of the variables in the Choleski decomposition, both within the group of global variables and the gross capital flow series.

Figure 5. Response of gross capital flows to other foreign shocks



Source: Authors' calculations.

<sup>1</sup> Response to a one standard deviation shock to U.S. real GDP growth (0.6 percentage points) and commodity prices (7.5 percentage points). Time horizon in quarters.

## B. Extensions

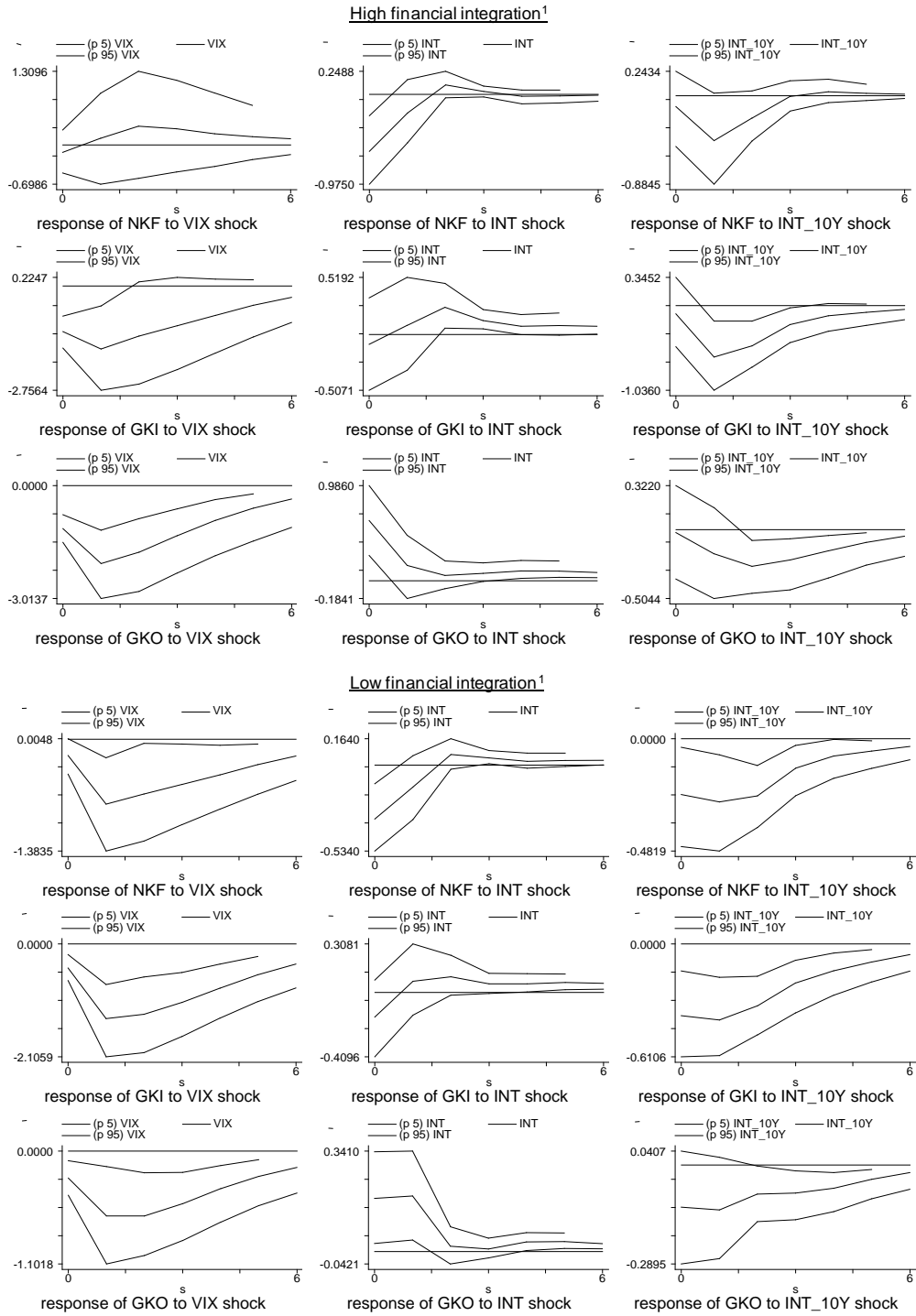
### Financial Integration

We study whether results depend on the country's degree of financial integration with the rest of the world. To this end, we split the sample in two groups based on each country's average degree of financial integration during the sample period, distinguishing those that were above or below the median value for the whole sample. Financial integration is measured as the sum of total foreign assets and foreign liabilities, in percent of GDP, using the updated version of the dataset created by Lane and Milesi-Ferretti (2007).

We find interesting differences between the more integrated and less-integrated economies (Figure 6). While global uncertainty shocks do not appear to have a statistically significant effect on net capital inflows to financial integrated EMEs, they do have a sizeable impact on the less-integrated economies. Although both groups are subject to a sharp drop in gross capital inflows, the extent of asset repatriation by local investors is much larger in the more financially-integrated economies (fully offsetting the drop in gross inflows). Short-term interest rate shocks, in turn, have a negative impact on net inflows to both groups of countries, yet the impact is larger in financially integrated economies. This mainly reflects that the increase in gross outflows tends to be larger in the more financially-integrated economies, where domestic investors appear to be highly sensitive to this type of shock. Finally, foreign investors reduce their accumulation of local assets (i.e., gross inflows decline) and local investors reduce their holdings of foreign assets (i.e., gross outflows fall) in response to a shock to the 10-year Treasury rate in both groups of countries. Gross flows appear to be, at least on impact, more sensitive in the case of the more financially-integrated economies. The offsetting effect of asset repatriation is relatively small, so net capital inflows decline in both groups of countries.

Alternatively, we split the sample using a measure of financial integration based on the degree of capital account openness, as measured by Quinn et al. (2011). The results are roughly similar (Figure 7). Uncertainty shocks do not have a significant impact on net capital flows to EMEs with more open capital accounts, as asset repatriation by residents fully offsets the drop in gross capital inflows. After short-term interest rate shocks, in contrast, there is no asset repatriation by residents, as they actually increase their purchase of foreign assets. A shock to the 10-year Treasury bond rate has a negative impact on net capital inflows, as the decline in gross outflows is not large enough to completely offset the fall in gross inflows. In economies with more capital account restrictions, we find that results are qualitatively similar but entailing much smaller magnitudes in the response of both gross inflows and outflows, as expected given the partial restrictions on capital mobility.

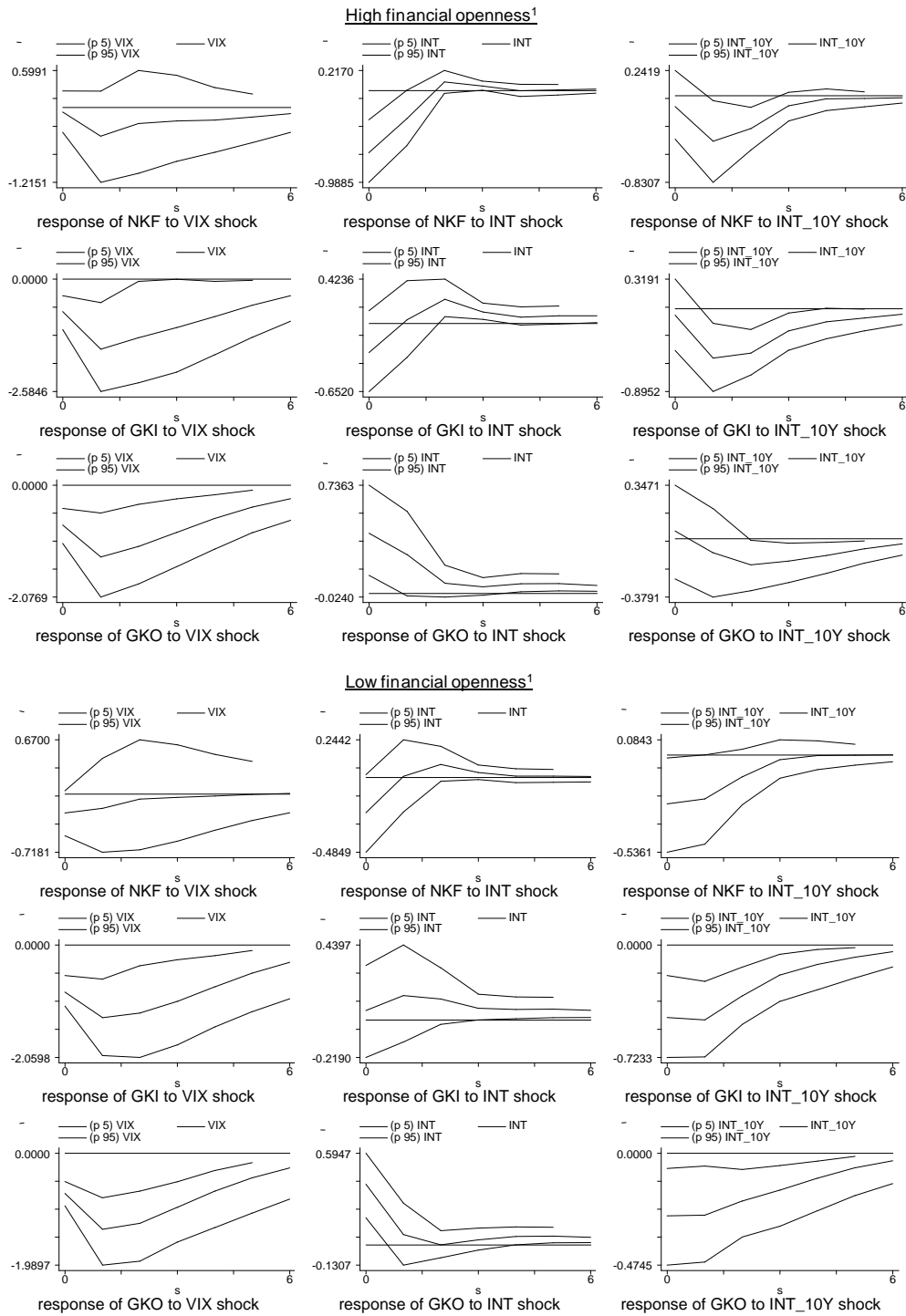
Figure 6. Response of capital flows to global financial shocks: the role of financial integration



Source: Authors' calculations.

<sup>1</sup> Based on measures of foreign assets and liabilities, in percent of GDP, from Lane and Milesi-Ferretti (2007) updated dataset.

Figure 7. Response of capital flows to global financial shocks: the role of capital account openness



Source: Authors' calculations.

<sup>1</sup> Based on overall index of capital account openness, as measured by Quinn et al (2011).



## Types of Flows

Next, we examine the response of different types of capital flows to global shocks. With this aim, we break up the series of net and gross flows into their FDI and non-FDI components. We find qualitatively similar responses for both types of flows to global uncertainty shocks (Figure 8), but—as expected—much larger sensitivities in the case of non-FDI flows (mainly portfolio and other debt flows).<sup>16</sup> The response of non-FDI (gross and net) flows to a U.S. short-term interest rate shock is similar to that of total flows, with declines in gross inflows and increases in gross outflows. However, the impact of such shocks on FDI (gross and net) inflows appears to be insignificant. The impact of a shock to the U.S. 10-year interest rate on non-FDI (gross and net) flows is similar to that on total flows. Both net and gross inflows decline, while gross outflows also fall—although the magnitude of asset repatriation is relatively small. The sensitivity of FDI gross flows to a shock to the 10-year rate is much lower, with the impact on net flows being insignificant. The responses of the two types of flows to U.S. growth shocks are also different (Figure A2.2 in Appendix 2). While improvements in economic activity in the U.S. appear to induce non-FDI net inflows to EMEs, the response of net inflows of FDI is negative. Finally, both FDI and non-FDI net and gross inflows react positively to increases in commodity prices.

## Regional Perspective

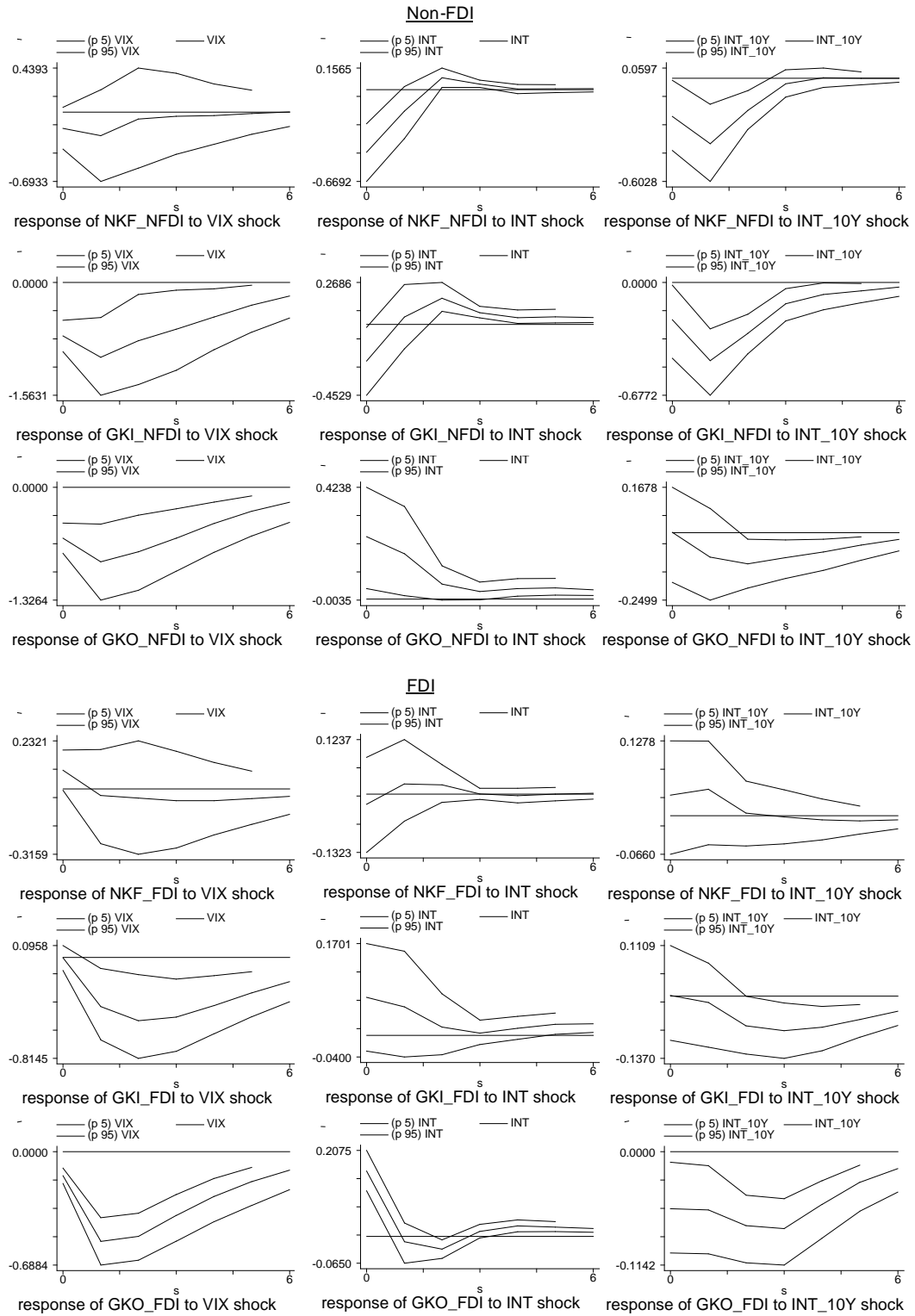
We also explore potential differences across regions by splitting the sample into four EM regions: Asia, Europe, Latin America, and others. Qualitatively, the main results of the benchmark specification hold for the most part for all regions. There are, however, differences across them in terms of the magnitude of the impact of the shocks analyzed (Figure 9). Most interesting to note is:

- i. Global uncertainty shocks appear to have a particularly large impact on net inflows to Latin American (and to a lesser extent Asian) EMEs. This reflects a sizable decline of gross inflows (twice as large as in the benchmark specification), only partially compensated by asset repatriation by residents. In emerging Europe, in contrast, the effect on both gross and net inflows is not significant.
- ii. The negative impact of U.S. short-term interest rate shocks on net flows appears to be (qualitatively) more uniform across regions, although it is considerably larger in emerging Europe. In this region, the sharp decline is mostly driven by the large fall in gross inflows (the increase in gross outflows by local investors also contributes but to a much lesser extent). On the other hand, in Asia and Latin America the decline in net inflows is largely explained by increases in foreign asset accumulation by residents.
- iii. A shock to the U.S. 10-year interest rate has a negative impact on net capital inflows in all EM regions, except in Emerging Europe. The fall in net flows is especially large in Latin America, reflecting a substantial decline in gross inflows that is not offset by the decline in gross outflows. Interestingly, only in this region (and to a lesser extent in Asia) local investors respond to shocks to the U.S. 10-year rate by repatriating foreign assets.

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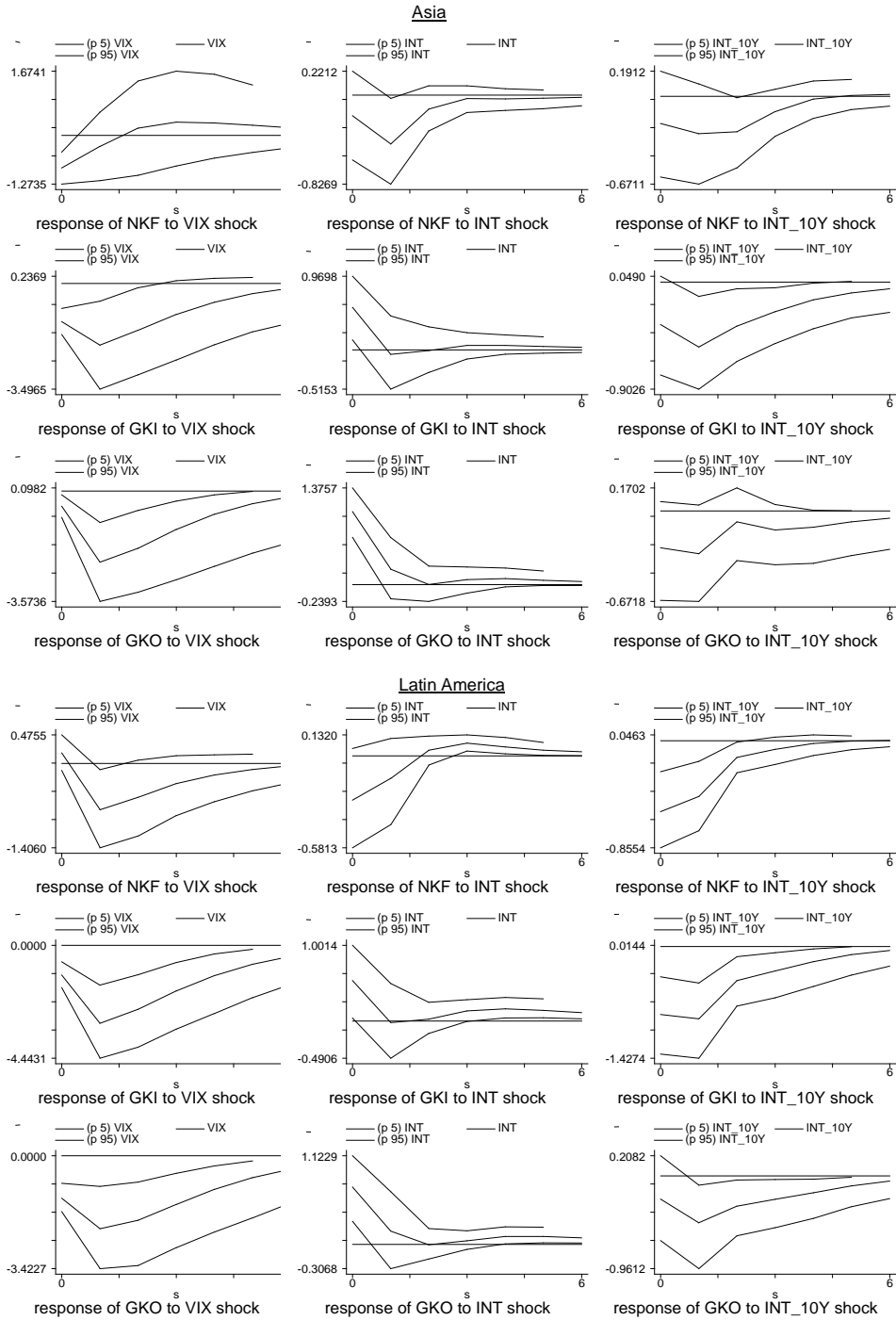
<sup>16</sup> A breakdown of non-FDI flows into portfolio and other debt creating flows is not possible given data inconsistencies in some countries in the earlier part of our sample.

Figure 8. Response of capital flows to global financial shocks: type of flows



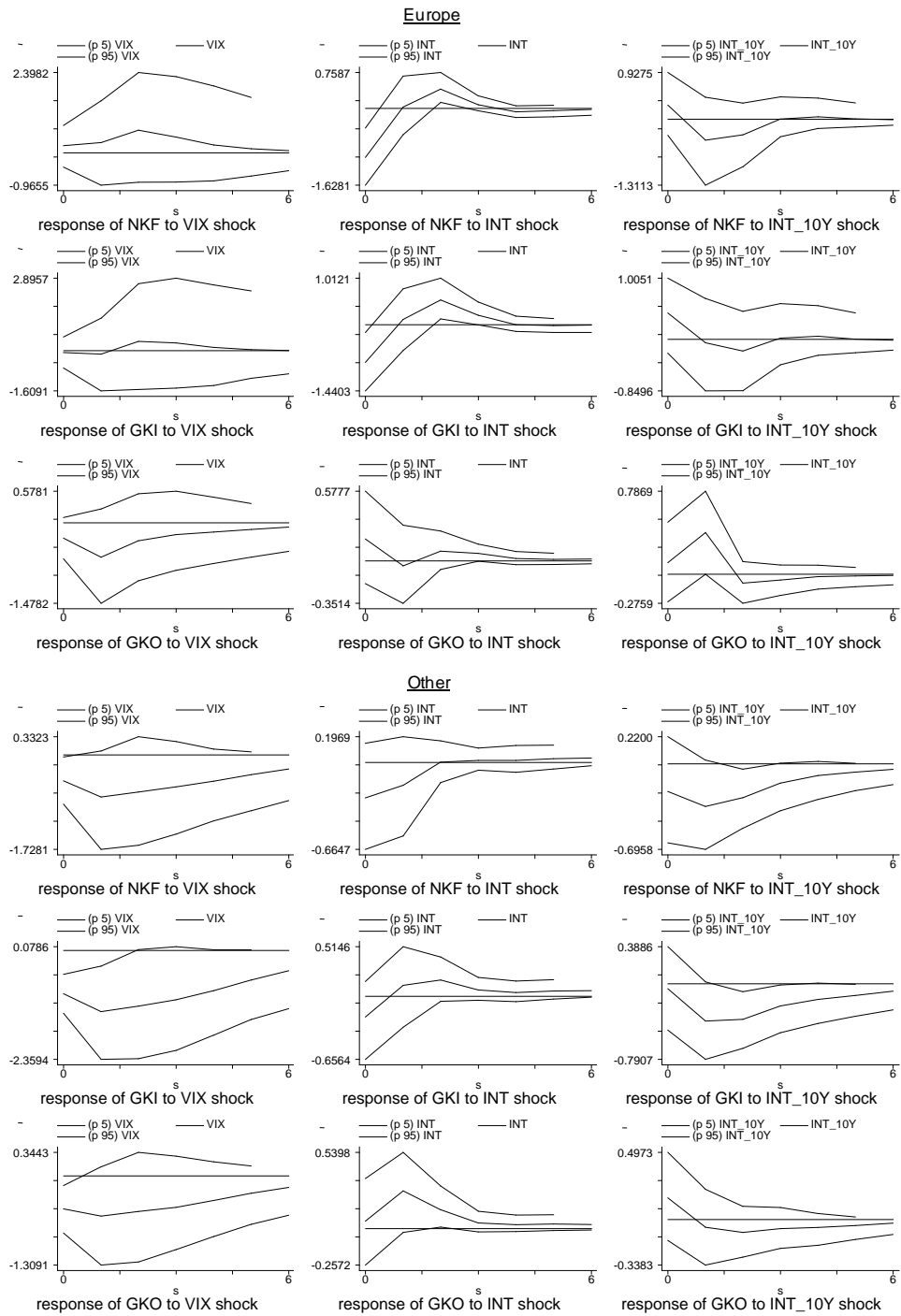
Source: Authors' calculations.

Figure 9. Response of capital flows to global financial shocks: A regional perspective<sup>1</sup>



Source: Authors' calculations.  
<sup>1</sup> See list of countries in Appendix table A1.

Figure 9. Response of capital flows to global financial shocks: A regional perspective<sup>1</sup> (cont.)



Source: Authors' calculations.  
<sup>1</sup>See list of countries in Appendix table A1.

#### IV. CONCLUSIONS

The paper studied the dynamic response of gross capital flows in EMEs to different global financial shocks, with a focus on the possible stabilizing role played by domestic investors in offsetting the behavior of foreign investors. We find evidence of such role, but its existence and magnitude depend on the type of shock.

Local investors appear to offset the behavior of non-residents in the face of global uncertainty shocks, as well as shocks to long-term U.S. interest rates. In the former case, sizeable asset repatriations largely offset the retrenchment of non-residents, except in Latin America. In this region, global uncertainty shocks appear to have a particularly large negative impact on net inflows, reflecting a sizable decline of gross inflows (twice as large as in the other EMEs) which is only partially offset by residents' asset repatriation. In the case of long-term U.S. interest rates shocks, the offsetting effect is much more limited (with shocks causing net outflows from EMEs). In the case of short-term U.S. interest rate shocks, on the other hand, residents and non-resident appear to behave alike (shifting capital towards higher interest rates), although magnitudes appear to be economically moderate.

These results suggest that, while increased financial integration over the last two decades may have raised EME's exposure to global financial shocks, increased foreign asset holdings are likely to play an important—although not complete—stabilizing role. Our findings also have important implications for assessing the possible impact of the Fed's exit from QE going forward. In particular, we find that a rise in long-term U.S. interest rates would have only moderate effects on capital flows to EMEs if it is mainly driven by positive developments in U.S. economic activity. If, in contrast, the rise largely reflects a pure U.S. interest rate shock, the impact would be more sizable, as asset repatriation would only play a partial stabilizing role.

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## Appendix 1. A Simple Event Analysis

As a first attempt to explore the potential impact of these shocks on capital flows to EMEs, a simple event analysis is performed. We study net and gross capital flows for a sample of 38 EMEs, centering them at the quarter of the largest variation of the VIX, the U.S. Federal Fund rate, and the U.S. 10-year Treasury bond interest rate within the shock episodes depicted in Figure 1 (Table A.1.1 presents the details about the episodes).<sup>17</sup> Our focus is primarily on adverse shocks (i.e., sharp increases in each of these variables). Flows are demeaned to exclude possible country-specific level effects.

**Table A1. Episodes of Global Financial Shocks, 1990-2012<sup>1</sup>**

VIX shocks						U.S. Fed Funds interest rate shocks						10-year U.S. Treasury bond interest rate shocks					
Episode		VIX level				Episode		Fed Fund rate level				Episode		10-year rate level			
start	end	1	avg.	peak	end+1	start	end	start-1	avg.	peak	end+1	start	end	start-1	avg.	peak	end+1
1990q1	1990q4	9.6	23.0	26.0	22.3	1994q2	1995q2	-0.1	1.6	2.9	2.5	1994q2	1994q4	2.9	3.9	4.1	4.0
1997q4	1997q4	22.5	27.4	27.4	21.3	2000q3	2001q1	2.4	3.3	3.4	1.5	1999q2	2000q1	2.2	2.9	3.2	2.9
1998q3	1999q1	21.5	28.9	29.9	24.4	2004q4	2006q1	-1.4	0.9	2.7	2.1	2005q4	2006q2	1.9	2.1	2.4	2.4
2002q3	2003q1	21.8	31.9	35.1	21.5												
2008q4	2009q2	25.1	45.6	58.7	25.5												
2011q3	2011q4	17.4	30.1	30.3	18.3												

Source: Authors' calculations.

<sup>1</sup> Based on quarterly averages. In percent, except for the VIX index.

This simple exercise fails to unveil any discernible pattern (Figure A.1.1), except in the case of uncertainty shocks. Spikes in global uncertainty appear to affect capital flows to EMEs significantly, with a marked deceleration in net inflows (upper left chart). The decline in net inflows is largely driven by the behavior of gross inflows, which display a sizeable reversal during these episodes. Gross outflows, on the other hand, appear to play a meaningful offsetting role only in some cases (as illustrated by the drop in the line corresponding to the 25<sup>th</sup> percentile). Furthermore, there is no evidence of acceleration in gross outflows, pointing to an asymmetric behavior of residents, who do not exacerbate reversals in gross capital inflows, and in some cases help to offset them.

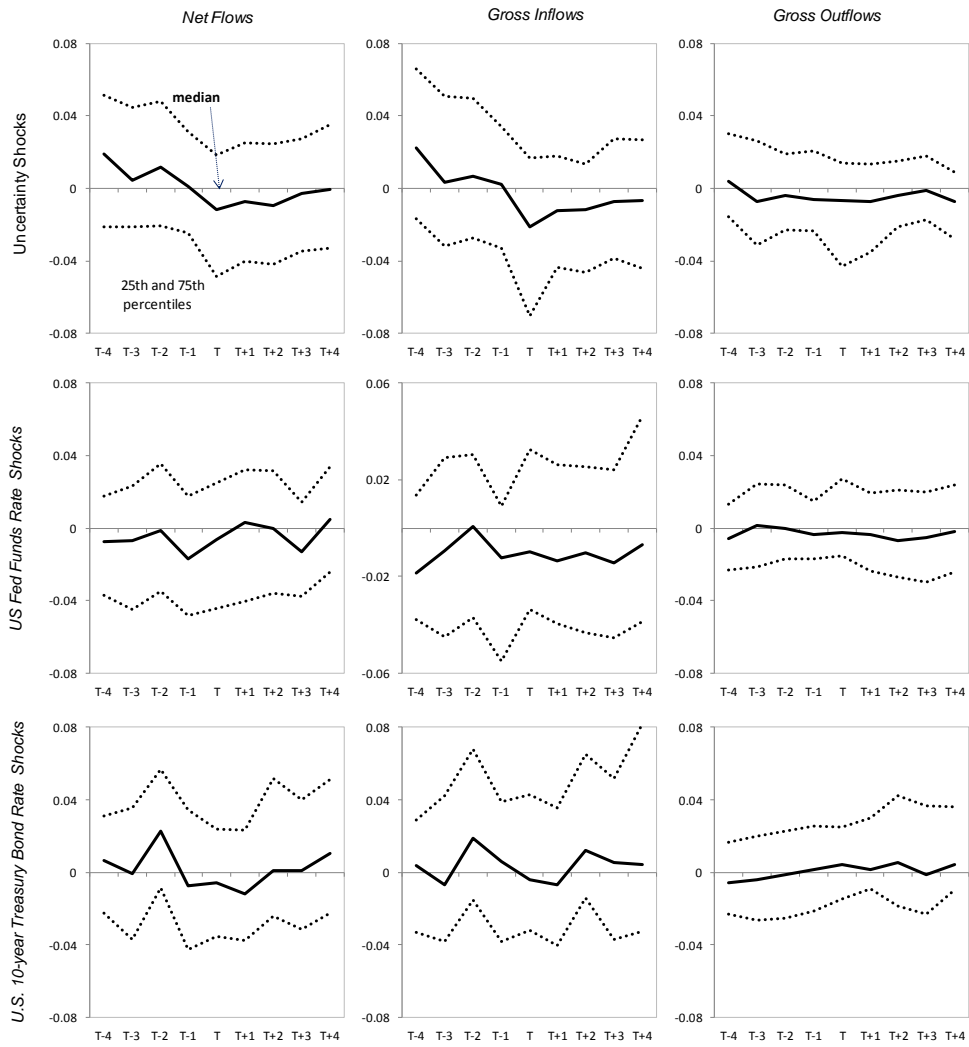
In the case of (U.S.) interest rate shocks (both short- and long-term rates), interestingly, we find no clear pattern for the response of capital flows.<sup>18</sup> This is likely to reflect the joint occurrence of shocks, as global financial conditions are typically highly correlated with economic activity and commodity prices—Figure A1.5. The latter stresses the importance of disentangling the effect of financial shocks from other (real) external shocks in a multivariate setting. It should be noted that such correlation is also relevant in the case of uncertainty (VIX) shocks. However, while in the latter cases the effect of economic activity and financial shocks on EMEs' flows are likely to be of the same sign (with weaker economic activity as well as distress in global financial markets affecting flows to EMEs negatively), this is unlikely to be the case for U.S. interest rate shocks.

<sup>17</sup> See the list of countries in Table A2.1 in Appendix 2.

<sup>18</sup> These results hold, broadly, across different EM regions (Figures A1.2-A1.4).



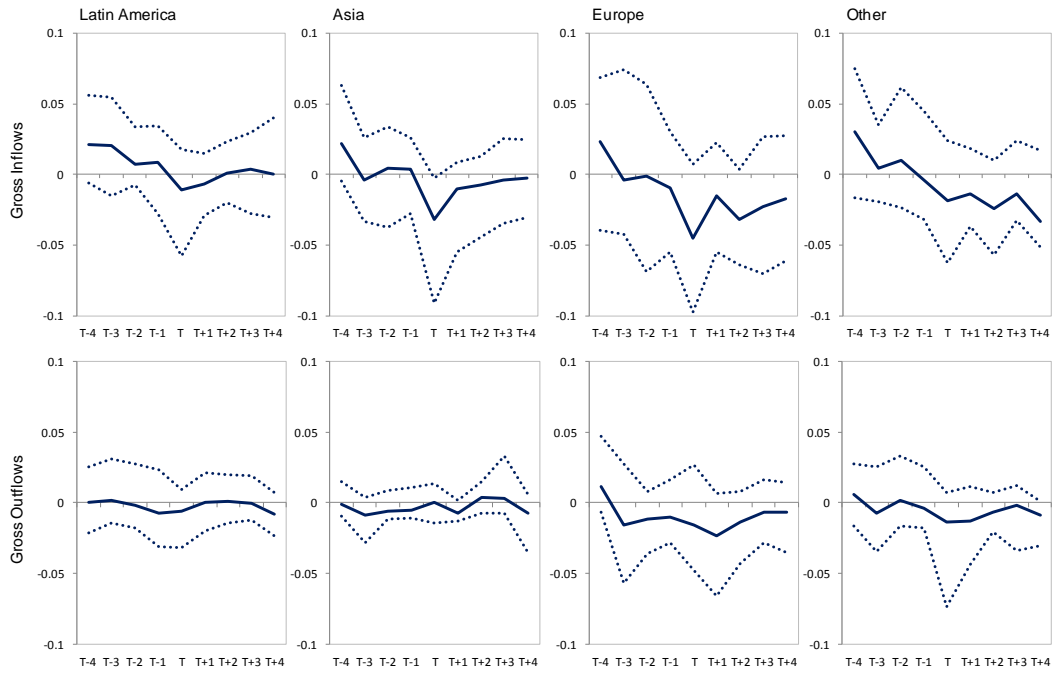
**Figure A1.1. Capital Flows to Emerging Markets around Negative Global Financial Shock Episodes<sup>1</sup>**  
*(Percent of GDP)*



Sources: IMF's Balance of Payments Statistics and authors' calculations.

<sup>1</sup> Negative episodes refers to *increases* in global uncertainty or interest rates. Demeaned series. Gross outflows (inflows) refer to asset (liability) side flows—i.e., positive numbers denote outflows (inflows).

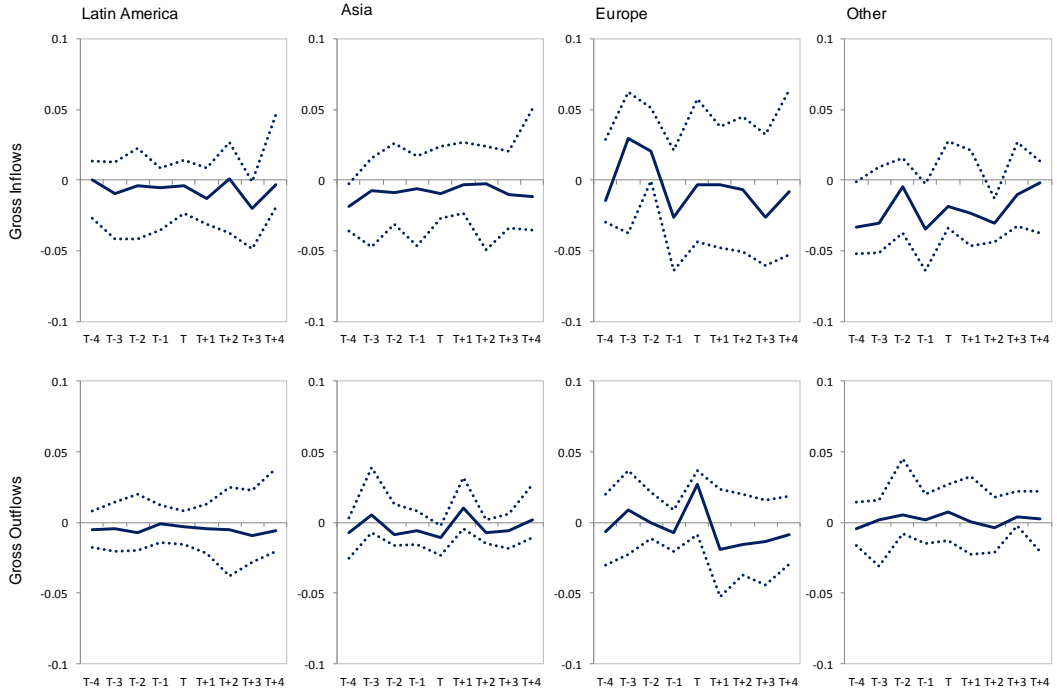
**Figure A1.2. Capital Flows to Emerging Markets around Global Uncertainty Shock Episodes<sup>1</sup>**  
(Percent of GDP)



Source: IMF's *Balance of Payments Statistics*; and authors' calculations.

<sup>1</sup> De-meaned series. Gross inflows refer to liability side flows (positive numbers denote inflows, i.e. increase in liabilities)

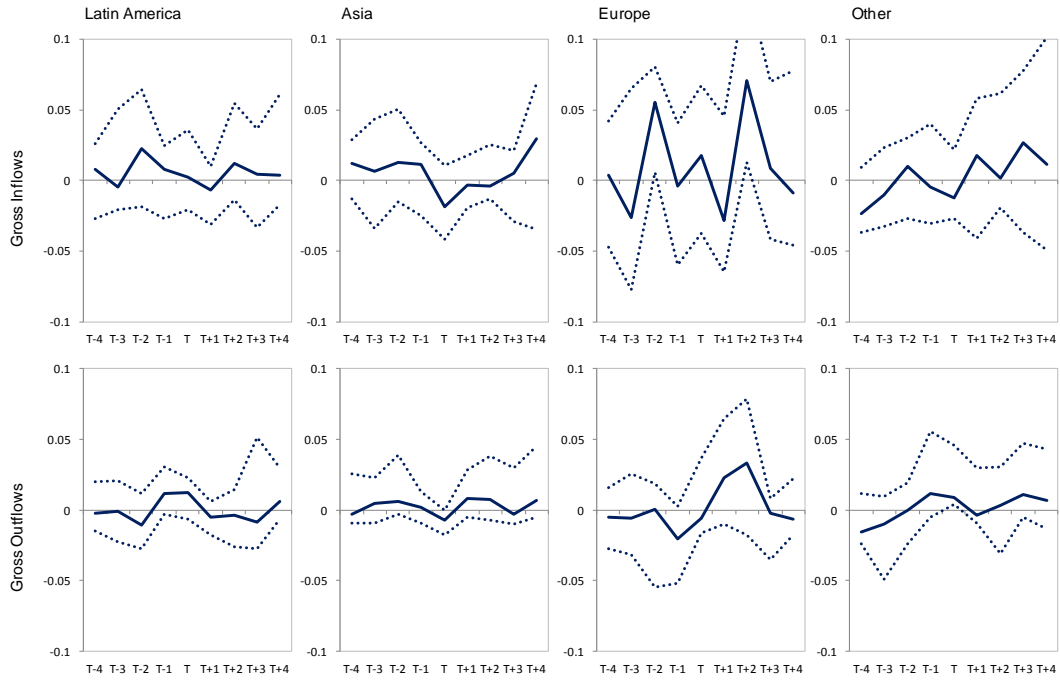
**Figure A1.3. Capital Flows to Emerging Markets around Fed Fund Rate Shock Episodes<sup>1</sup>**  
(Percent of GDP)



Source: IMF's *Balance of Payments Statistics*; and authors' calculations.

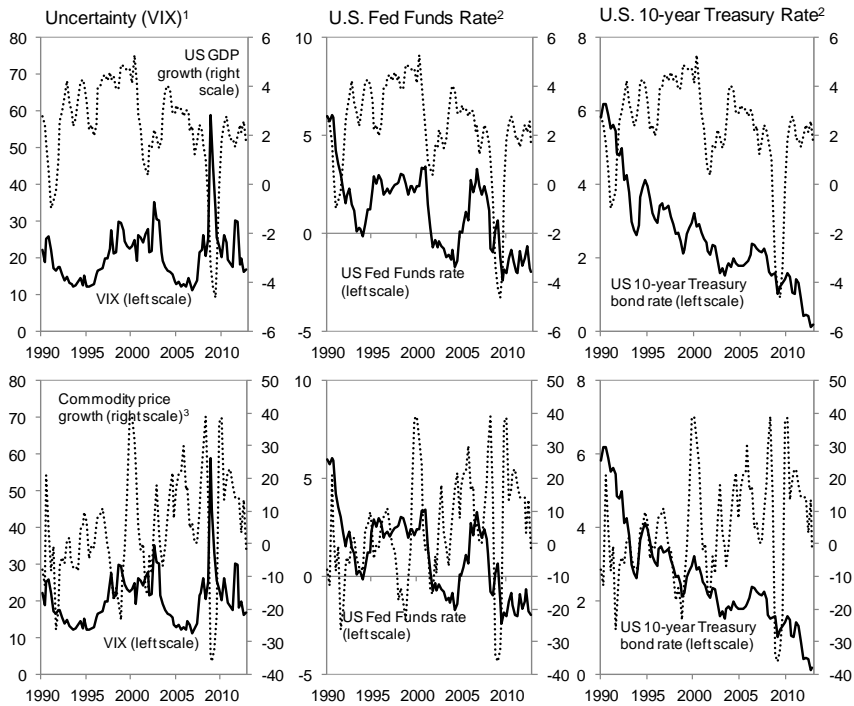
<sup>1</sup> De-meaned series. Gross inflows refer to liability side flows (positive numbers denote inflows, i.e. increase in liabilities)

**Figure A1.4. Capital Flows to Emerging Markets around US 10-year Interest Rate Shock Episodes<sup>1</sup>**  
(Percent of GDP)



Source: IMF's *Balance of Payments Statistics*; and authors' calculations.  
<sup>1</sup> De-meaned series. Gross inflows refer to liability side flows (positive numbers denote inflows, i.e. increase in liabilities)

**Figure A1.5. Global Financial Conditions, U.S. Output, and Commodity Prices, 1990–2012**  
(Percent, unless otherwise stated)



Sources: Haver Analytics; and Cleveland Federal Reserve.  
<sup>1</sup> Chicago Board Options Exchange Market Volatility Index.  
<sup>2</sup> Real interest rates based on forward-looking (1 and 10 year) inflation expectations.  
<sup>3</sup> IMF broad commodity price index. Annual percentage change.

## Appendix 2. Additional Tables and Figures

**Table A2.1. List of Variables**

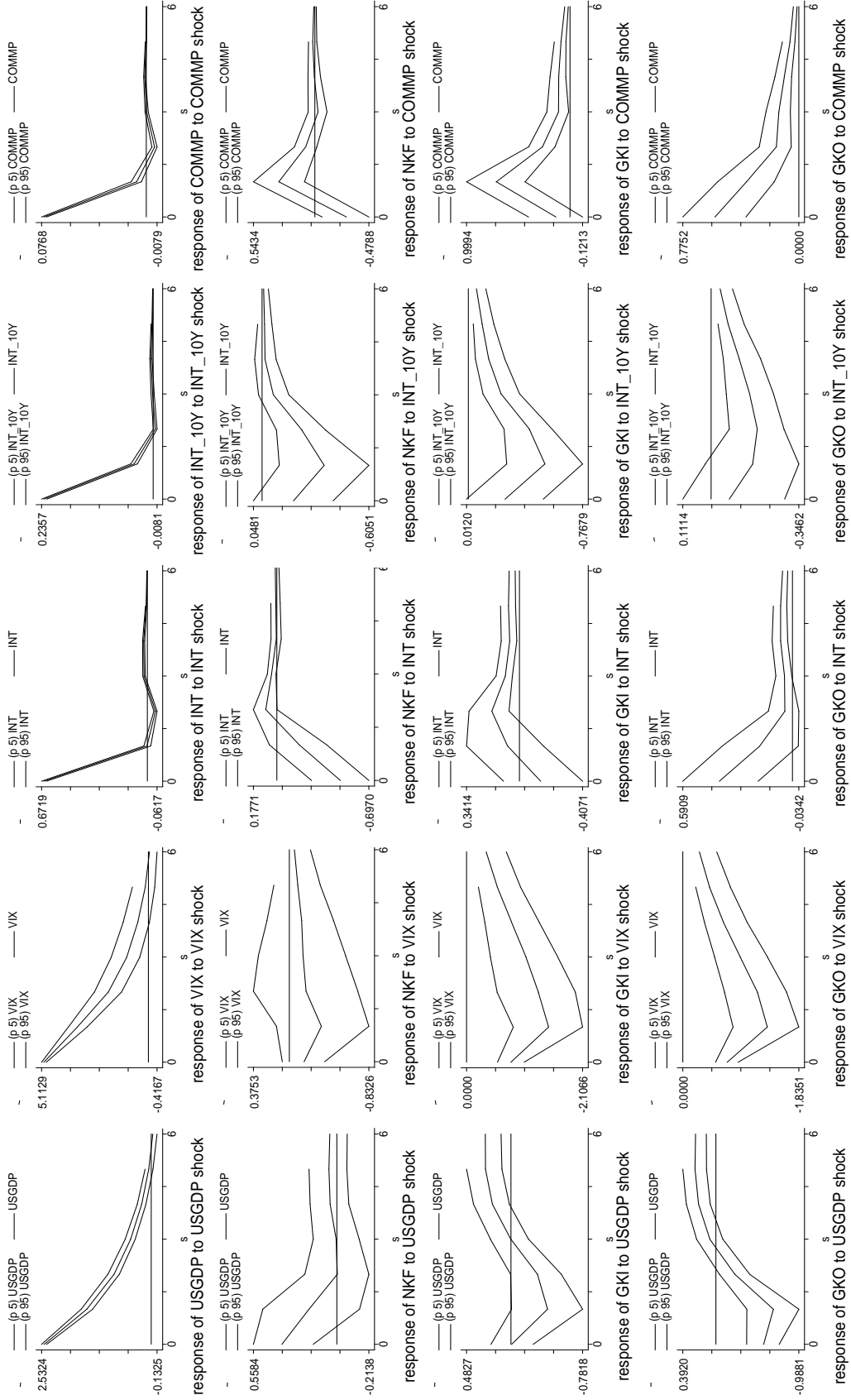
Abbrev.	Definitions	Details	Sources
GKI	Gross capital inflows	Total liabilities in terms of trend nominal GDP in dollar: (FDI_Liab + PI_Liab + OI_Liab)/GDP; Forward demeaned (Helmert transformation).	IMF's Balance of Payment BP6TS, and authors' calculations.
GKO	Gross capital outflows	Total Assets in terms of trend nominal GDP in dollar: (FDI_Assets + PI_Assets + OI_Assets)/GDP; Forward demeaned (Helmert transformation).	IMF's Balance of Payment BP6TS, and authors' calculations.
NKF	Net capital Flows	Net liabilities flows in terms of trend nominal GDP in dollar : GKI - GKO; Forward demeaned (Helmert transformation).	IMF's Balance of Payment BP6TS, and authors' calculations.
GKO_FDI	Direct investment abroad	Net acquisition of financial assets : FDI, in terms of trend nominal GDP in dollar; Forward demeaned (Helmert transformation).	IMF's Balance of Payment BP6TS, and authors' calculations.
GKI_FDI	Direct investment in reporting countries	Net incurrence of financial liabilities: FDI, in terms of trend nominal GDP in US\$; Forward demeaned (Helmert transformation).	IMF's Balance of Payment BP6TS, and authors' calculations.
NKF_FDI	Net Foreign Direct Investment	Net FDI in terms of trend nominal GDP in dollar: GKI_FDI - GKO_FDI; Forward demeaned (Helmert transformation).	IMF's Balance of Payment BP6TS, and authors' calculations.
GKO_FDI	Non Foreign Direct Investment assets	Net acquisition of financial assets portfolio investment and other investment, in terms of trend nominal GDP in US\$. Forward demeaned (Helmert transformation).	IMF's Balance of Payment BP6TS, and authors' calculations.
GKI_FDI	Non Foreign Direct Investment liabilities	Net incurrence of financial liabilities: portfolio investment and other investment, in terms of trend nominal GDP in US\$. Forward demeaned (Helmert transformation).	IMF's Balance of Payment BP6TS, and authors' calculations.
NKF_FDI	Net Non Foreign Direct Investment	Net Non-FDI, in terms of trend nominal GDP in US\$: GKI_NFDI - GKO_NFDI; Forward demeaned (Helmert transformation).	IMF's Balance of Payment BP6TS, and authors' calculations.
GDP	Nominal detrend GDP, in USD	Hodrick–Prescott filter.	IMF WEO
VIX	VIX	Forward demeaned (Helmert transformation).	WSJ
INT	Real Federal Fund rate	Federal Fund rate deflated by expected inflation.	IFTS, Cleveland FED
INT_10Y	Real 10 year US government bonds	10-year US Treasury bond interest rate deflated by 10-year inflation expectations.	IFTS, Cleveland FED
COMMP	Broad Index of real commodities prices	Forward demeaned by Helmert transformation.	WEO
USGDP	Real US GDP Growth	Forward demeaned by Helmert transformation.	WEO
Dum_IIP	Degree of financial integration based on International investment position (IIP)	Take value 1 if IIP in terms of GDP of the country is greater than or equal to the median of the sample.	Lane and Milesi-Ferretti updated database
Dum_kapoen	Net degree of openness on net capital account	Take value 1 if the degree of openness is greater than or equal to the median of the sample, if more open.	Chinn-Ito Index
Dum_kao	Degree of openness on capital outflows	Take value 1 if the degree of openness is greater than or equal to the median of the sample, if more open.	Chinn-Ito Index
Dum_kai	Degree of openness on capital inflows	Take value 1 if the degree of openness is greater than or equal to the median of the sample, if more open.	Chinn-Ito Index

**Table A2.2. Sample of Countries<sup>1</sup>**

IFS code	Name	IFS code	Name
213	Argentina	273	Mexico
911	Armenia	686	Morocco
913	Belarus	728	Namibia
223	Brazil	564	Pakistan
918	Bulgaria	283	Panama
228	Chile	288	Paraguay
924	China, P.R.: Mainland	293	Peru
233	Colombia	566	Philippines
238	Costa Rica	964	Poland
960	Croatia	968	Romania
258	Guatemala	922	Russian Federation
944	Hungary	456	Saudi Arabia
534	India	199	South Africa
536	Indonesia	578	Thailand
439	Jordan	186	Turkey
916	Kazakhstan	926	Ukraine
941	Latvia	298	Uruguay
946	Lithuania	299	Venezuela, R.B.
962	Macedonia	582	Vietnam
548	Malaysia		

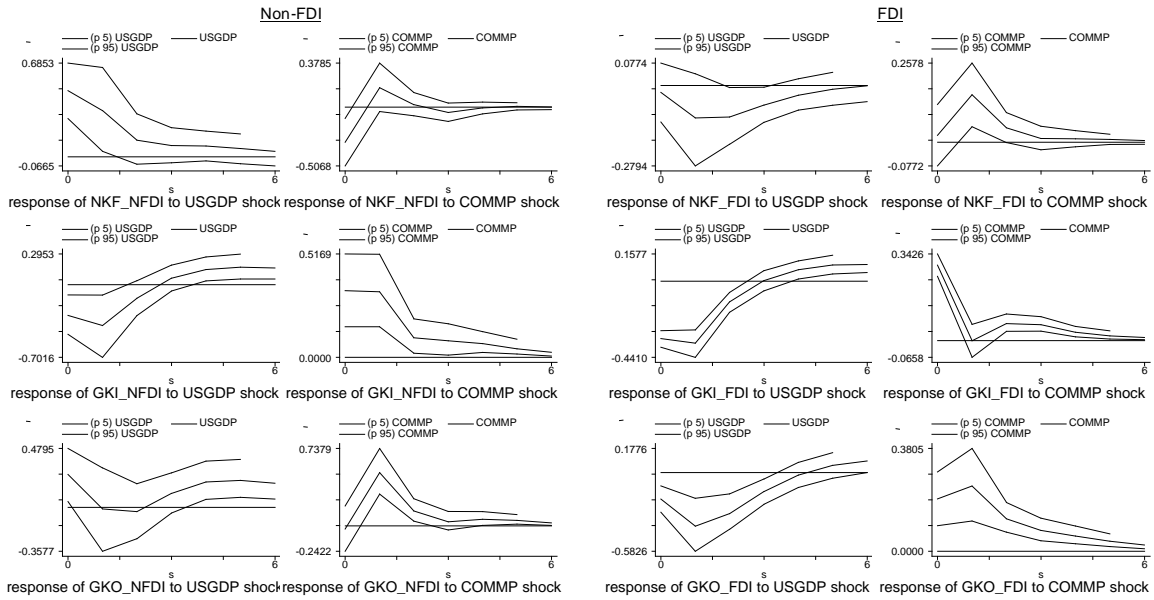
<sup>1</sup> Includes countries classified as emerging and developing countries according to the IMF's World Economic Outlook classification.

Figure A2.1. Benchmark model: Impulse Responses



Source: Authors' calculations.

Figure A2.2. Response of gross capital flows to other foreign shocks: Types of flows



Source: Authors' calculations.

<sup>1</sup> Response to a one standard deviation shock to U.S. real GDP growth (0.6 percentage points) and commodity prices (7.5 percentage points). Time horizon in quarters.