Capital Flow Management Measures and Monetary Policy Shocks *

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Abstract

We study the effectiveness of capital flow management measures (CFMs) in curbing the capital flows' fluctuations in Emerging Market Economies (EMEs) caused by monetary policy shocks. In particular, we examine i) the extent to which CFMs mitigate the impact of US monetary shocks, and ii) whether the mitigating effect differs between net capital flows and gross capital flows. Our results, based on local projection panel estimations for the period 2000-2018, indicate that CFMs effectively reduce the fluctuations of both gross capital inflows and outflows when there are monetary policy shocks from the US. Our findings also show that the effect in gross flows is greater than in net flows. In contrast to the effects in gross flows, the mitigating effects on net flows are ambiguous in most specifications.

JEL Codes: F32, F38, G18, H23

Key words: Capital Flow Management, Gross Capital Flows, Global Financial Cycle

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1 Introduction

In the aftermath of the Global Financial Crisis (GFC), capital flow management policies have been widely employed in emerging market economies (EMEs) to mitigate the impact of external shocks.[1] Accordingly, many empirical studies have been undertaken to assess the effectiveness of these policies. Although mixed, the results generally suggest that capital flow management measures (CFMs) lower EMEs exposure to external shocks (Kokenyne and Baba, 2011; Ahmed and Zlate, 2014; Forbes, Fratzscher, and Straub, 2015; Akinci and Olmstead-Rumsey, 2018). Similarly, Erten, Korinek, and Ocampo (2021) suggest that recent estimations show that "a tightening in capital controls reduces financial fragility indicators such as bank leverage, bank credit, and exposure to portfolio liabilities" (p. 76).[2]

In a similar vein, we try to answer two questions with this paper: 1) how effective are CFMs on curbing the international capital flows' cycles, and 2) whether there is a meaningful difference between the effect of CFMs on gross flows and that on net flows. The second question is motivated by the growing interest of the literature on the differential role of gross capital flows in policy design and macroeconomic outcomes. Based on recent literature (e.g., Forbes and Warnock, 2012; Broner, Didier, Erce, and Schmukler, 2013; Cavallo, 2019), overseas investment of domestic agents (i.e., gross outflows) increased significantly in EMEs since the 2000s, indicating the need to distinguish gross outflows from gross inflows. This trend can be also found in the selected economies as shown in Figure 1.[3] On the other hand, another relevant feature (visible in the figure), is that the movements in gross outflows and inflows tend to move in opposite directions (have a negative covariance), which is translated in a lower variance of the resulting net flows and could lead to underestimating the role and effects or policies targeting this latter variable. We examine whether the characteristics abstracted from analyses based on net flows become relevant when we focus separately on each type of gross flows.

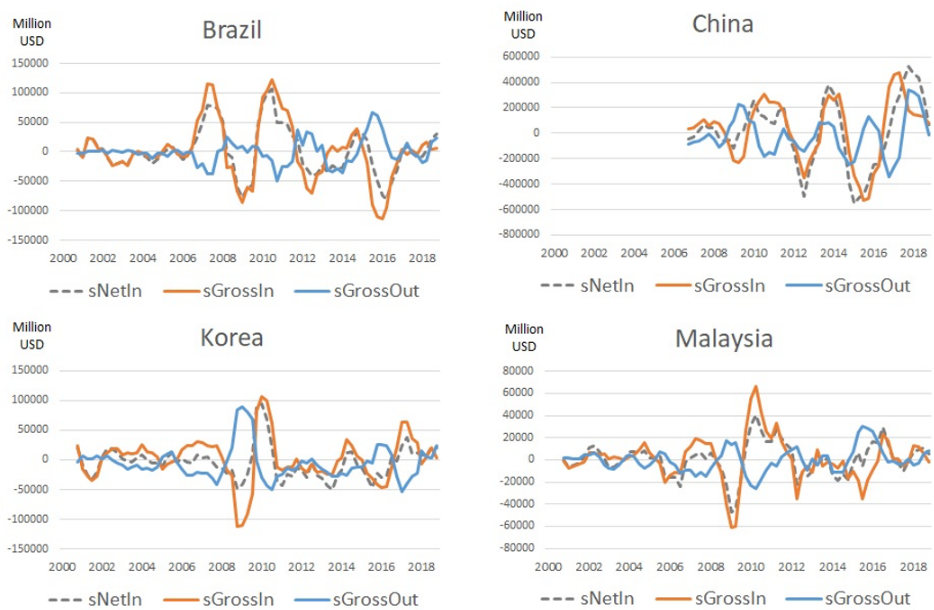
To address these questions, we construct a quarterly panel dataset for 32 economies that have employed CFMs during 2000-2018, and assess, based on local projections (Jordà, 2005; Coman and Lloyd, 2022), whether CFMs can offset the effects of US monetary shocks on both net and gross flows. We focus on the effect of US monetary policy shocks on the capital flows and compare how these are different in the presence of CFMs. We find that CFMs do mitigate the impact of the shock on capital flows and that these offsetting effects are more clearly shown

[1] According to the IMF 2019 Taxonomy of Capital Flow Management Measures (IMF, 2019), 36 economies have introduced capital flow management policies since 2000. See Appendix A for the list of economies and Appendix B for the time trends of the implementations.

[2] On the other hand, empirical studies using annual data sources such as Magud, Reinhart, and Rogoff (2018) and Reinhart and Smith (2002) often find no significant evidence that capital controls are effective in reducing capital flows. It can be argued against these studies that the introduction of capital controls during a specific month may not be captured by annual data. See Erten, Korinek, and Ocampo (2021).

[3] The details of how capital flows are constructed are presented in the data description section.

with gross inflows and outflows,whereas, in contrast, they are somewhat ambiguous with net flows. The directions of CFMs' mitigating effects are largely similar in most local projection estimations with some exceptions.[4] The results are robust to other alternative specifications, for example, with different control variables or different length of lagged terms.



Source: IMF - International Finance Statistics.

Figure 1: Net and Gross Capital Flows in selected economies

These results add further evidence to the empirical literature on CFMs. Broadly speaking, we contribute to the literature on the policies' effectiveness vis-à-vis external shocks. In particular, our result complements the research on the impact of US monetary policy shocks on EMEs, which tend to be more vulnerable relative to advanced economies (e.g., Kalemli-Ozcan, 2019). The spillovers from the US monetary shocks into EMEs has drawn much attention after the GFC. Rey (2015), for example, notes that countries with both fixed and flexible exchange rate regimes are affected by the global financial cycle and calls this phenomenon a dilemma between monetary policy independence and international capital flows. In other words, EMEs can have independent monetary policies only when they manage actively their international capital flows with CFMs (among other additional tools).

Our findings also support recent studies showing that CFMs effectively guard against financial turmoil and that countries with tighter measures are less affected by external shocks. Coman and Lloyd (2022) use the dataset constructed by Cerutti, Correa, Fiorentino, and

[4] By using sub-indexes of CFMs, for example, we find that CFMs on inflows not only mitigate the fluctuation of gross inflows but also gross outflows.

Segalla (2017) to find that prudential policies in EMEs can offset negative spillovers from the US monetary policy, suggesting that such policies can help EMEs maintain their monetary policy autonomy in the face of the global financial cycle. They also find that specific prudential policies such as loan-to-value (LTV) ratio limits and reserve requirements are the most effective tools to reduce the spillover effects on EMEs. In a similar vein, Ahmed and Zlate (2014) estimate, based on a sample for the period 2002-2013, that capital controls introduced after 2009 have significantly discouraged net capital inflows to EMEs in terms of both total and portfolio capital flows. Finally, Akinci and Olmstead-Rumsey (2018) conclude, based on an index of macroprudential policy in 57 economies for the period 2000-2013, that tighter macroprudential measures are associated with lower growth in bank credits.

On the other hand, we also consider the special role of gross capital flows on intermediating the effects of global shocks on EMEs. In that sense, it builds on the literature emphasizing the distinction between gross capital inflows and outflows, such as Cavallo, Izquierdo, and León (2017) and Davis and Van Wincoop (2018). The former authors, for example, argue that sudden stops in net capital inflows can be prevented if a repatriation of domestic investors' overseas investment can offset a reduction in foreign lending to the domestic economy. Similarly, the IMF (2013) points out that EMEs can be resilient against global financial cycle when they are able to mitigate the impact of foreign gross inflows with domestic gross outflows. We contribute to these findings by examining whether the effectiveness of CFMs against external shocks differ by type of capital flows (net and gross).

The remainder of this paper is organized as follows. Section 2 explains the panel dataset. Section 3 describes the local projection methodology. The results are shown in section 4 and robustness checks are presented in the Section 5. Finally, we conclude in Section 6.

2 Data description

We construct a quarterly panel dataset with 32 economies that implemented CFMs during 2000-2018 according to the IMF 2019 Taxonomy of CFMs. The sample consists mainly of emerging economies and include countries such as Brazil, China, India, Indonesia, Korea, and Russia, among others.[5] Our specifications use the net capital inflows, gross inflows, and gross outflows as dependent variables.[6] All types of capital flows are calculated using the

[5]Initially, 36 economies that introduced CFMs since 2000 are considered. However, four economies are excluded in the dataset since there was very limited data for three economies (CEMAC, Cyprus and Greece), and Seychelles did not use any CFMs until 2019. Therefore, the quarterly panel dataset for 32 economies in the periods from 2000 to 2018 is constructed for this study. See Appendix A for the full list of economies.

[6]Following Cerutti, Correa, Fiorentino, and Segalla (2017) and Cavallo, Powell, Pedemonte, and Tavella (2015) and Cavallo (2019), we measure gross capital inflows by the sum of net incurrence of liabilities, and measure gross capital outflows by the negative sum of net acquisition of assets. These series of liabilities and assets include direct investment, portfolio investment, financial derivatives and other investments (excluding reserve assets). Since gross outflows are computed with a negative sign, net capital inflows are defined as the sum of

IMF balance of payment (BoP) dataset based on Cerutti et al. (2017). Following Forbes and Warnock (2012), capital flows are smoothed out by aggregating series for four quarters (past three quarters and the current quarter), and then taking year-over-year differences. We account for the size of each economy by considering the ratio to GDP for each type of capital flow.

For independent variables, we use measures of US monetary shocks that represent a major source of international financial shocks to most economies. For the LP-OLS specification, the US monetary policy shocks are simply measured with the federal funds rates collected from the Federal Reserve Economic Data (FRED) developed by the Federal Reserve Bank of St. Louis. For the LP-IV specification, we use surprises in 3-month ahead federal funds future rates to estimate the US monetary shocks that we compute following Gertler and Karadi (2015).

We construct CFM dummy variables by collecting the data from the IMF (2019) Taxonomy of CFMs.[7] We indicate as 1 if any kind of CFM is used during the period t. If not, the variable takes the value of 0. For example, Brazil introduced CFMs by imposing a tax on external loans in January 2008, while Peru placed a reserve requirement on foreign credit lines in February 2010. Thus, CFM dummies for these periods in both countries are ones. [8]

There are two types of control variables in this study. First, the change in the Chicago Board Options Exchange Volatility Index (VIX) and US output growth rates are considered as global control variables. Second, some variables are used as country-specific control variables. For example, we collect the Industrial production (IP) indexes from the World Bank Global Economic Monitor (WB GEM) database. We also include the consumer price index (CPI), nominal foreign exchange rate relative to US dollar that we take from the IMF IFS database, and finally, we consider the domestic interest rates (3-month government bond rates) which are collected from Bloomberg.[9]

3 Empirical Strategy

The methodological framework of this study follows a lag-augmented local projection (LP) approach along the lines of Coman and Lloyd (2022) or Richter, Schularick, and Shim (2019) that build on the projection method of Jordà (2005).[10] The method is being increasingly applied

gross inflows and gross outflows. In our dataset, for example, when domestic agents sell their foreign assets and repatriate funds into the home country by 10, reducing the size of their foreign asset holding during the period from 100 to 90, it implies that the value of gross capital outflows changes from -100 to -90, which raises net capital inflows.

[7] We provide the time series of CFMs' implementation in Appendix A.

[8] See the IMF (2019) Taxonomy of CFMs for details.

[9] See Appendix A for the summary of variables used.

[10] Coman and Lloyd (2022), for example, focus on macro-prudential policies, differentiating them from capital flow management. We use a different set of capital flow management measures (CFMs) from the IMF (2019) Taxonomy of CFMs. Also, we used different dependent variables. Instead of using total and bank credits of 29 EMEs from the BIS database, we use capital flows calculated from the IMF BoP database for 32 economies. Choice

in empirical studies, as it is found to be more robust to misspecification than the traditional VAR methods (Haug and Smith, 2012; Montiel and Plagborg-Møller, 2021). According to Montiel and Plagborg-Møller (2021), "local projection inference robustly handles two issues that commonly arise in applications: highly persistent data and the estimation of impulse responses at long horizons" (p. 1789).

While the LP-IV is used as the benchmark specification, we choose to show both LP-OLS and LP-IV specifications in this study as the correction-step for endogeneity of the latter can be insightful in understanding the nuances behind the interaction between the CFMs and the global shocks when affecting the capital flows. Most existing LP-OLS specifications show that gross capital inflows increase when the US policy rates are raised, which does not align with our expectation that higher US interest rates reduce global investors' appetite for domestic markets.[11] With that in mind, we recognize the potential endogeneity between the US monetary policy and the macroeconomic variables including capital inflows, as done in other studies in the literature (e.g., Kalemli-Ozcan, 2019; Coman and Lloyd, 2022). Endogeneity is a feature we want to remove from our estimates; for this, we perform an LP-IV estimation where we create a monetary policy shock for US along the lines of Gertler and Karadi (2015).

3.1 Specifications

For our baseline LP-IV estimation, we use a two-stage IV regression similar to Kalemli-Ozcan (2019) and Jordà, Schularick, and Taylor (2020). In the first stage, we use the three-month-ahead Fed futures rate as the instrument, and focus on the differences in future rates using a one-day window around the FOMC announcement dates (for both scheduled and unscheduled FOMC meetings and conference calls), thereby extending the policy shock series until December 2018.[12] We identify the US monetary policy shocks and obtain the fitted values ($\widehat{USMP_t}$) from a first-stage regression of Fed rates on the futures rates surprises. In the second stage, we consider the impact of a US monetary shock in quarter t ($\widehat{USMP_t}$), CFMs implemented in economy i ($CFM_{i,t-1}$) and their interaction ($\widehat{USMP_t} \times CFM_{i,t-1}$) on capital flows (as a share of GDP) in the economy i at quarter $t+h$ ($y_{i,t+h}$).

Note that we consider the lag of the CFM measures at each date in order to mitigate sources

of variables also differ from those in Coman and Lloyd. For example, we include additional global controls such as exchange rate depreciation rate and domestic interest rates. Time dummies are also added before, during, and after the Global Financial Crisis.

[11] Kalemli-Ozcan (2019) describes the notion as follows: "In popular discourse, when the center country – most often the U.S. – runs a contractionary monetary policy, policy rate differentials across the world ($i_{\text{country}} - i_{\text{US}}$) contract, affecting short-term and possibly long-term market interest rates. Global investors re-balance their portfolio by shifting capital from low interest rate countries to the high interest rate center" (p. 1).

[12] Gertler and Karadi (2015) compute a similar estimate but focusing on a 30-minute window around the announcement. Here we focus on the daily window in an attempt to capture the policy surprise with more readily available data – that can be obtained in a standard Bloomberg terminal. We find that the correlation between the two time-series (from this paper and Gertler and Karadi's work) is 0.673 during the overlapping periods (February 2000 to June 2012).

of simultaneity bias. On the other hand, the monetary policy is contemporaneous since it is already instrumented in the LP-IV specification. Thus, our estimation equation, for horizons $h = 0, 1, \ldots, H(= 8)$ is:

$$\begin{aligned} y_{i,t+h} - y_{i,t-1} = \alpha^h + \beta_1^h \widehat{USMP}_t + \beta_2^h CFM_{i,t-1} + \beta_3^h (\widehat{USMP}_t \times CFM_{i,t-1}) \\ + \gamma^h IndividualControl_t + \delta^h GlobalControl_t \\ + \eta^h \sum_{j=1}^{J} Lag_{i,t-j} + \theta^h GFCdummy_t + FE_i^h + \epsilon_{i,t+h}, \end{aligned} \tag{1}$$

where t and h denote quarter and horizon.

$GlobalControl_t$ is a vector that contains the change in VIX and US growth rate, which reflect global economic and financial conditions. $IndividualControl_{i,t}$ represents the economy-specific control variables, including the growth rate, inflation rate, exchange rate depreciation rate, and domestic interest rate. As a proxy for domestic interest rates, we use government bond rates with maturity of three months for consistency with the quarterly dataset. We include these controls because domestic conditions can affect the capital flows for reasons apart from international markets features. By incorporating the exchange rate depreciation rate and domestic interest rates, we can better focus on the effect of external US monetary shocks and CFMs. To note, there is a loss of observations in our dataset due to data restrictions on domestic interest rates. The results without using domestic interest rates as controls are provided in the section on robustness checks.

Lagged terms for most of the variables for the previous J periods are included as well (in $\sum Lag_{i,t-j}$). In that vector we include independent variables (US monetary shocks, CFM dummy, and the interaction term), economy-specific and global controls, and dependent variables.[13] We set the number of lags to four ($J = 4$) to capture past effects up to one year.[14] GFC time dummy variables are added to capture the possible structural changes in the international financial markets.[15] Fixed effects (FE_i^h) are included to capture potential confounding factors specific to each economy. Similar to Coman and Lloyd (2022), our estimation equation does not include time fixed effects, as the US monetary shocks variable is common to all countries in the sample.

$\alpha, \beta_1, \beta_2, \beta_3, \gamma, \eta, \theta$ and ϵ are the coefficients and error term in the second-stage regression, respectively. Here, β_1 measures the effect of a US monetary shock in quarter y on capital flows

[13]The lag terms for dependent variables (capital flows) in the right-hand-side start from two-period prior term as the left-hand-side of the estimating equation already includes one-period prior term for capital flows.

[14]There appears to be different choices in the number of lags in the empirical studies using lag-augmented LP method. For simplicity, we assume the structural break starts at the beginning of 2008. The results derived with a higher number for lag terms ($J = 6$) are reported in the following sections.

[15]The duration of the GFC is from Jan 2008 to Jun 2009 based on NBER recession indicator. The results derived without using GFC dummies are provided in the following sections.

at quarter $t+h$. Thus, $\hat{\beta}_1^h$ for each horizon h are the estimated impulse responses to a US monetary shock when CFMs are not implemented ($CFM = 0$), and $\hat{\beta}_1 + \hat{\beta}_3$ represents the impulse responses when CFMs are implemented ($CFM = 1$). The differences between the two responses correspond to the interaction term $\hat{\beta}_3$.

On the other hand, for alternative LP-OLS specifications, all variables except the US monetary shock ($USMP_t$) are the same to the second stage of LP-IV specification in equation. In this case, we use the monetary policy rates directly (effective federal funds rate). (1). For $h = 0, 1, \ldots, H(= 8)$,

$$\begin{aligned} y_{i,t+h} - y_{i,t-1} = \alpha^h + \beta_1^h USMP_t + \beta_2^h CFM_{i,t-1} + \beta_3^h (USMP_t \times CFM_{i,t-1}) \\ + \gamma^h IndividualControl_t + \delta^h GlobalControl_t \\ + \eta^h \sum_{j=1}^{J} Lag_{i,t-j} + \theta^h GFCdummy_t + FE_i^h + \epsilon_{i,t+h}, \end{aligned} \tag{2}$$

where t and h denote quarter and horizon, respectively.

4 Results

We present the impulse response functions (IRFs) of net and gross capital flows on US monetary shocks based on the local projection estimates in both LP-IV and LP-OLS specifications. The resulting IRFs for two years ($H = 8$), depicting the percentual change in the capital flows after a 1%p increase in US monetary policy shock are shown in Figure 2 and Figure 3. The solid lines are IRFs when CFMs are not implemented, and the dashed lines are IRFs when CFMs are implemented. The left panel shows IRFs where net capital flows are included as dependent variable, whereas the center and right panels are the cases where the dependent variables are gross capital inflows and outflows, respectively. For example, the solid line on the left panel in Figure 2 indicates that a 1%p increase in the Fed rates is associated with approximately 17%p increase in net capital flows as a share of GDP after a year (4 quarters) when CFMs are not implemented.

Without considering the 68% confidence bands for IRFs, basic implications can be drawn initially by using the direction and magnitude of IRFs. As presented by the solid lines in the center and right panels in Figure 2 with LP-OLS specification, both gross inflows and outflows increase in response to US monetary shocks when CFMs are not used.[16] In other words, both foreign and domestic agents increase their overseas investment when the Fed rates are raised. As noted earlier, the direction of gross inflows does not match our expected results. We expect higher US policy rates to cause foreign agents to reduce investment in domestic markets

[16]To note, the sign of gross outflows is defined to be negative in case of its increase by the convention of empirical studies. Thus, net flows are calculated as the sum of gross inflows and outflows in this study.

with relatively low interest rates and adjust their portfolio to other countries—including the US—with relatively high interest rates. A possible explanation for this inconsistency is the fact that a recovery in the US and global economy is typically followed by an increase in the Fed rates caused by concerns of inflation. Therefore, in the period of global economic recovery, both gross inflows and outflows can increase due to optimistic behaviors of domestic and foreign investors, while gross inflows are partly offset by higher Fed rates.

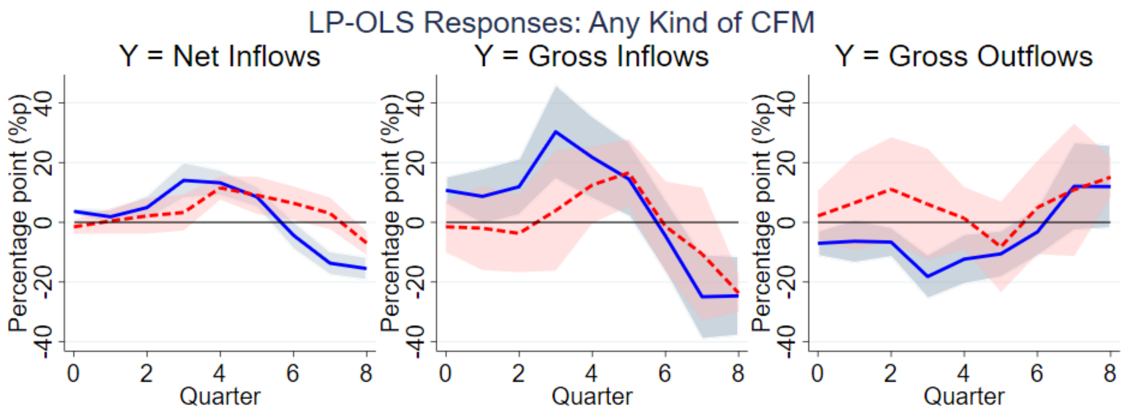


Figure 2: LP-OLS IRFs to an Increase of 1% in the US MP Shock

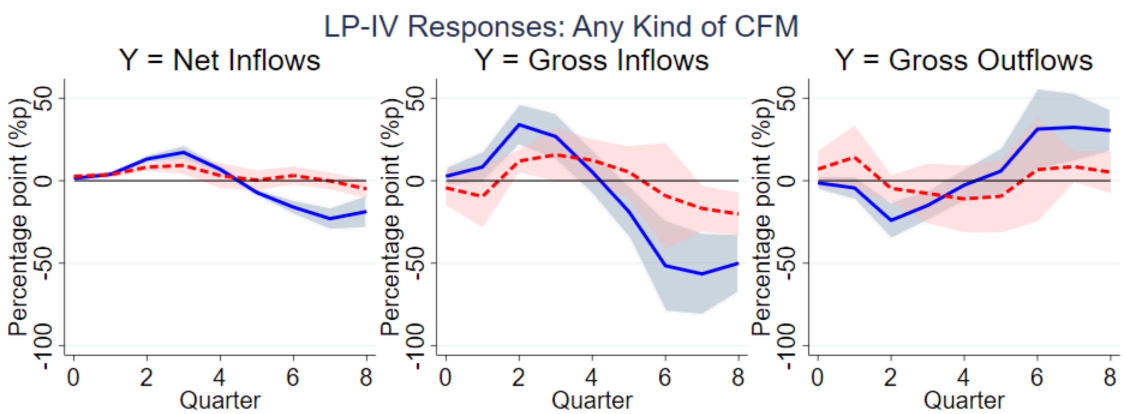


Figure 3: LP-IV IRFs to an Increase of 1% in the US MP Shock

This can be interpreted as the effect of endogeneity between the US monetary policy shocks and the macroeconomic variables. In such case there could be a co-founding exogenous driver of both variables, for example, a global financial shock like the GFC that prompted decreases on every type of capital flows and in the interest rate as explained in Davis and Van Wincoop (2018, 2021). In this study, we tackle this issue by using an instrument variable for the US monetary policy following Gertler and Karadi (2015) in line with other existing studies (e.g., Kalemli-Ozcan, 2019; Coman and Lloyd, 2022). With the LP-IV specification, the magnitude of gross inflows in the center panel in Figure 3 lowers relative to the LP-OLS specification, although the direction is still positive for the first year after the shock. The improved results indicate that the instrument helps partially to correct the endogeneity issue. [17]

As the changes in investment volume are greater for foreigners (i.e., gross inflows) than domestic agents (i.e., gross outflows), both specifications show an increase in the net inflows. After the first year, these flows drop below zero, this effect goes in line with the expected sign following a return differential argument (in favor of US investments). We see this happening for both estimations. Then, our instrumental approach corrects the initial surge in gross inflows and retains the subsequent, and expected drop. Now, an alternative interpretation may consider that the interest parities don't hold, and instead the shor-term response also includes a risk premium component. In that case, the increased return in the US may denote a higher implied risk (rather than more productive assets) that is being compensated and may discourage certain types of investors. Thus, we could have a situation with higher investments in both US and emerging locations. We think we partially correct for the potential endogeneity and the positive effect in the flows we see in the very short term may be due to this latter type of effect that weakens for medium horizons (beyond a year).

What is crucial for us, however, is that regardless of the sign of the effect, the interaction with the CFMs are driving the response towards zero, implying a mitigation role for the CFMs for either type of gross flow. We can see this in the dashed lines, that include the CFMs implementation. In that case, the initial increase in net flows is lower, and a similar effect is shown in both types of gross flows (center and right panels of figure 3). Something important is that in the first two quarters, the mitigation looks weaker for the net flows (left panel), which we can attribute to the response in the gross inflows whose mitigation is only partial. The gross outflows' effects on the other hand, are fully mitigated at all horizons once the CFMs are implemented. On the other hand, for longer horizons we see a more complete mitigation of the net flows. However, the net inflows' effects are harder to contain in that case too. Thus, we can see that the effects of the monetary shock is more marked in the gross inflows.

In the following sections, aside from exploring the robustness of these results, we inquire on the incomplete mitigation of the monetary shock in the net flows in the short-run, and on whether these effects are different when we look at CFMs on inflows and outflows separately.

The reason why it is relevant to analyze both gross flows and measures targeting them separately, is that by construction the mitigation on each type of gross flow cancel out in the net-flows measure, which makes hard to gauge the actual effect of these measures and actually represent our and the literature motivation on analyzing each type of flow separately after the onset of the GFC of 2008[18]. In fact, for it to show up at some horizons as in figure 3 we should

[17]This study can be further developed by using different sets of instrument variables for the US monetary shocks in line with existing research (e.g., Bu et al., 2021; Miranda-Agrippino, 2015).

[18]Kalemli-Ozcan (2019) explains that this change from net to gross flows is justified recently due to the higher

have that the effect is stronger in some periods in one of the two types of gross flows.

Nonetheless, before turning to further exercises, it is useful to analyze the direct mitigation effect of our baseline estimations. This is gauged by the interaction terms in our IRF specification ($\hat{\beta}_3$). The dynamics of the pure interaction are shown in figures 4 and 5 for the OLS and baseline LP estimations. In this case, the coefficient represents the change in the effect of the monetary shock on the capital flows after the implementation of the CFM.

Regarding gross flows, we obtain a negative interaction effect on the inflows for the initial four quarters, and a positive effect for the outflows, the former implies that the CFMs help reduce the (positive) effect of the US monetary shock on the gross inflows and the latter the opposite, i.e., in both cases we see a mitigation effect that is marked in the initial quarters. There are additional signs of such mitigation in the later quarters for the inflows too. Interestingly, the net inflows paint a seemingly different picture: the interaction effect of the CFMs is negative but weaker than in later quarters. This occurs because the effects between gross flows offset and only the longer-lasting effects on the outflows are reflected in later quarters.

The overall results show how the mitigating effect of CFMs more visible when gross flows are considered; conversely, they are opaque when determined by the magnitude between two offsetting effects as in for net flows. In effect, looking only at net inflows measures could lead to the mistake of assuming that the CFMs have little to no shocks insulation effects for some horizons where the opposite is the case. Similarly, the fact that the CFMs' mitigating effects can vary according to the type of flows may explain why their effectiveness on net flows is not clearly established in the literature.

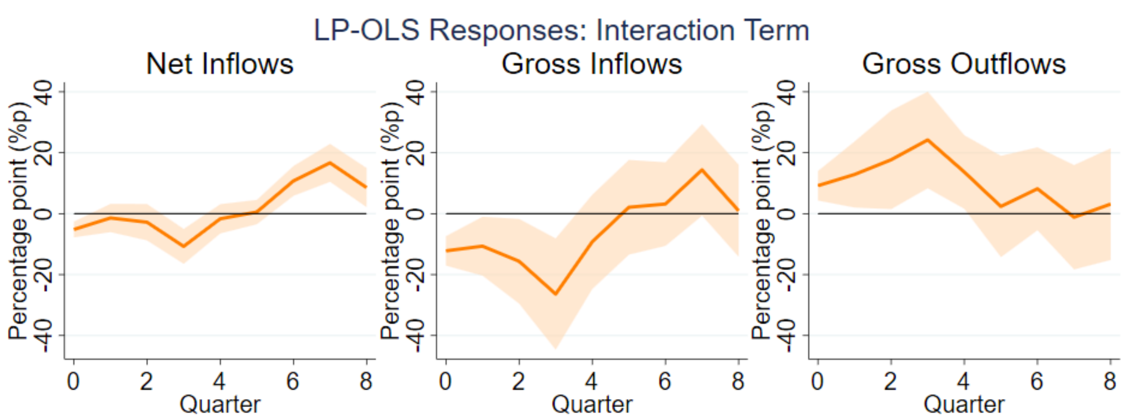


Figure 4: LP-OLS IRFs (Coefficient of Interaction Term)

investment activity on every type of economy, including the emerging markets where traditionally accounting for gross inflows or net-inflows was roughly equivalent.

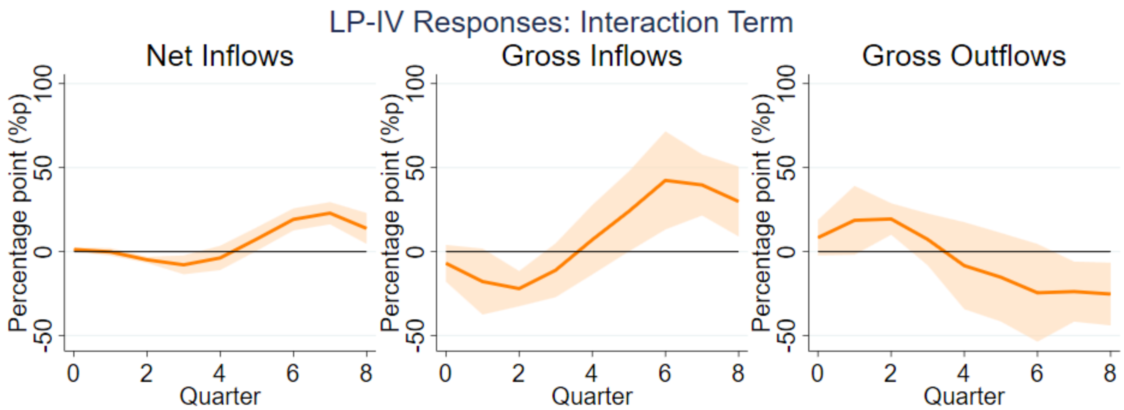


Figure 5: LP-IV IRFs (Coefficient of Interaction Term)

A side caveat that should be mentioned is that the evidence on the mitigation effects can be more limited in the cases where the confidence intervals of the effect of capital flows overlap with those that in addition account with for the CFMs (dashed line in figures 2, 3), in those cases the case can be made that both effects cannot be rejected to be statistically different. Such overlapping is observed more in the OLS specification which reflects the better identification or our baseline, and addition, for our interpretations we focus more on the cases where the initial effect is significant and becomes null after the CFMs implementation. That is the main notion we consider when defining a mitigation effect.

On the other hand, there are other limitations to this exercise. First, there still can be other sources of endogeneity: the implementations of both CFMs and US monetary shocks may be correlated to other economic variables that reflect country-specific features such as output growth. The potential endogeneity from US monetary policy shocks is widely known in many studies (e.g., Romer and Romer, 2004; Gertler and Karadi, 2015; Bu, Rogers, and Wu, 2021) and partly addressed in this study with the LP-IV specifications. However, it is challenging to find a good instrument to address the endogeneity issues of the CFM measures (Erten, Korinek, and Ocampo, 2021). As an alternative. we use lag terms of the CFM variables as additional controls to partially address this issue, i.e., we include them in the lag-augmented component of the setup (Coman and Lloyd, 2022; Kalemli-Ozcan, 2019).[19]

Finally, the intensity and direction of CFMs are not captured; the data only considers the presence of CFMs. This is not only due to data limitations, but to the difficulty of aggregating the intensity of different kinds of CFMs, even for the same country. According to Batini and Durand (2021), a simple indexing as zero or one without capturing the intensity could in fact ensure objectivity, since there may be a risk of subjectivity in scoring the intensity of CFMs which take various forms across countries. Extensions with various indexes of CFMs reflecting

[19]Specifically, we use $CFM_{i,t-1}$ instead of $CFM_{i,t}$ as main regressors. See next section.

their intensity and direction remain as potential areas of further research.

4.1 Effects by types of CFM tools

We further investigate the effects of different types of CFMs. In particular, we exploit the data from the IMF (2019) Taxonomy of CFMs, which disaggregate CFMs into several sub-categories.[20] The major distinction is between CFMs on capital inflows and CFMs on capital outflows. According to the IMF (2019), the data contains some details about CFMs including "whether they are designed to limit capital inflows and/or outflows" (p. 2). From these, we focus on the distinction between CFMs on inflows and on outflows.

Thus, unlike before, we are not pooling any type of CFM in our policy indicator, but will consider specific estimations, analogous to (1), for CFMs on inflows and on outflows. This specification is meant to capture the effect of each type of CFMs on capital flows in the event of foreign monetary shocks and would have the benefit of allowing to inspect whether each type of CFMs complies with its expected policy outcome, for example, we expect CFMs on inflows to affect foreign investors' behavior and reduce gross inflows mainly (as opposed to outflows). [21]

The results for CFMs on inflows are shown in Figure 6. We can see that the mitigating effects are still present on both gross inflows and outflows, similar to the baseline results with the aggregate CFMs (Figure 3).[22] As expected, the mitigating effect is salient for the inflows. We would not not expect that such effect exists for gross outflows considering the aim of the policy. However, we still obtained that domestic investors reduce the amount of overseas investment with the implementation of CFMs on inflows. Notably, we see a reduction of the gross inflows (measured by the interaction term) and then a compensation on the opposite direction in later periods, which in either case is showing a reversal of the monetary policy shock effect and towards an overall null, or mitigated effect of the shock in the local economy.

On the other hand, we see similar mitigation effects from the CFMs targeting outflows, that is, the dashed line is above the continuous one for most horizons in the in the right panel of Figure 7. However, the effect is weaker than with the CFMs targeting inflows and the interaction effects by type of gross flow are non-significant. This supports the hypothesis that although the fragility of both types of gross flows to external shocks mediated by the CFMs,

[20]The classification is based on the IMF's Institutional View on Capital Flows in Practice 2018. Examples of CFMs on inflows are taxes, reserve requirements and stamp duties on nonresident property transactions. Example of CFMs on outflows include restrictions on financial institutions' overseas investment and surrender requirement of export proceeds. See IMF (2018) for more details.

[21]Nonetheless, some measures could also affect the residents' ability of repatriate outflows, i.e., the reversal of a previous capital outflow towards its country of origin.

[22]Part of the similarity may be explained by the fact that the economies included used CFMs on inflows more frequently than in outflows, particularly in the second part of the sample. See Figure 11 in Appendix B.

the prevailing mitigation effect is that on gross inflows, which ultimately is what, for some horizons, allow to see a mitigation effect on net inflows.[23]

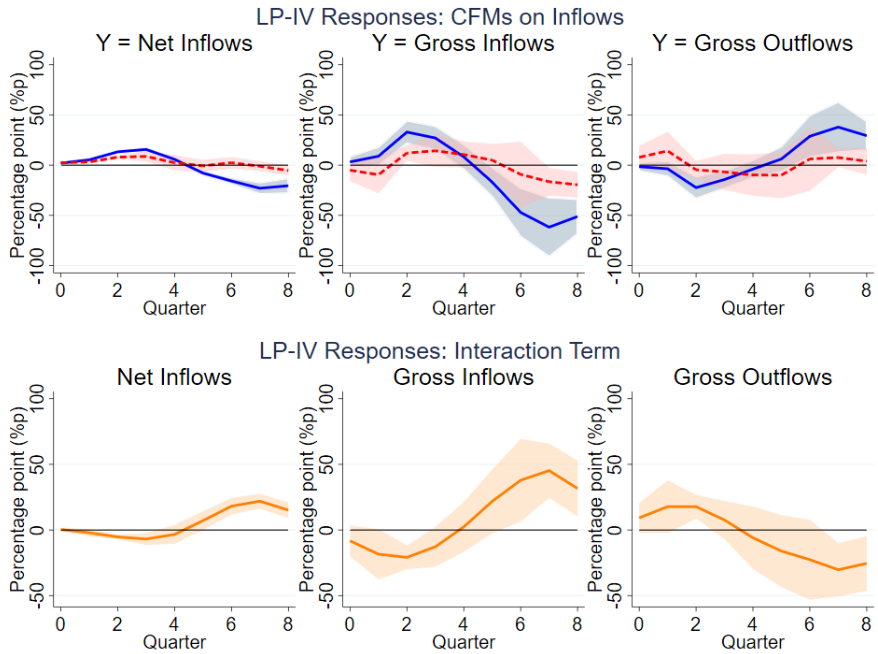


Figure 6: LP-IV IRFs (with CFMs on inflows)

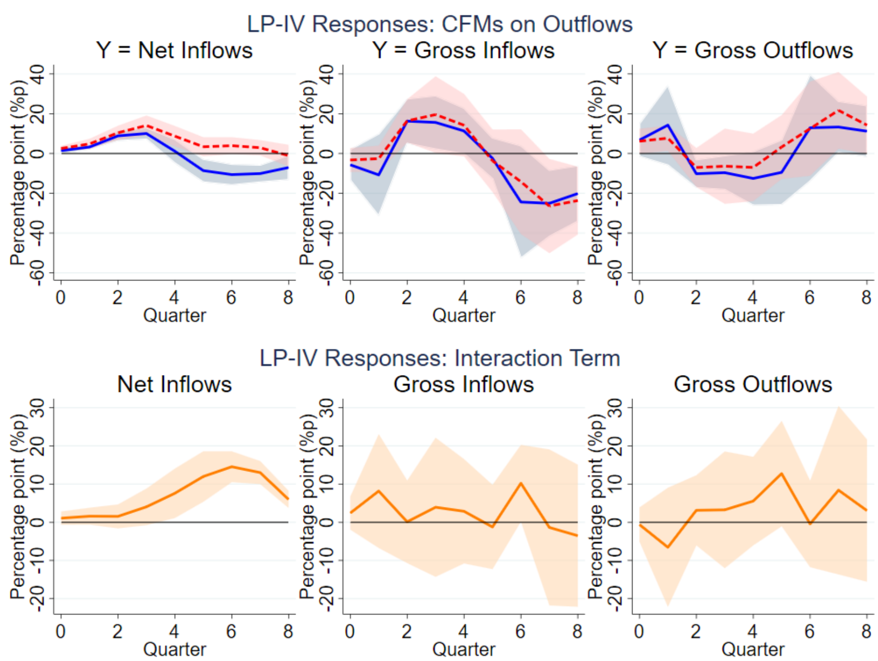


Figure 7: LP-IV IRFs (with CFMs on outflows)

[23]These results with each type of CFMs are also robust to alternative specifications. Results of alternative LP-OLS and LP-IV specifications are presented in the Appendix B.

Finally, regarding net flows, although the CFMs on outflows still show a mitigation effect for later horizons, it's hard to adjudicate it to effects on either type of gross flow. Until now we discussed how we can obtain null effects on net flows as a result of offsetting effects on gross flows. However, the reverse scenario is less reasonable (i.e., no effects on gross flows but mitigation effects on net flows). For this reason, the effects by type of CFM tend to favor the measures specific to controls on capital inflows as the main driver of the mitigation effects, which in case of the effects on outflows, would be attributed to policies affecting the repatriation of assets by domestic investors.

5 Robustness checks

5.1 Alternative specifications

To verify the robustness of our estimations, we compare the results with several alternative specifications. The first alternative specification does not include domestic interest rates as country-specific control variables, the second excludes a GFC dummy variable, a third one allows for more lags in the controls, and a final one includes the only country in our sample (i.e. reporting CFMs in the original policy database) that is not an emerging economy.[24]

Based on the premise that the monetary policy response of domestic countries to that of the US can be summarized in the interest rate differential, one would say that including the domestic rates as a control is proper. However, there is a substantial data loss of observations when this variable is included. By excluding domestic interest rates, we can increase the number of observations from 403 to 1,538 and the number of economies considered from 13 to 23.[25] Thus, in the first alternative specification, we re-estimate our baseline equation but with the domestic interest rates variable abstracted from. The estimating equations look identical as Equation (1), except for the component of individual controls.

No domestic interest rates. The result of this first alternative specification is illustrated in Figure 8, and the outcomes are consistent with the results in Section 4, i.e., the mitigation effects of the CFMs on the impacts of foreign monetary policy shocks are present. However, the results are less significant for some horizons although similar lessons still apply.

Specifically, we can see the mitigating effects are present with the alternative specification. The response of both gross inflows and outflows to the shocks are still dampened in the presence of CFMs. Since the impact on gross inflows and outflows also offset each other, the mitigation effect of the CFMs is not clearly seen for the net flows in the first year after the foreign policy shock (the left panel in the Figure 8). On the other hand, it is noticeable that the direction of net capital flows is different from the baseline results in Section 4, while those of

[24] The estimations of these specifications for the LP-OLS estimates are left for the appendix B.

[25] We provide the list of 18 economies in this alternative specification in the Appendix A.

gross inflows and outflows are quite similar. This adds to the evidence that the effectiveness of CFMs on capital flows is more difficult to predict when using net rather than gross flows, but also is indicative of the relevance of including domestic policy controls, as we can't rule out that domestic monetary responses to the external shock may affect the flows as well.

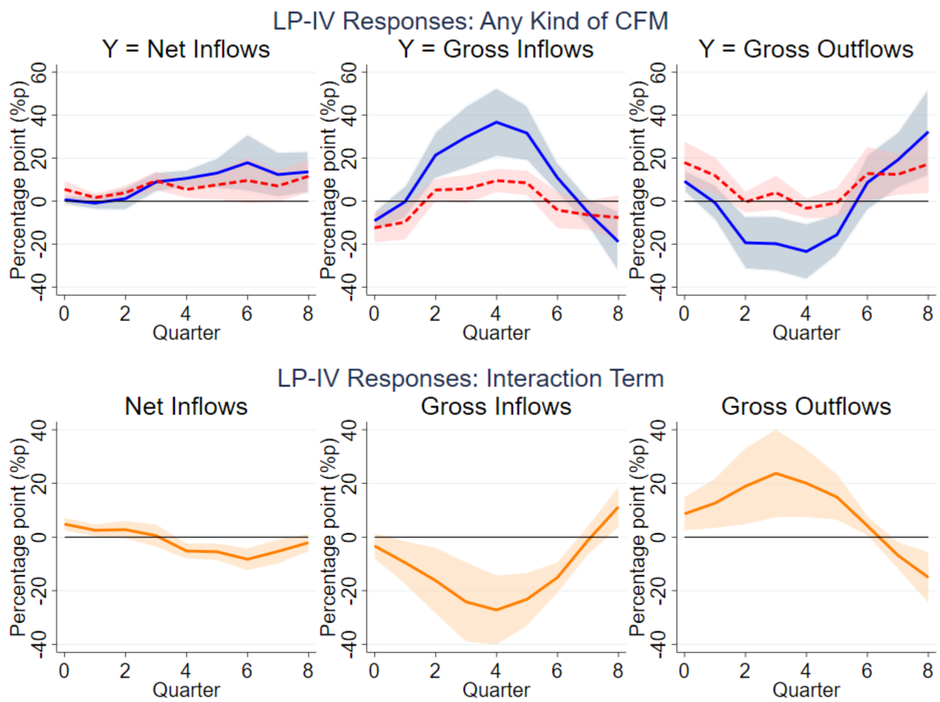


Figure 8: LP-IV IRFs (Excluding Domestic Interest Rates)

No GFC time dummy. In the second alternative specification we consider a model with no global financial crisis (GFC) dummy variables. In the baseline specifications in Section 4, time dummies are incorporated to consider possible structural breaks during and after the GFC. As shown in Figure 9, the results are similar, i.e., the mitigation effects a still present; however; they are more clearly visible and significant relative to the baseline. Similarly, the pure interaction coefficient show the same marginal effects. More significant mitigation effects in absence of controls for the GFC can be explained by the fact that global retrenchment of assets were exacerbated during that episode as explained by Broner et al. (2013). In that sense, the inclusion of the dummy in our baseline allows for a more conservative gauging of the mitigation effect of the control measures.

More lags for controls. In the third alternative specification, we change the number of periods in the lagged controls. The estimation is analogous to the baseline, except that now include lagged controls for 6 quarters instead of 4. The results are shown in Figure 10 and do not reflect meaningful changes relative our baseline.Especially, the LP-IV results in the baseline and the alternative specifications are closely aligned in terms of both direction and magnitude.

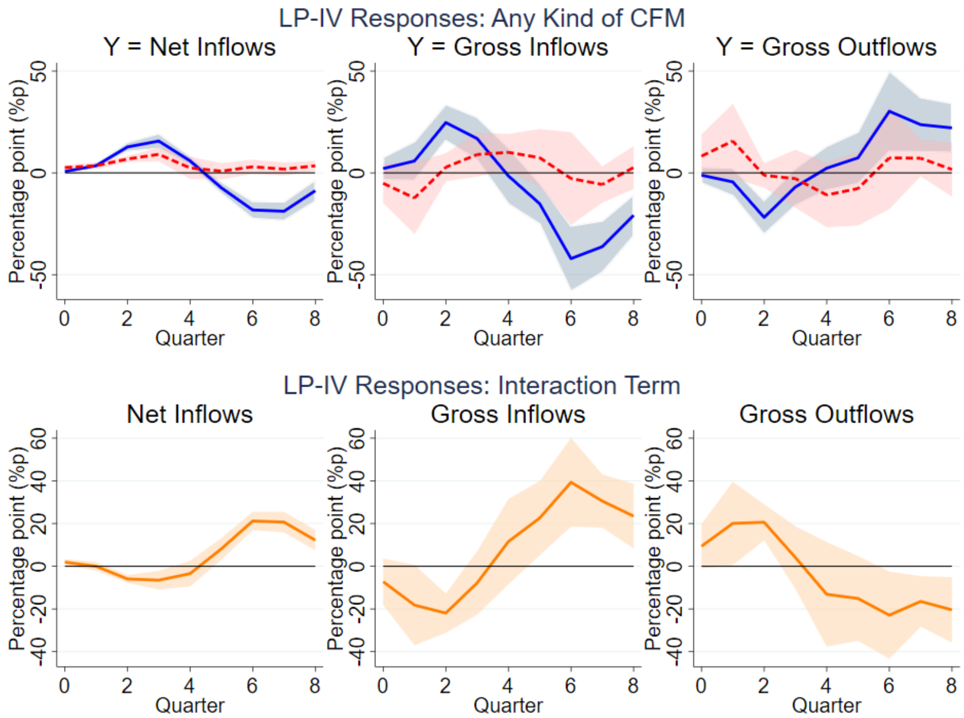


Figure 9: LP-IV IRFs (No GFC time dummy)

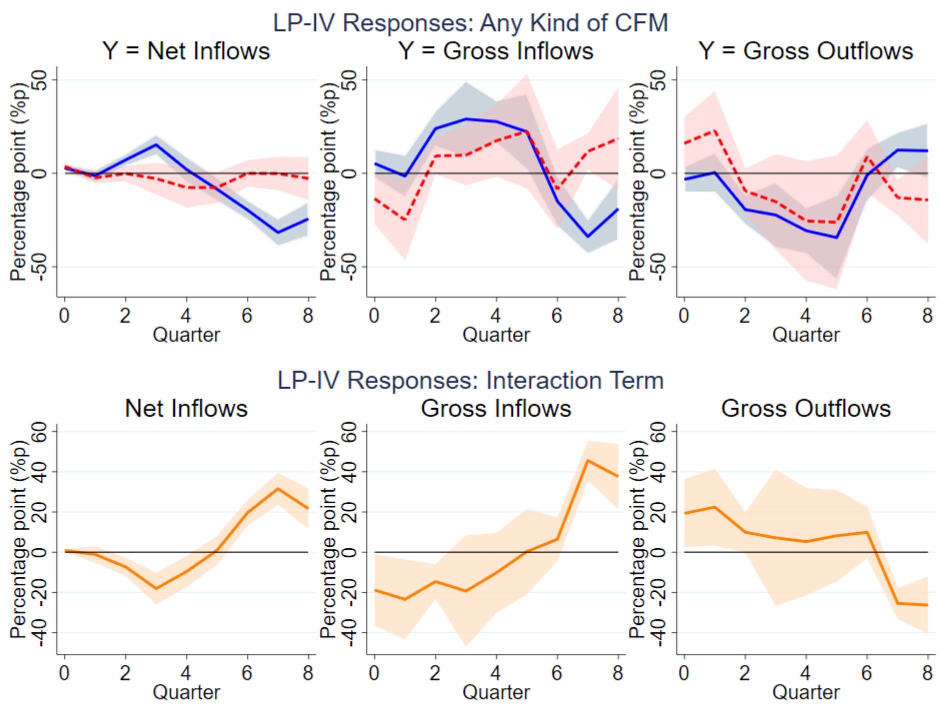


Figure 10: LP-IV IRFs (six-quarters lagged controls)

Inclusion of other countries: Our baseline sample includes countries that report the implementation of CFMs to the IMF taxonomy database 2019. The resulting list of countries comprises emerging economies in most cases, however, a salient exception is Canada, an advanced economy and a member of the G7. To make our conclusions applicable to emerging economies we removed it from the dataset. However, we can include it in an auxiliar estimation. In such estimation (shown in Figure 19 the appendix B) we obtain similar results, mainly for the later horizons. However, for the initial periods the estimates now incorporate a much higher volatility which lowers the significance of the results. The latter outcome may be due to the lower similarity of this country with the rest of economies included in our base sample.

6 Conclusions

We assess the capacity of capital flows measures (CFMs) in insulating against major external shocks—namely, US monetary policy shocks—with an emphasis on the effects on gross capital flows relative to those in net flows. We focus on the case of CFMs implemented in emerging economies (EMEs) that have employed these policies during most of the last two decades. Our results suggest CFMs are effective in mitigating the effect of US monetary shocks on these countries, and moreover, the insulation features of these policies differ considerably in each type of capital flow. The results are consistent with the literature on net capital flows, however, we contribute to it with estimations of the policies' effects on both net and gross capital flows, as well as by gauging the effects of controls that target specific types of financial flows.

Despite the difficulties of gauging these effects on net flows we are able to obtain a dampening effect of the CFMs on the fragility of these flows to external shocks. However, in this case the insulation effects are harder to obtain by construction. This is due to both the increased importance of gross outflows on emerging countries in recent years coupled with the increase in the correlation between inflows and outflows (e.g., Davis and Van Wincoop, 2018). Since both gross inflows and outflows are protected by CFMs, the effects offset in the net flows. Two lessons arise, first, the lack of consensus in the literature regarding the insulation properties of the CFMs can be explained by these offsetting effects, second and more importantly, policymakers aiming to mitigate the effect of foreign shocks on their economies can be more effective by targeting different types of flows with their regulations.

Considering these implications when designing policy or reacting to global policy innovations is paramount as prescriptions based only on net flows can lead to systematic policy mistakes. Instead, we propose that each global shock and its associated policy response be evaluated in light of the effect it may have on each part of the flows (gross inflows and outflows) and the actual part of the net flows that the policymakers prioritize to target. On the other hand, it should be mentioned that the current data limitations do not make it possible to fully analyze the effect of CFMs of different intensities. An analysis that controls for this, subject to future data developments that perhaps also allow for stronger identification strategies (on the side of CFMs), represents a promising venue for future research.

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A Additional descriptive data

A.1 List of Economies

Table 1: Economies included in the IMF 2019 Taxonomy of CFMs

Argentina	Australia	Barbados	Belarus	Bolivia	Brazil
Canada	CEMAC	China	Costa Rica	Cyprus	Dem. Rep. Congo
Ecuador	Georgia	Ghana	Greece	Hong Kong SAR China	Iceland
India	Indonesia	Kazakhstan	Korea	Liberia	Macao SAR China
Madagascar	Malaysia	New Zealand	Nigeria	North Macedonia	Peru
Russia	Seychelles	Singapore	Sri Lanka	Ukraine	Uzbekistan

Table 2: List of Economies in the dataset

List of economies included in the dataset after dropping missing observations			
Number of economies	32	13	23
List of economies	Argentina, Australia, Barbados, Belarus, Bolivia, Brazil, Canada, China, Costa Rica, Republic of Congo, Ecuador, Georgia, Ghana, Hong Kong SAR, Iceland, India, Indonesia, Kazakhstan, Korea, Liberia, Macao SAR, Madagascar, Malaysia, New Zealand, Nigeria, North Macedonia, Peru, Russia, Singapore, Sri Lanka, Ukraine, Uzbekistan	Australia, Brazil, China, Hong Kong, India, Indonesia, Korea, Malaysia, Nigeria, Peru, Russia, Sri Lanka, Singapore	Argentina, Australia, Belarus, Bolivia, Brazil, China, Costa Rica, Ecuador, Georgia, Hong Kong SAR, Iceland, India, Indonesia, Kazakhstan, Korea, Malaysia, Nigeria, North Macedonia, Peru, Russia, Singapore, Sri Lanka, Ukraine
N. Observations	2432	403	1538

Note 1: 4 economies are deleted from 36 economies that introduced CFMs since 2000, because they have very limited data (CEMAC, Cyprus and Greece) or no CFM used during the periods of 2000-2018 (Seychelles).
Note 2: Inclusion of Canada (as a robustness check) will increase the number of observation to 476 and 1,611 in the second and third columns, respectively.

A.2 Time series of CFMs implementation

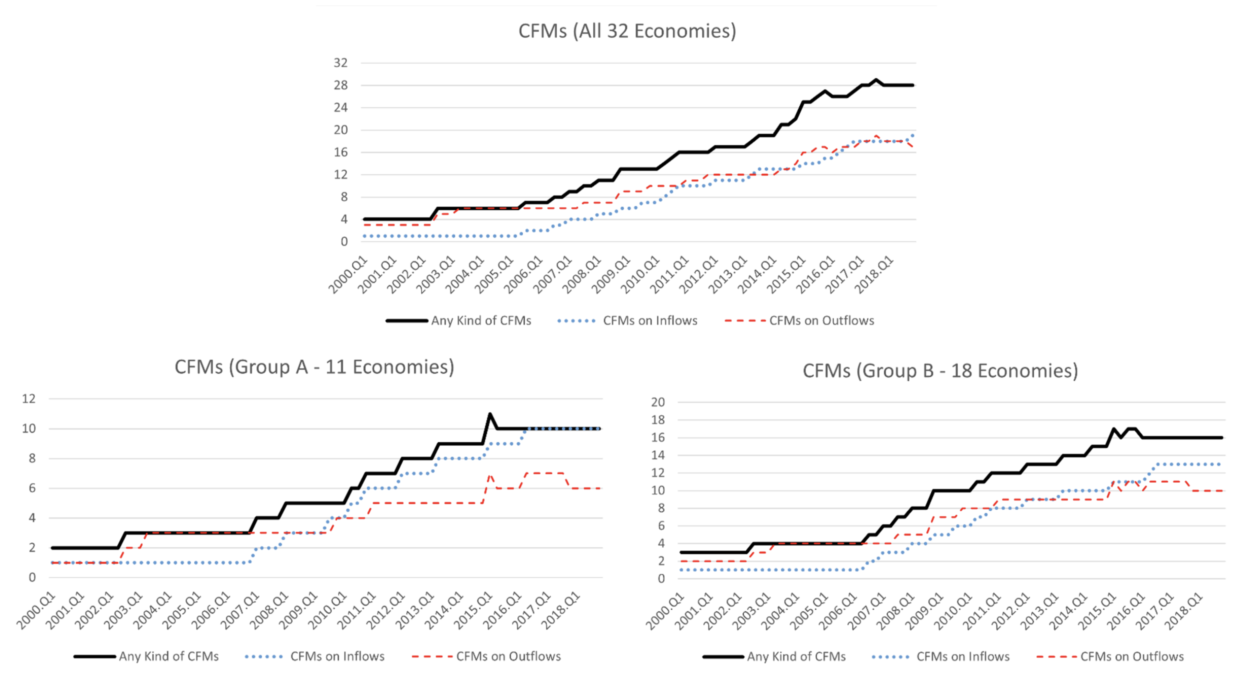

Figure 11: CFMs implementation over time (by country groups). Top: All economies; Bottom-left: Group A (11 economies); Bottom-right: Group B (18 economies)

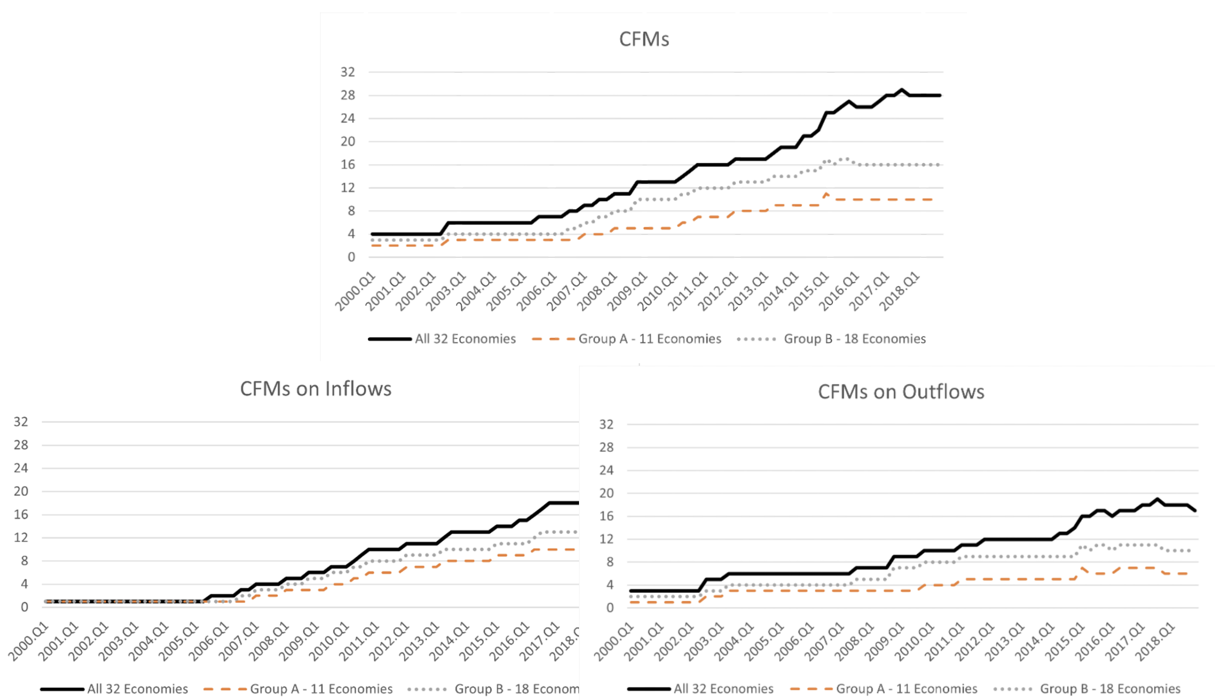

Figure 12: CFMs implementation over time (by type of policy tool). Top: All CFMs; Bottom-left: CFMs on Inflows; Bottom-right: CFMs on Outflows

A.3 Data description and sources

Table 3: List of Economies in the dataset

Name	Description	Sources
Dependent variables		
Capital flows		
Net (in)flows, Gross inflows and Gross outflows	Methodology by Cavallo and Izquierdo (2017). They smoothed time series following Forbes and Warnock (2012) by aggregating series for 4 quarters (past three and current quarters), and then taking year-over-year differences. To consider the size of economy, capital flows to GDP ratio is used.	IMF IFS (BoP, BPM6) (downloaded on 5/11/2020)
Explanatory variables		
CFM dummy	1 if any kind of CFM is used during the period. Otherwise, 0.	IMF 2019 Taxonomy of CFMs
US Monetary Policy Rates	Effective Federal Funds Rate	FRED (downloaded on 2/18/2020)
Instrument	3-month-ahead Federal Funds Futures Rate	Bloomberg (downloaded on 2/20/2020)
Control variables		
VIX	The Chicago Board Options Exchange S&P 500 Volatility Index	GFDFinaeon (downloaded on 1/16/2020)
US Growth Rates	Industrial production (seasonally adjusted, constant USD)	WB GEM (downloaded on 1/6/2020)
Country-specific control variables		
Output Growth Rates	Industrial production (seasonally adjusted, constant USD)	WB GEM (downloaded on 1/6/2020)
Inflation	Consumer Price Index (2010 = 100)	IMF IFS (downloaded on 3/26/2020)
Exchange Rates	Nominal exchange rate (Price of 1 USD in terms of local currency, Average period)	IMF IFS (downloaded on 3/26/2020)
Domestic MP Rates	Domestic interest rates (3-month government bond rates) (as proxies)	Bloomberg
Others		
GFC dummy	Before/during/after the Global Financial Crisis (2008Q1-2009Q2)	FRED (NBER recession indicator)

B Additional results

B.1 Results for additional robustness checks

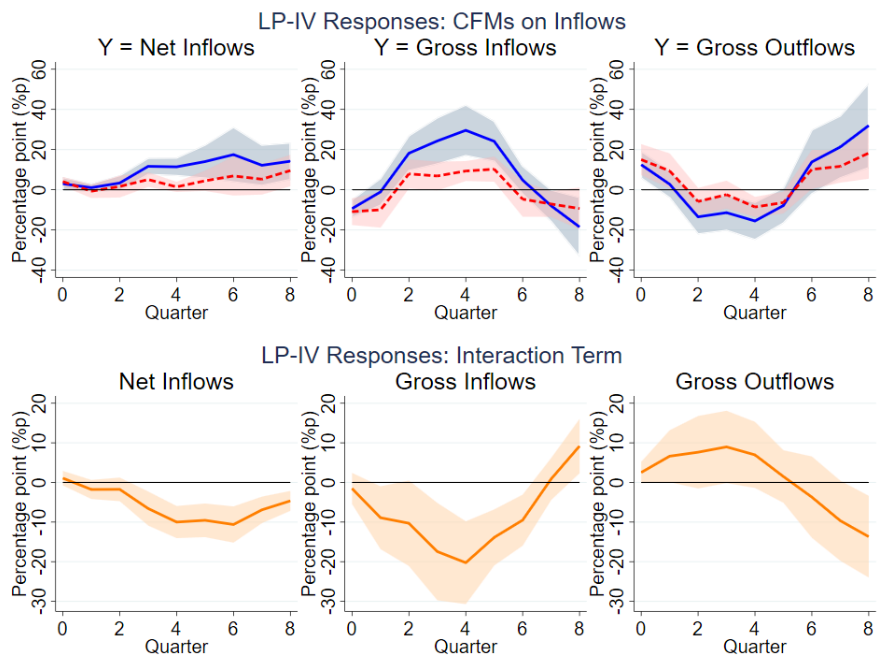

Figure 13: LP-IV IRFs to 1% in US MP Shock (CFMs on Inflows and without Domestic Rates)

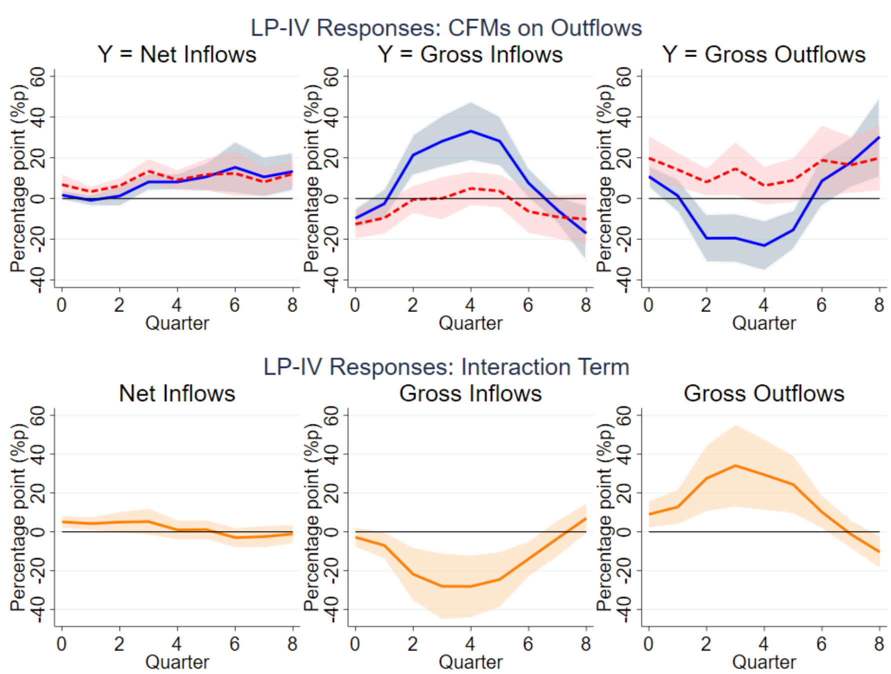

Figure 14: LP-IV IRFs to an Increase of 1% in US MP Shock (with CFMs on Outflows and Excluding Domestic Interest Rates)

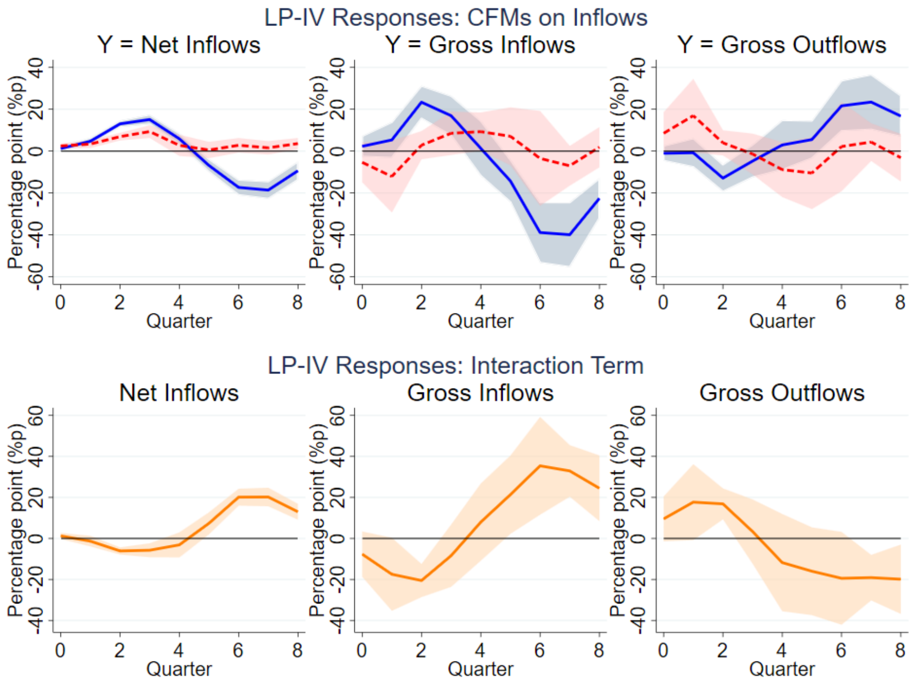

Figure 15: LP-IV IRFs to an Increase of 1% in US MP Shock (with CFMs on Inflows and No Time Dummy)

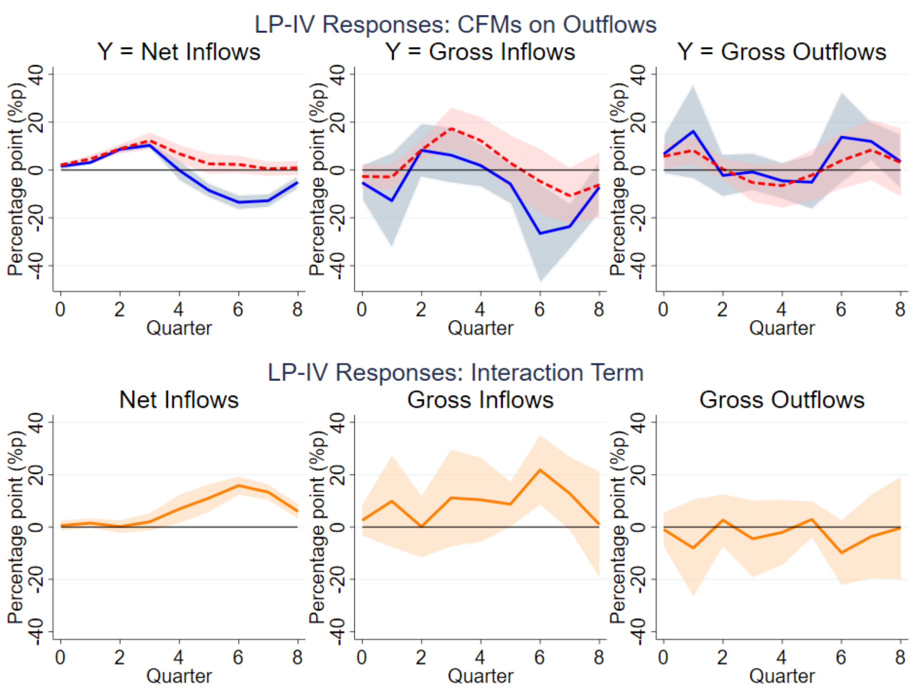

Figure 16: LP-IV IRFs to an Increase of 1% in US MP Shock (with CFMs on Outflows and No Time Dummy)

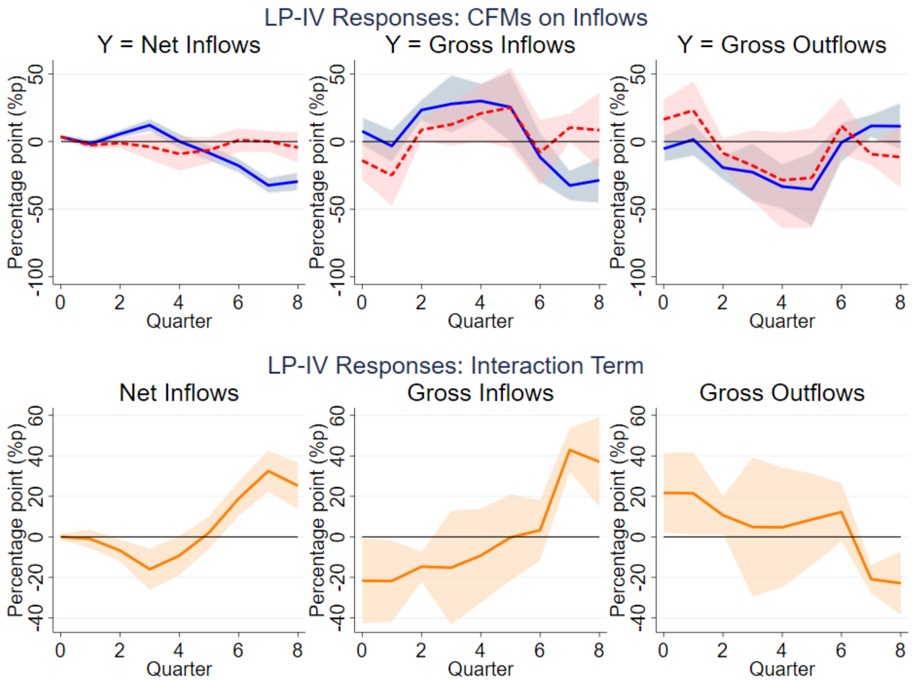

Figure 17: LP-IV IRFs to an Increase 6 quarters Two-Year Lagged Terms)

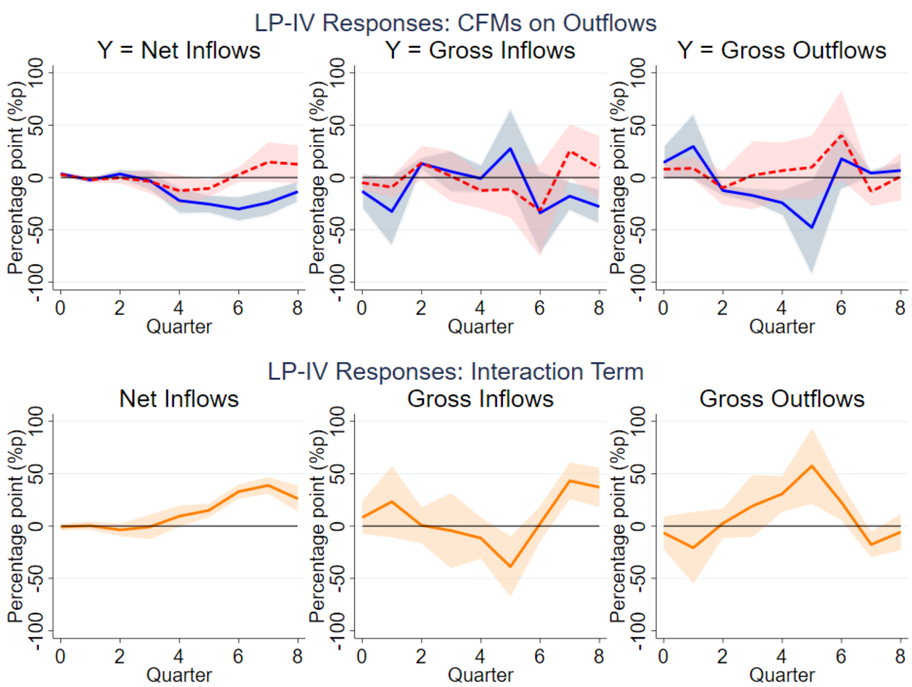

Figure 18: LP-IV IRFs to an Increase of 1% in US MP Shock (CFMs on Outflows and 6 quarters Lagged Terms)

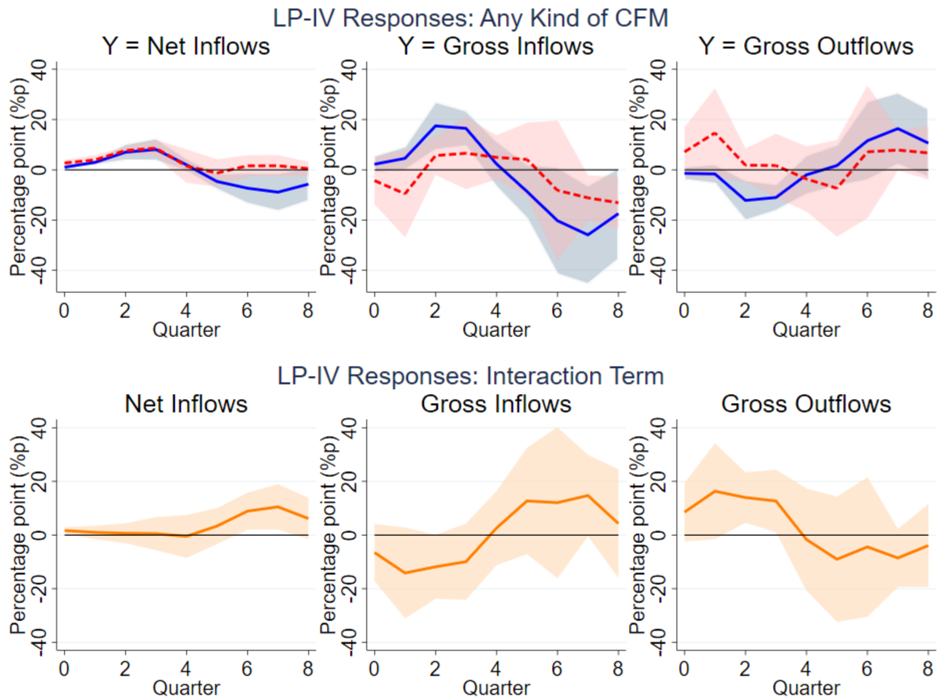

Figure 19: LP-IV IRFs (with Canada included)

B.2 Alternative specifications for OLS estimates or specific types of CFMs

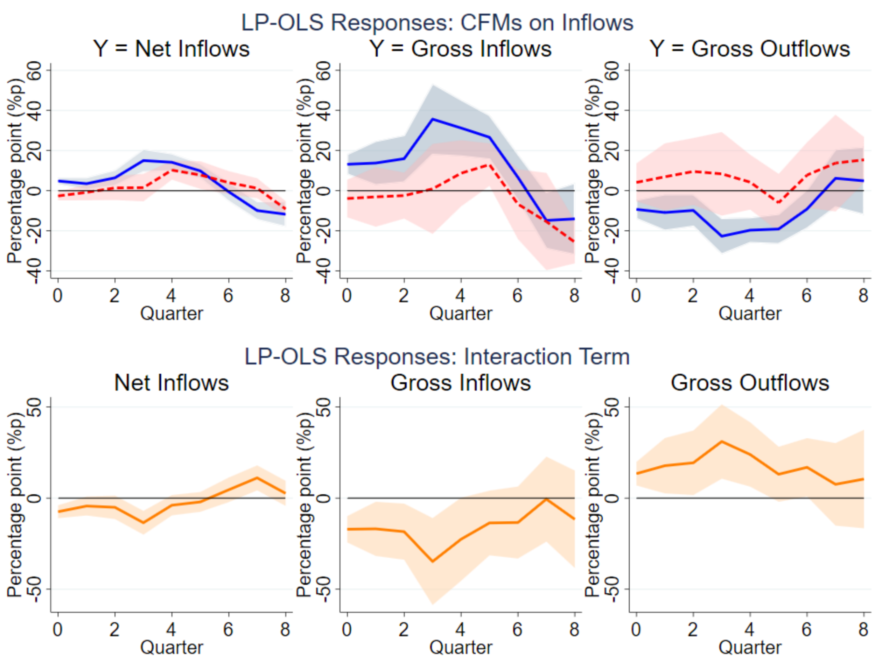

Figure 20: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Inflows only)

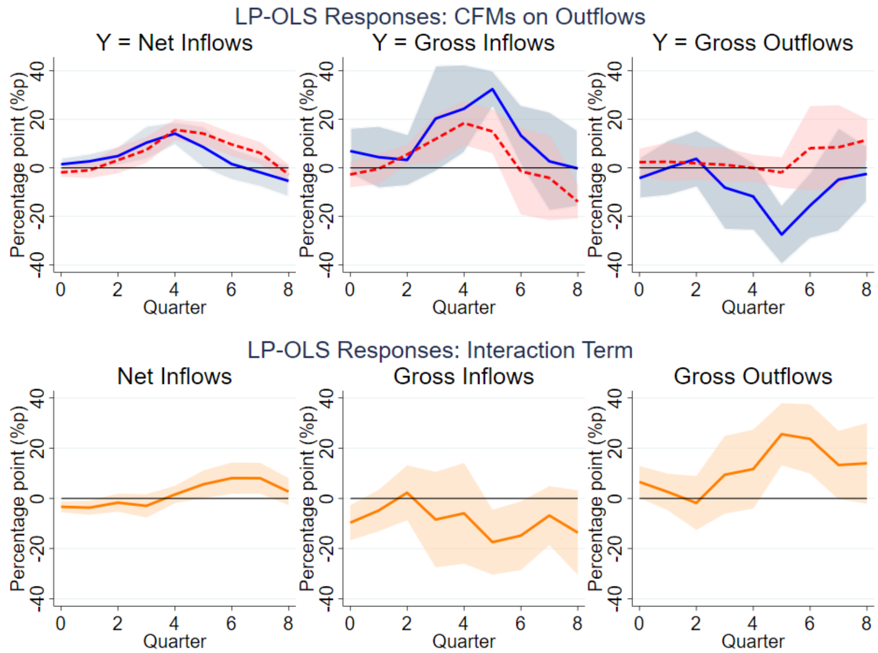

Figure 21: LP-OLS IRFs to an Increase of 1% in US MP Shock s (with CFMs on outflows only)

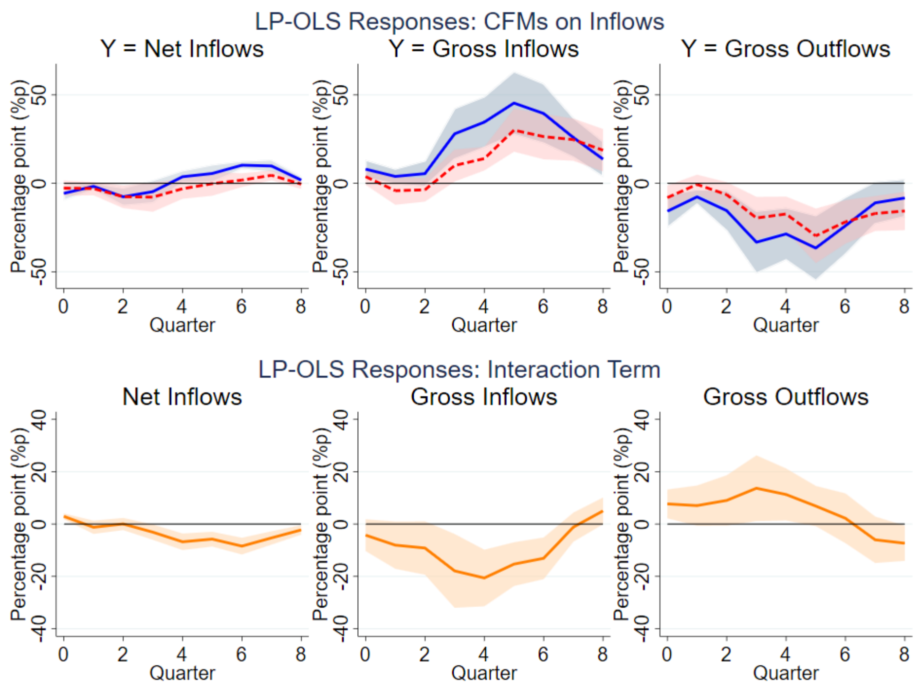

Figure 22: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Inflows and Excluding Domestic Interest Rates)

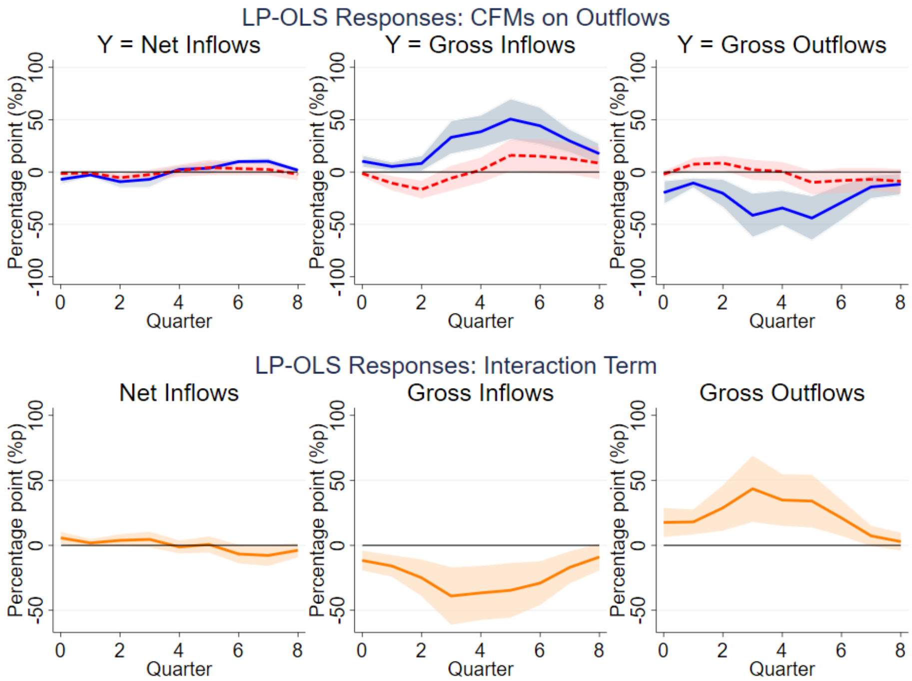

Figure 23: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Outflows and Excluding Domestic Interest Rates)

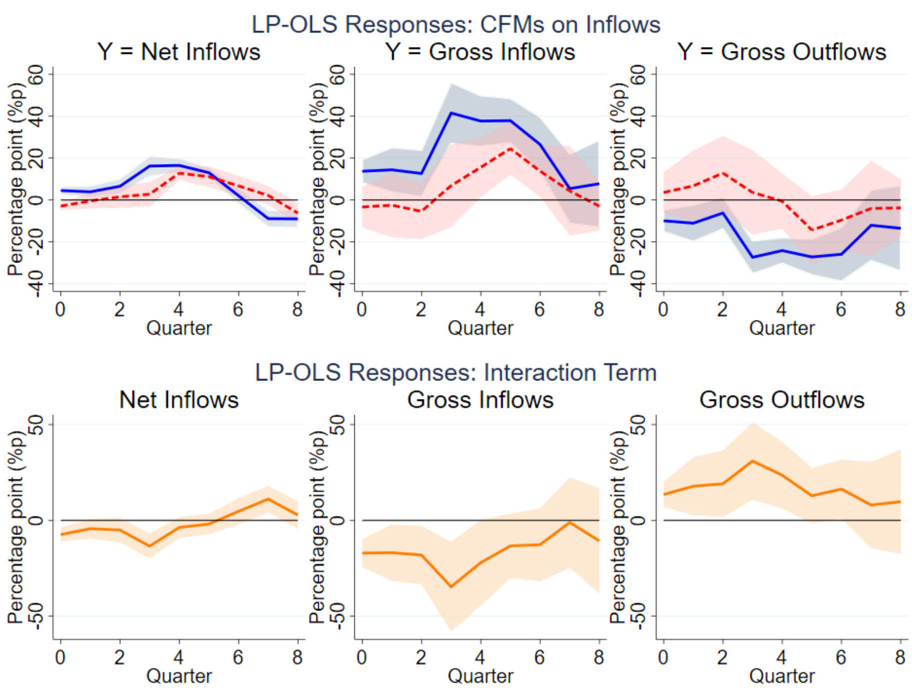

Figure 24: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Inflows and No Time Dummy)

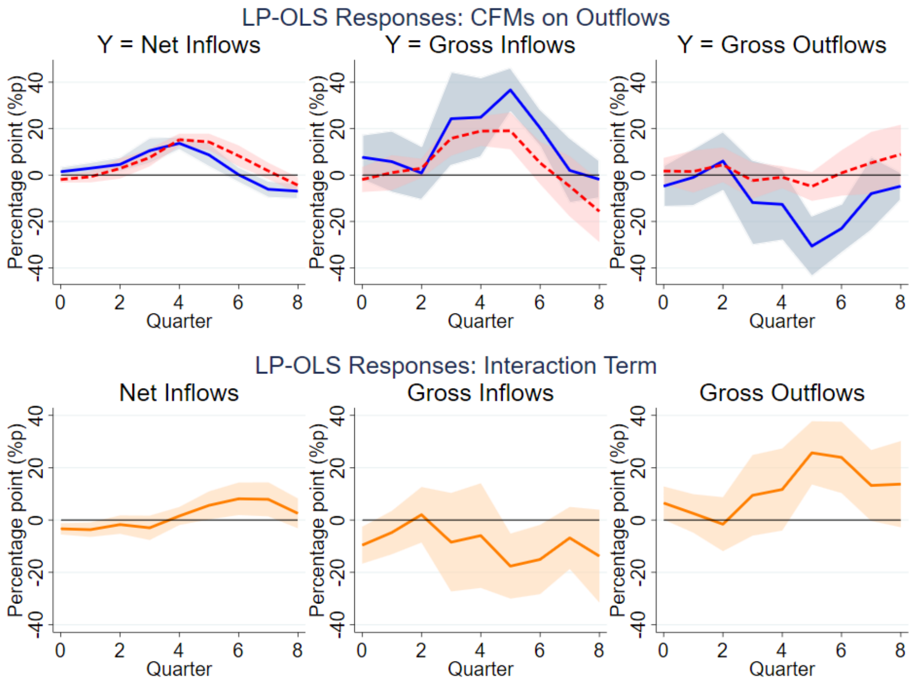

Figure 25: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Outflows and No Time Dummy)

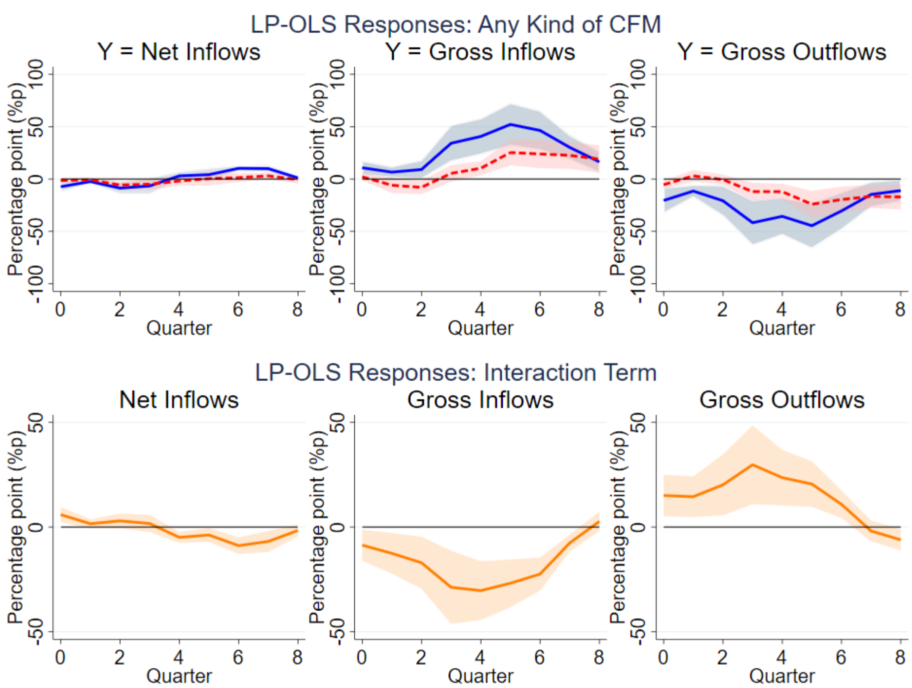

Figure 26: LP-OLS IRFs (Excluding Domestic Interest Rates)

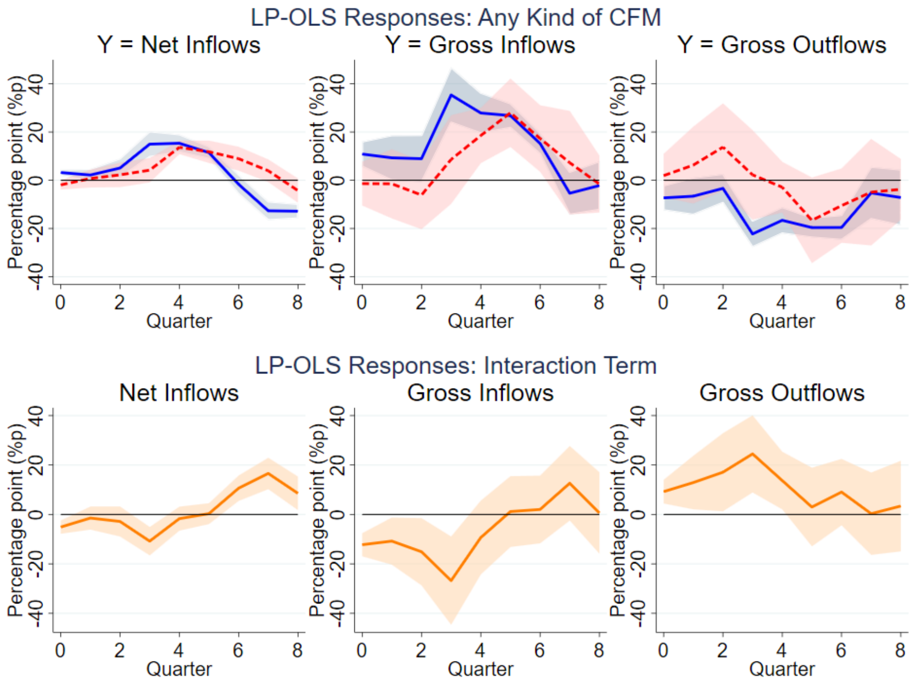

Figure 27: LP-OLS IRFs (No time dummy)

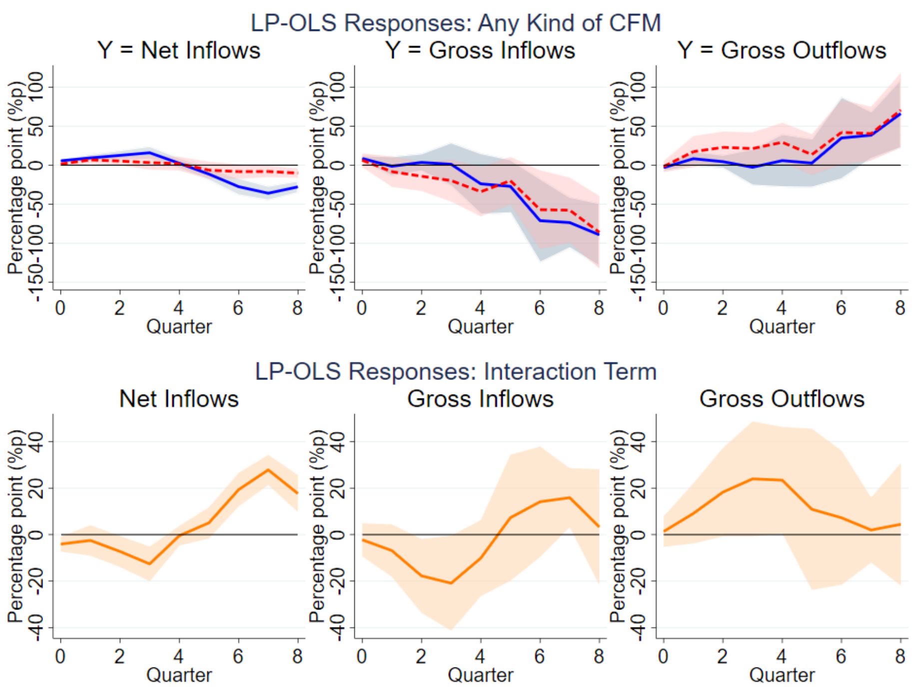

Figure 28: LP-OLS IRFs (two-years lagged controls)