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.

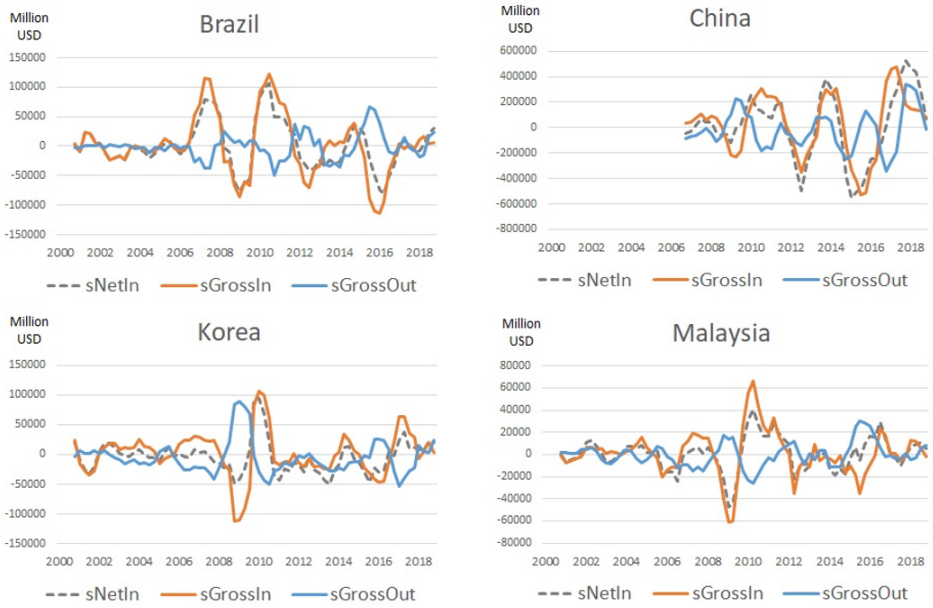
To address these questions, we construct a quarterly panel dataset for 32 economies that have employed CFMs during 2000-2018, and assess, based on local projections (Jordà, 2005; Coman and Lloyd, 2022), whether CFMs can offset the effects of US monetary shocks on both net and gross flows. We focus on 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.
Note: This figure includes "smoothed" capital flows constructed as in Cavallo et al. (2017), see the Appendix A for details.

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.

[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.

Coman and Lloyd (2022) use the dataset constructed by Cerutti, Correa, Fiorentino, and 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 8. Finally, we conclude in Section 9.

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

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. We approximate these shocks along the lines of Gertler and Karadi (2015) and based on the surprises in the 3-month-ahead Federal Funds Futures Rates. [7]

We construct CFM dummy variables by collecting the data from the IMF (2019) Taxonomy of CFMs.[8] 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. [9]

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.[10]

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).[11] The method is being increasingly applied

assets). Since gross outflows are computed with a negative sign, net capital inflows are defined as the sum of 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] For the OLS specifications shown in the appendix we use the Federal Funds Rate directly

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

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

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

[11] 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 of variables also differ from those in Coman and Lloyd. For example, we include additional global controls such

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).

Our benchmark estimations are based on a Local Projections with Instrumental Variables (LP-IV) specification, where we correct the endogeneity that can arise between the capital flows and the monetary policy as discussed in the literature (e.g., Kalemli-Ozcan, 2019; Coman and Lloyd, 2022). For that, we construct a series of US monetary policy shocks based on Gertler and Karadi (2015). We, however, also obtain OLS estimates that are reported in the Appendix B. From the latter estimates —with endogeneity issues— we still obtain signs of our main results but subject to higher uncertainty or with less intuitive responses of the capital flows to foreign shocks.[12]

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.[13] 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 ($\widehat{USMP}_t$), of CFM measures implemented domestically ($CFM_{i,t-1}$) and of their interaction ($\widehat{USMP}_t \times CFM_{i,t-1}$), on the 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 simultaneity bias. In contrast, the monetary policy is contemporaneous since it is already

as exchange rate depreciation rate and domestic interest rates. Time dummies are also added before, during, and after the Global Financial Crisis.

[12] 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).

[13] 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).

instrumented. 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.[14] We set the number of lags to four ($J = 4$) to capture past effects up to one year.[15] GFC time dummy variables are added to capture the possible structural changes in the international financial markets.[16] 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 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

[14] 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.

[15] 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.

[16] The GFC is included as a time dummy taking the value of 1 starting in 2008Q1 (in accordance with the crisis dates following the NBER recession indicator) and in the subsequent periods. The results derived without using GFC dummies are provided in the following sections.

impulse responses when CFMs are implemented ($CFM = 1$). The differences between the two responses correspond to the interaction term $\hat{\beta}_3$.

4 Results

We present the impulse response functions (IRFs) of net and gross capital flows after a US monetary shock based on the local projection estimates. The resulting responses for two years ($H = 8$), depicting the percentual change in the capital flows after a 1%p (100 basis points) increase in US monetary policy shock are shown in Figure 2. The solid lines are the IRFs when CFMs are not implemented, and the dashed lines are responses in presence of CFM measures. 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 18%p increase in net capital flows as a share of GDP after three quarters when CFMs are not implemented.

Doing away the confidence intervals for now, we can already see some implications on the effect of the shock. We see an initial increase in the capital inflows which does not align with the usual intuition that higher foreign returns should decrease the inflows from foreign investors. This rather puzzling effect—which is more prevalent in emerging economies as the ones we consider here—has been documented in the literature and tied to fiscal dominance, and risk premium increases, among other drivers (Kohlscheen, 2014; Hnatkovska, Lahiri, and Vegh, 2016). [17] A possible implication is that the shock is seen as an increased interest rate premium rather than as an improvement in the average profitability of the US assets' returns; in such case it could be plausible for EMEs to experience an increase in inflows after the shock. Consistent with this, the positive effect disappears for longer horizons, which aligns with our expectations that for later periods the premia features of the asset should not be as relevant anymore.

Now, on the side of the outflows, we observe the expected response at first, that is, negative, which given the way they are recorded (in terms of payment income for assets as in Cavallo, Izquierdo, and León, 2017) implies higher outflows towards foreign economies. However, there is also a reversal. We will see as we dig further into the types of capital flows, that both the responses of inflows and outflows actually have the expected signs for all horizons, that

[17] The other potential drivers refer to additional sources of interest premia or funding, as an example of the former, Caballero and Upper (2023) document short run increases in equity inflows after a foreign monetary shock due to a higher US term premium. As for the latter, London and Silvestrini (2023) focus on the role of the trade-credit channel and explain that firms in emerging economies, rely on their trade partnerships as an alternative source of credit that could be used to offset the effects of the shocks. Another explanation can be related to the procyclicality of all types of flows in an scenario of global economic cycles as studied in Davis and Van Wincoop (2018) and Broner et al. (2013).

is, if we focus on the specific types of capital where the foreign shocks have actual significant effects and there is an actual insulation role for the CFM measures to fulfill.

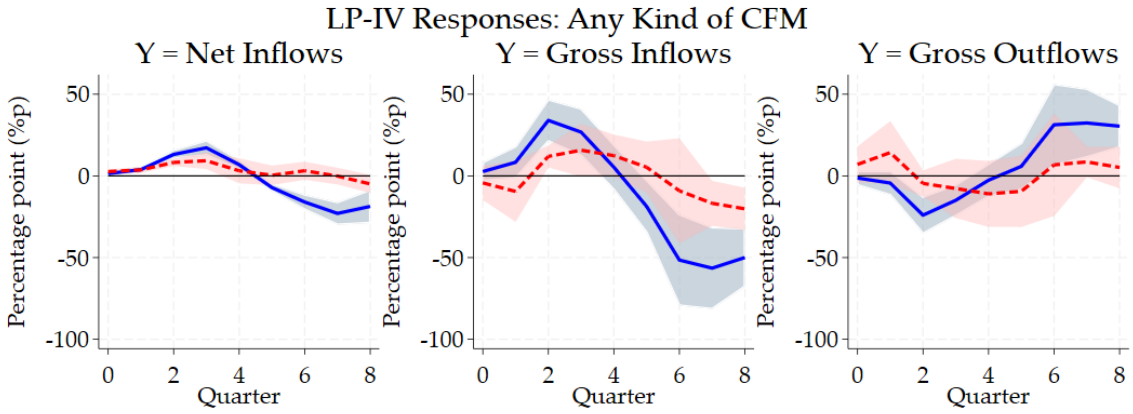


Figure 2: LP-IV IRFs to an Increase of 1% in the US MP Shock

In any case, what is crucial here 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 2). 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 an almost complete mitigation of the net flows -negative- effects, which will not be full due to some prevailing effect on the inflows' side. On this note, it's noticeable that although the mitigation on the inflows' response is stronger, the initial effect to mitigate is larger and, in contrast to that of the outflows, cannot be fully offset with the CFM measures.

In the following sections, aside from exploring the robustness of these results, we inquire further 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 CFM policies 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 it difficult 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 2 we

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

should 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 Figure 3. In this case, the coefficient represents the change in the effect of the monetary shock on the capital flows after the implementation of the CFMs.

On the gross flows' side, we obtain a significant interaction effect for both the inflows and outflows. The mitigation will be more marked in the final periods. Similarly, the net flows show a stronger interaction in the later periods, which reflects the stronger effect of the policies on the capital inflows' side.

The overall results show how the mitigating effect of CFMs are 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.

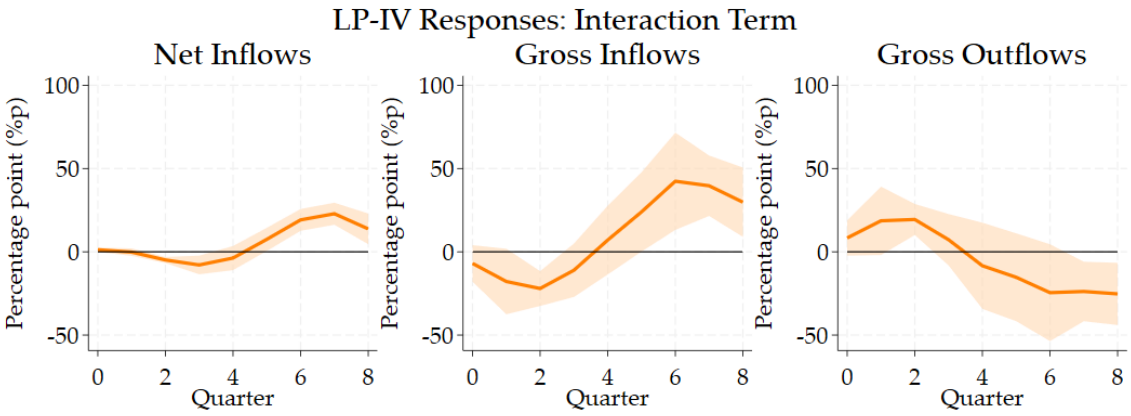


Figure 3: LP-IV IRFs (Coefficient of Interaction Term)

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 also account for the CFMs (dashed line in Figure 2), in those instances the case can be made that both effects cannot be rejected to be statistically different. Although, not shown here, such cases are less prevalent in our identification than in preliminary OLS based

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

estimates (where endogeneity is an issue). In any case, our notion of mitigation, is instead more focused on significant capital flows' effects in absence of CFMs that become null after the controls' 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 be more convenient, since there are related subjectivity risks in scoring the intensity of CFMs which take various forms across countries. Extensions with various indexes of CFMs reflecting their intensity and direction remain as potential areas of further research.[20]

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.[21] 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.

Unlike before, we are not pooling any type of CFM in our policy indicator, but will consider

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

[20] Fernandez et al (2015) make an attempt to account for the intensity with a policy index that take on a range of values, however, such indicator is based on the count of control implementations on a variety of assets rather than an actual measure of the intensity of the policies. In that sense, their measure is more related to the breath or comprehensiveness of the controls, and thus is analogous to the ones we consider.

[21] 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.

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).[22]

The results for CFMs on inflows are shown in Figure 4. We can see that the mitigation effects are still present on both gross inflows and outflows, similar to the baseline results with the aggregate CFMs (Figure 2).[23] We can expect the mitigation effects to be more salient for inflows given the specific aim and scope of the policies. However, we still obtain 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.

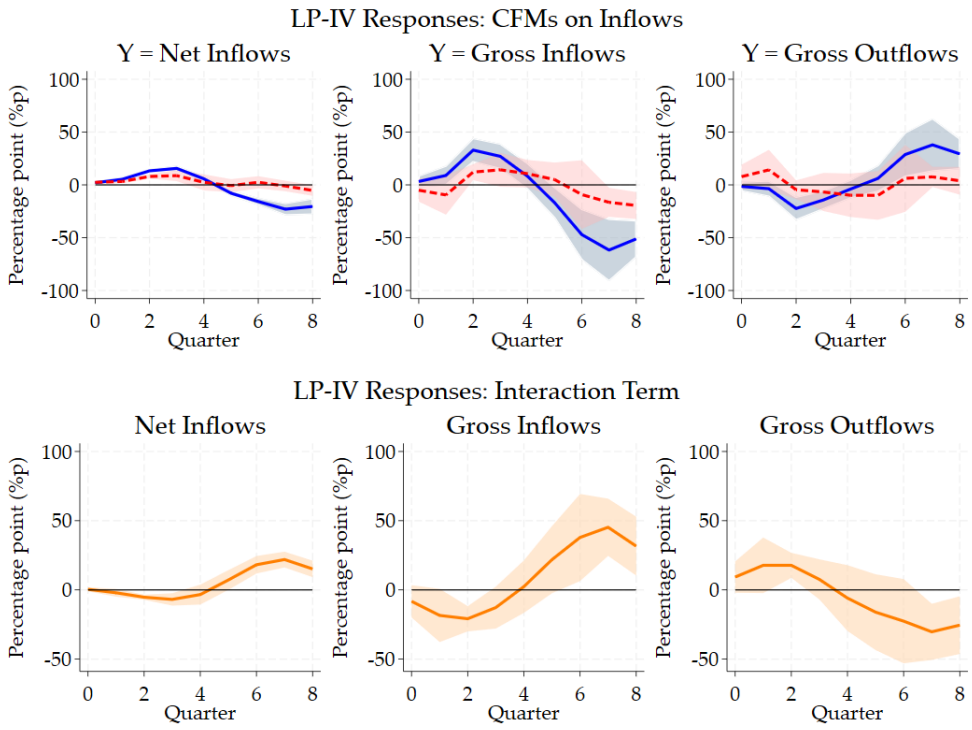


Figure 4: LP-IV IRFs (with CFMs on inflows)

[22] 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.

[23] 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 14 in Appendix B.

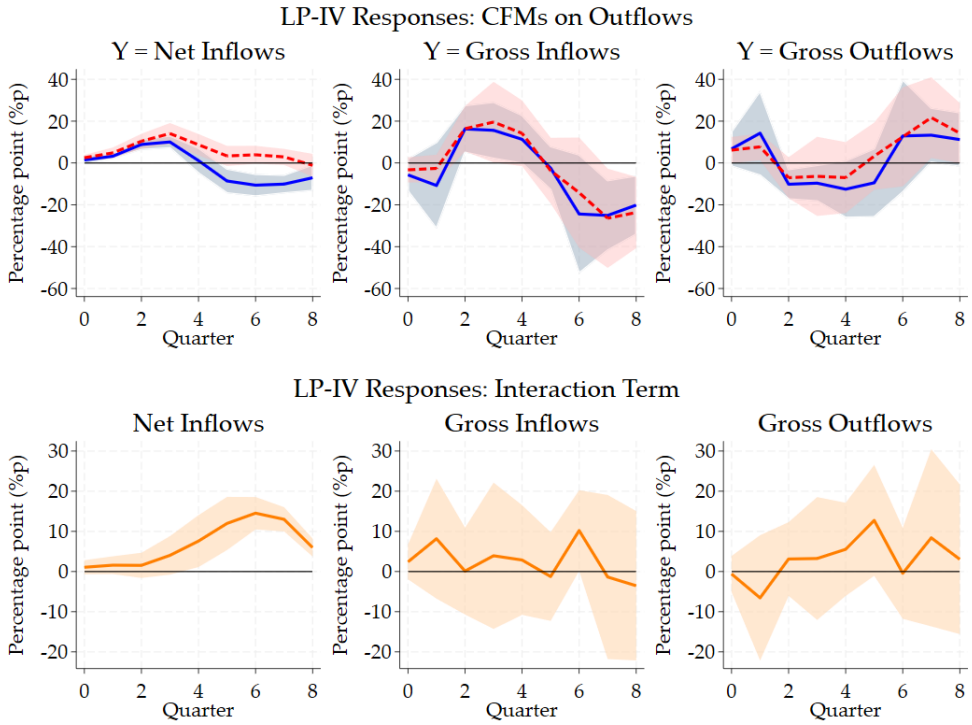


Figure 5: LP-IV IRFs (with CFMs on outflows)

On the other hand, we see somewhat similar mitigation effects from the CFMs targeting outflows, as the dashed line is above the continuous one for most horizons in the right panel of Figure 5. 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 is mediated by the CFMs, 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.[24]

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 possibly be attributed to policies affecting the repatriation of assets by domestic investors.[25]

[24]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.

[25]Consistent with these results, Ghosh, Qureshi, Kim, and Zalduendo (2014) find that the flows affected more largely by global factors are those associated to invesment flows rather than repatriation of assets while Cerutti, Claessens, and Puy (2019) link this sensitivity to global factors (and lack there of to local ones) to the gross inflows

5 Insulation Effects on Total Gross Flows

We can also analyze the total gross flows, defined as the sum of gross outflows and inflows. This variable can be associated to the general level of financial integration, and has been shown to co-move with the global financial cycle by Davis and Van Wincoop (2018), and to be more detached from the dynamics of the net flows given the stronger comovement of the gross flows after the GFC of 2008 (e.g., Forbes and Warnock, 2012; Davis, 2015).

The magnitude of large retrenchment episodes has been associated to the level of financial integration and the reliance on banking flows (e.g., in Milesi-Ferretti and Tille, 2011), and at the same time, the total gross flows are more procyclical and volatile than their net counterpart (see Broner, Didier, Erce, and Schmukler, 2013); thus, looking at the latter only (net or parts of it) may lead to an underestimation of the effect the foreign shock. Therefore, exploring the mediation of the CFMs for total gross flows can be revealing. Similarly, in our specific setup it is also relevant to consider this variable, as we can set aside considerations related to the offsetting between flows that arises by construction in the net flows, and instead, focus on the impact of the foreign shocks on the scale of financial integration.

of equity and bonds.

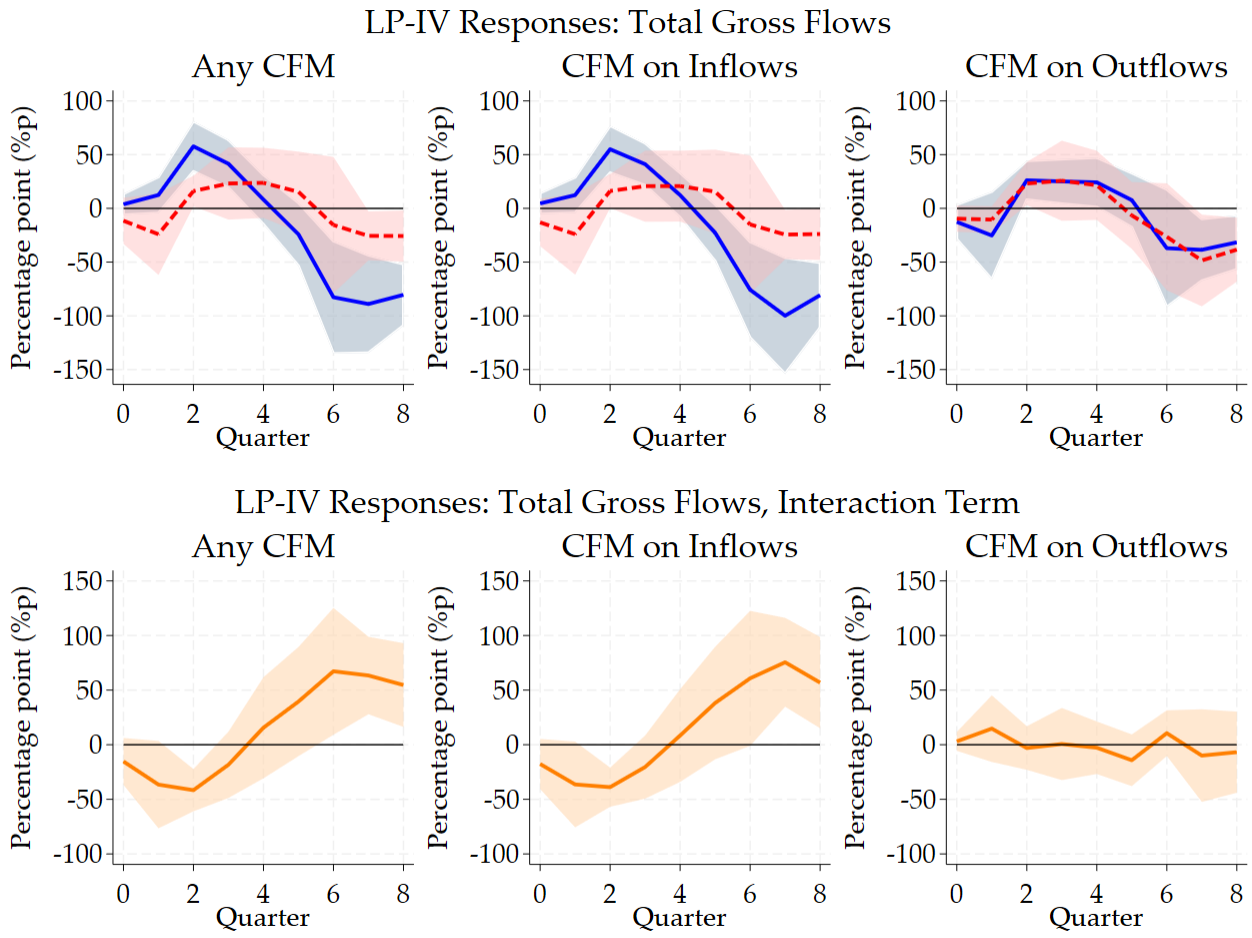


Figure 6: LP-IV IRFs for total Gross Flows

The effects of the foreign policy shock on the total gross flows is shown in Figure 6. We can see that the reaction of the total flows aligns with the ones obtained in previous sections and that, similarly, the implementation of CFM measures mitigate this effect and insulates the level of financial integration. In the middle column we show the effect when implementing controls on capital inflows only, and we can verify that this instrument is the one generating the insulation to the foreign shock. In contrast, the controls on outflows (right panels) depict little to no mitigation. This result enables us to confirm that the insulation is present and is not trivial when considering any definition of gross flows, that is aggregated or separately as before, and that at the same time, the policies with stronger mitigation effects are those aimed to control the capital inflows.

6 The risk profile of the capital flows

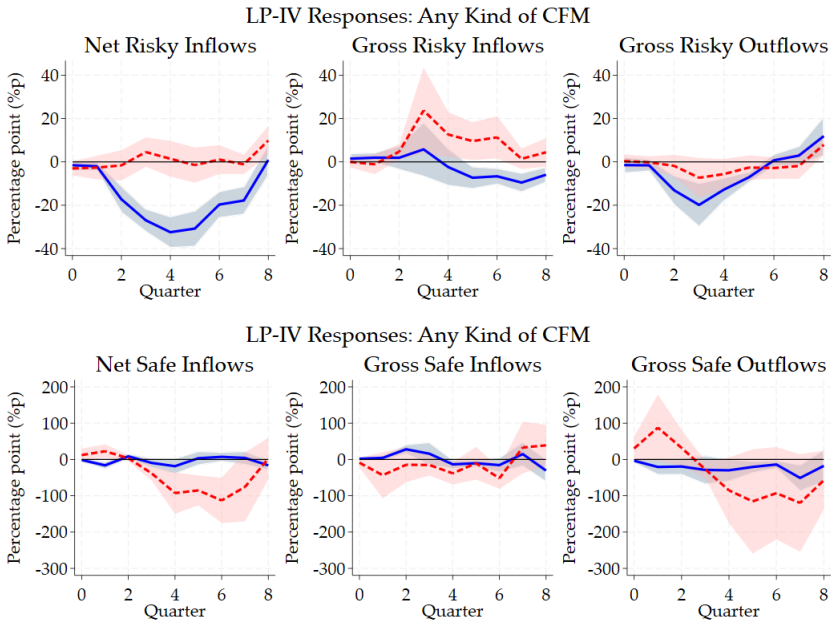
To understand better the insulation properties of the CFM measures, and inquire further into what drives our baseline results on the aggregate flows, it can be relevant to disentangle the effects by type of capital flow. Here we show how the effects change when we consider different risk profiles in the assets driving the investment flows.

To this end, we follow the definition of "risky" and "safe" flows in Davis and van Wincoop (2022), where the safe flows consist of the Foreign Direct Investment and Portfolio Equity flows, while the safe flows are the Portfolio Debt, and the Other Investments (banking flows).[26] For each of these types of flows, we perform separate estimations of Equation (1), and show the associated impulse responses in Figure 7.

Three salient features emerge: First, the effects of the foreign monetary shock and the insulation of the CFMs is present mainly in the risky flows. This is noteworthy as the intended target of the CFM policies are the most fickle and volatile flows. This result is also consistent with the renewed outlook of the IMF on the capital controls and their potential as part of the standard policy toolkit (see IMF (2018) and Qureshi et al. (2011)) as well as with Farhi and Werning (2014), Caballero and Simsek (2018), and Caballero and Simsek (2020) where the fickleness of the flows are a key factor in determining the incentive to tighten the capital controls.

The second important feature we obtain with this disaggregation is that now the responses to the foreign monetary shock are displaying the expected sign from the start. This, together with the fact that there is not a significant effect to mitigate on the side of the safe flows, allows to identify better what flows to focus on for the remainder of this study. With this in mind, we are exploring the risky flows in even more detail to determine whether the mitigation properties of the CFMs are present more strongly in a particular type of asset investments.

[26] Our definition works along the lines of Davis and van Wincoop (2022) but do not include foreign reserves to be consistent with our data construction following Cavallo, Izquierdo, and León (2017). Relatedly, It should be mentioned that there are alternative definitions of safe and risky assets in the literature that focus on specific types of portfolio flows (for example, see the one in Forbes and Warnock, 2014).



Note: The risky assets flows include Foreign Direct Investing and Portfolio Equity flows. The safe assets flows include the remaining assets (other investments, portfolio debt) except financial derivatives.

Figure 7: LP-IV IRFs for capital flows: Risky and Safe assets

On the other hand, a third interesting feature is that for more disaggregated flows, and unlike in our baseline results (with the total flows) the effect of the monetary shock —and the insulation of CFMs— is apparent for both the net and the gross flows. However, it can be noticed that without a proper disaggregation of the investments, we may underestimate both the effects of the foreign shock and of the CFM measures when only paying attention to the dynamics of the net flows.

6.1 Disaggregated risky assets flows

The natural following step is to disaggregate the risky capital flows. As before, we perform separate estimations of Equation (1) for each type of investment flows. The results, shown in the Figure 8, align with our notion that the more fickle or volatile flows are those where the insulation is prevalent. In effect, the effect of the shock, and the subsequent insulation by the CFM measures is present strongly in the Portfolio Equity Flows.

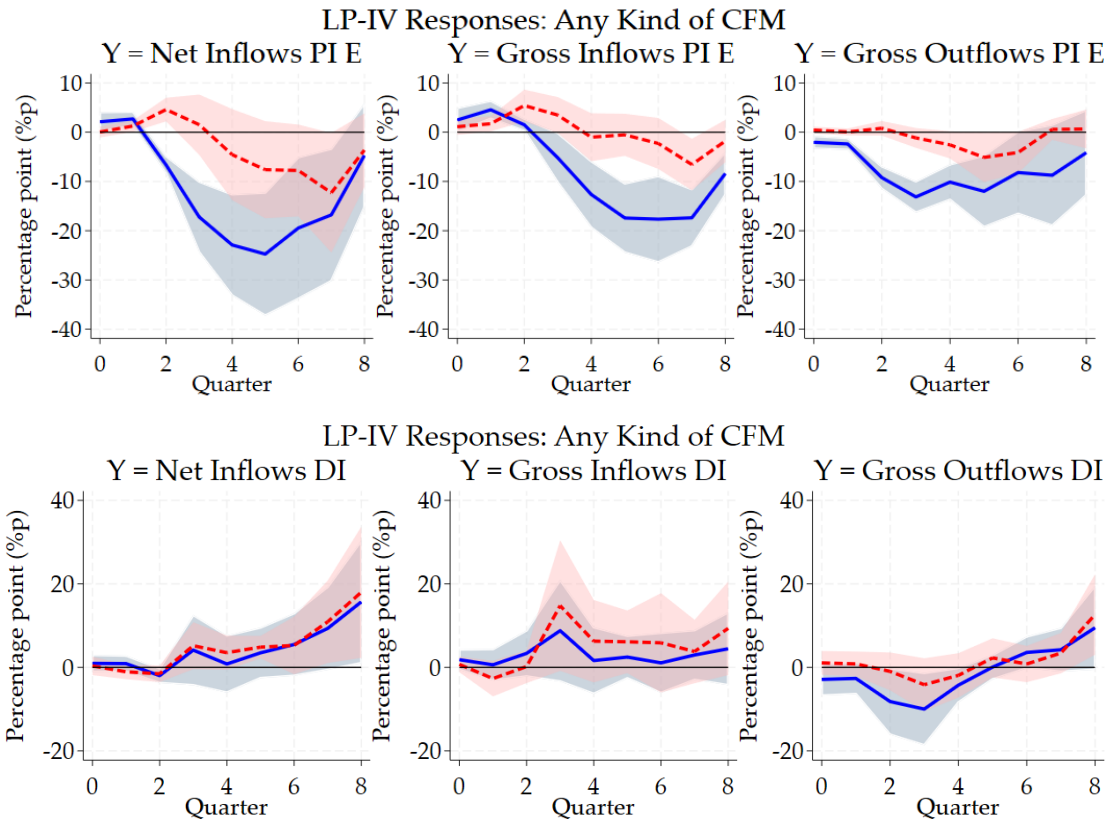


Figure 8: LP-IV IRFs for disaggregateed risky assets flows: Portfolio equity (PI E) and Foreign Direct Investment (DI)

The Foreign Direct Investment flows, although considered "risky", are still more stable flows, which explain why they are not strongly affected by the monetary shock and thus, there is not much of an effect to mitigate with the Capital Controls.

The takeaway after these exercises is that the most fickle capital flows are those affected by the foreign monetary shock, and that it is in those cases that there is an insulation role that can be played by implementing CFM measures.

Effects by specific type of control. As before, it can be interesting to determine whether the insulation is different for capital controls on Inflows relative to those on Outflows. We report the effects for those policies in Figure 9. In this case we obtain that, similar to the aggregate capital flows, the portfolio equity flows (most fickle part of the risky category) are more insulated by the CFM measures that target Inflows. However, in this case the controls on Outflows also have a strong insulation effect.

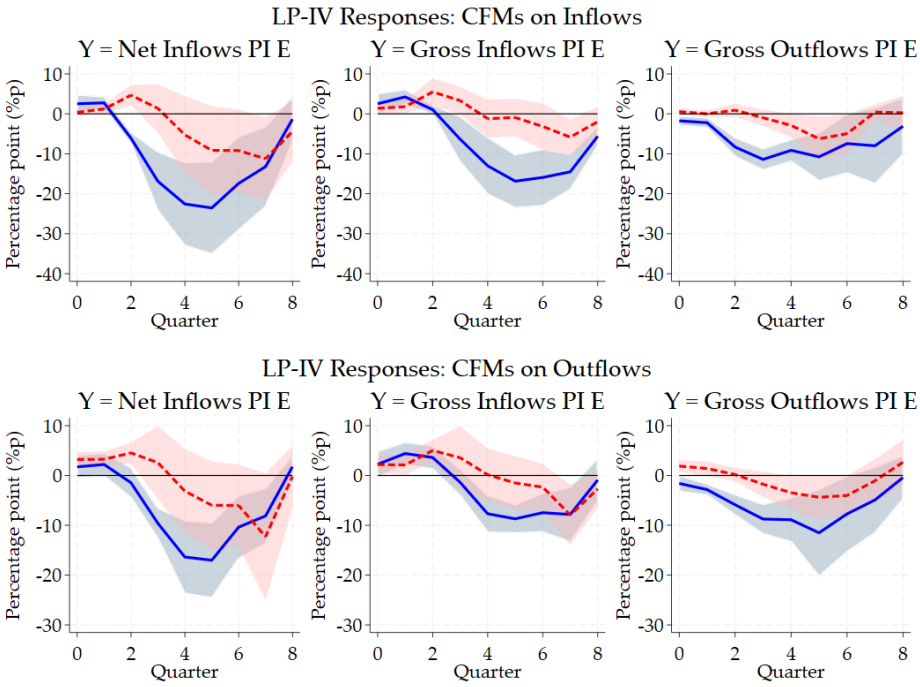


Figure 9: LP-IV IRFs for CFM measures on Inflows and Outflows: Portfolio Equity flows (PI E)

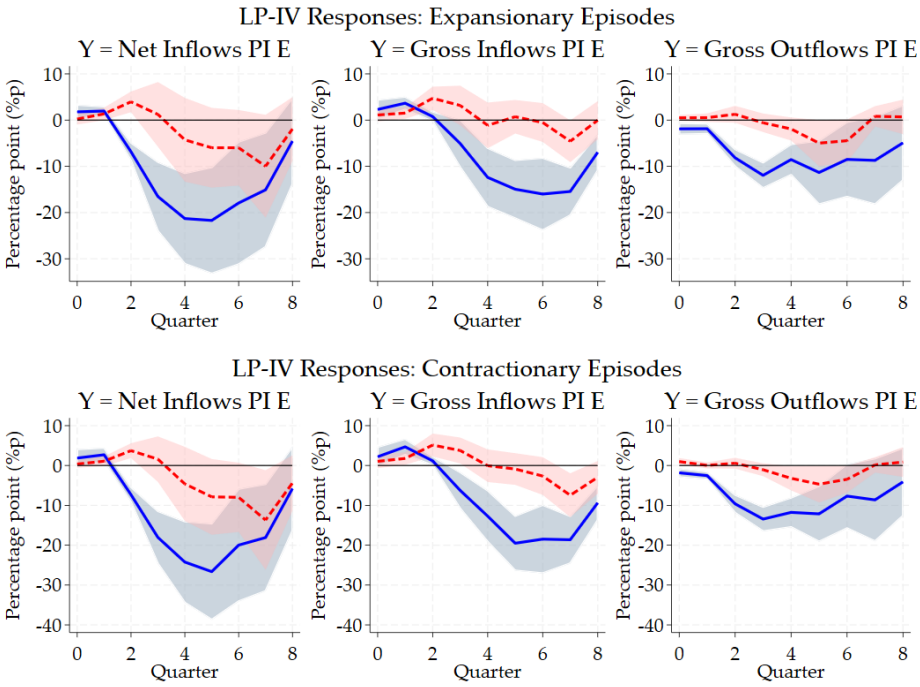
7 Contractionary and expansionary monetary shocks

As a final exercise, we can also study whether this effects vary by the type of monetary policy episode, that is, whether the insulation property of CFMs differ in times of monetary expansions (or expansionary shocks) relative to contractionary. We perform this exercise on the Portfolio Equity flows since these are the investments where the insulation property of the CFM measures is more clearly present.

For that, we construct modified policy instruments for separate estimations along the lines of Jordà, Singh, and Taylor (2020) as follows:

$$z_t^{expansion} = \begin{cases} 0 & \text{if } z_t > 0 \text{ or } \Delta USMP_t > 0 \\ z_t & \text{otherwise} \end{cases}, \qquad z_t^{contraction} = \begin{cases} 0 & \text{if } z_t < 0 \text{ or } \Delta USMP_t < 0 \\ z_t & \text{otherwise} \end{cases}$$

where z_t is our original instrument in the baseline estimations that we constructed in similar lines to Gertler and Karadi (2015), and $USMP_t$ is the federal funds rate or the US policy rate.



Note: These plots show estimations of the effects in contractionary and expansionary monetary policies where in each estimation the monetary shock instrument is modified as in Jordà et al. (2020).

Figure 10: LP-IV IRFs for portfolio equity flows in different types of US monetary policy episodes

The idea here is that the instrument $z_t^{expansion}$ will only recover shocks in expansionary episodes (and the opposite with $z_t^{contraction}$). In principle, if policymakers' intention is to prevent flows retrenchments towards the foreign economies, it could occur that CFMs are set more strictly during times of contractionary US policy changes (increases in the foreign rates).

Our findings in this alternative estimations are shown in Figure 10 and indicate that in both cases the insulation properties are present, however, the mitigation effect of CFM is slightly stronger during expansionary times. This is a potential drawback, or challenge from a policy perspective as the contrary is more desirable, but only reflects that although effective —at insulating the emerging country from the foreign shock— these policies have a slightly harder time mitigating the foreign shocks when more needed, that is, when there are stronger outward pressures on the investment flows of these economies.

8 Robustness checks

8.1 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.[27]

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.[28] 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 11, 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 11). 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 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.

[27] The results of these specifications for the LP-OLS estimates are left for the appendix B.
[28] We provide the list of 23 economies in this alternative specification in the Appendix A.

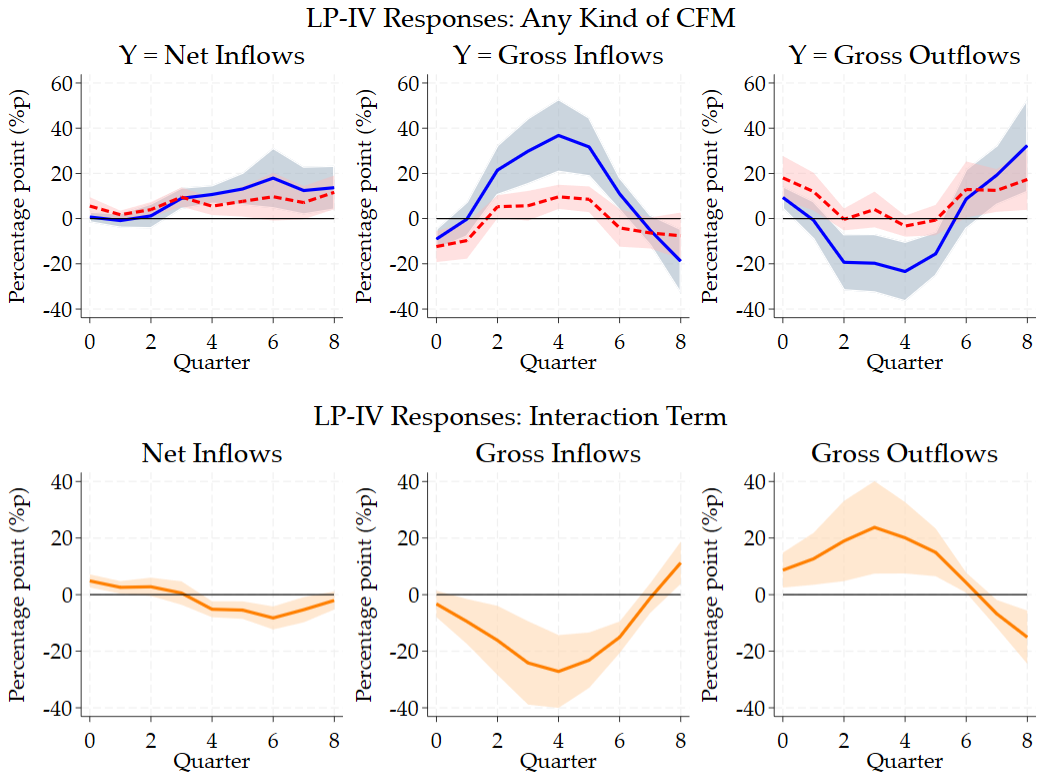


Figure 11: LP-IV IRFs (Excluding Domestic Interest Rates)

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 12, 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 13 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.

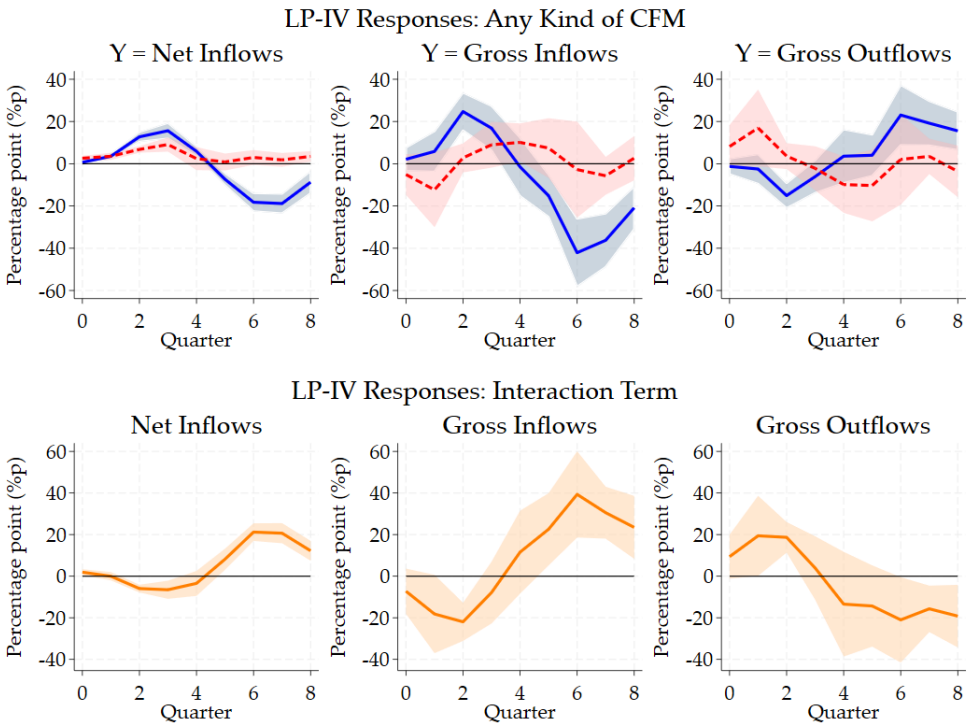


Figure 12: LP-IV IRFs (No GFC time dummy)

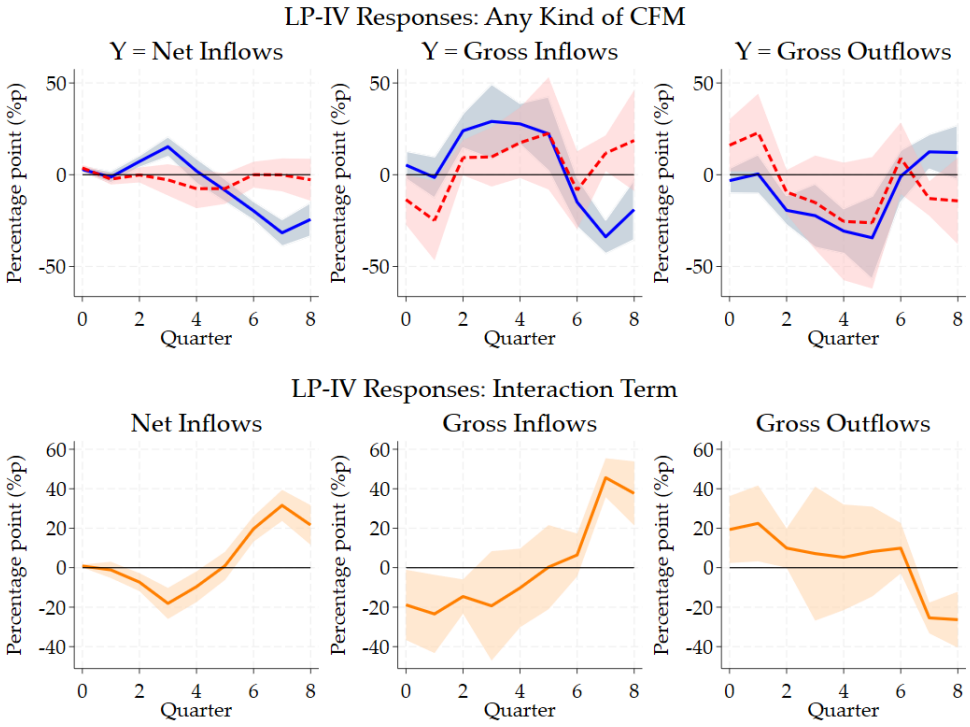


Figure 13: LP-IV IRFs (six-quarters lagged controls)

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 24 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.

9 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. We note the difficulty of perceiving this effect for net flows emerges due to both the increased importance of gross outflows 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, and second, policymakers aiming to mitigate the effect of foreign shocks on their economies can be more effective by targeting different types of flows.

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. Factors such as the intended specific flows of a policy, and the riskiness profile of its associated investment should be considered when implementing these controls with the intention of insulating an economy from global shocks. Finally, 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, as such information becomes available 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, Singapore, Sri Lanka.	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: The 23 economies group is used for a robustness exercise and where the domestic interest rate is omitted as a control variable (which allows for further observations).
Note 3: 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

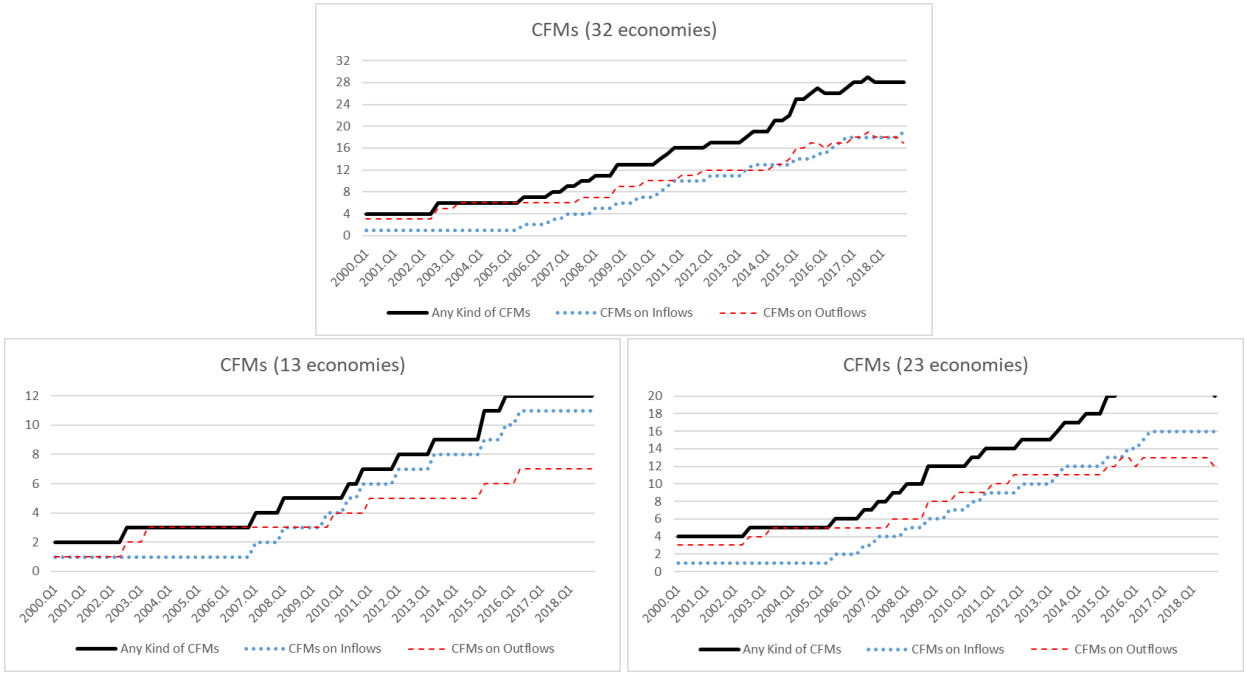

Figure 14: CFMs implementation over time (by country groups). Top: All countries (32 economies); Bottom-left: 13 economies; Bottom-right: 23 economies

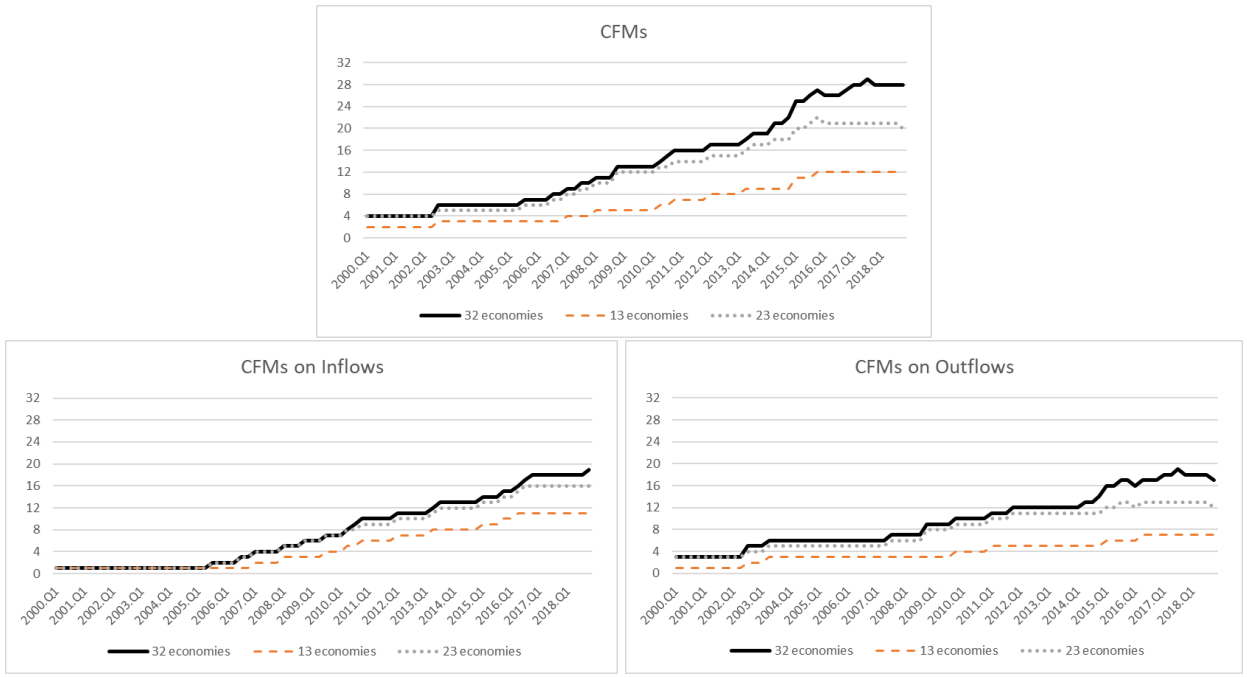

Figure 15: CFMs implementation over time (by type of policy tool). Top: All CFMs; Bottom-left: CFMs on Inflows; Bottom-right: CFMs on Outflows

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, Izquierdo, and León (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/after the Global Financial Crisis (2008Q1)	FRED (NBER recession indicator)

B Additional results

B.1 Additional capital flows and CFM measures disaggregations

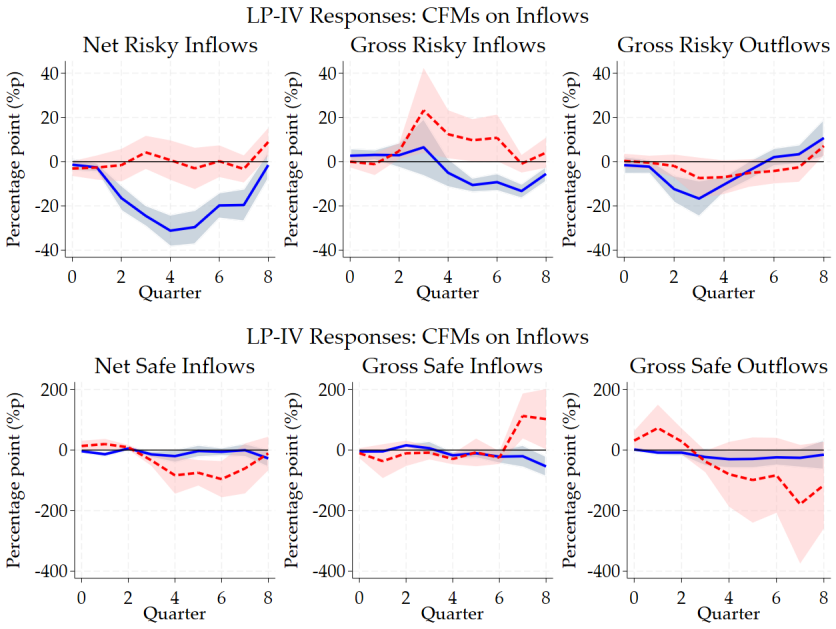

Figure 16: LP-IV IRFs for Risky and Safe capital flows: CFM measures on Inflows

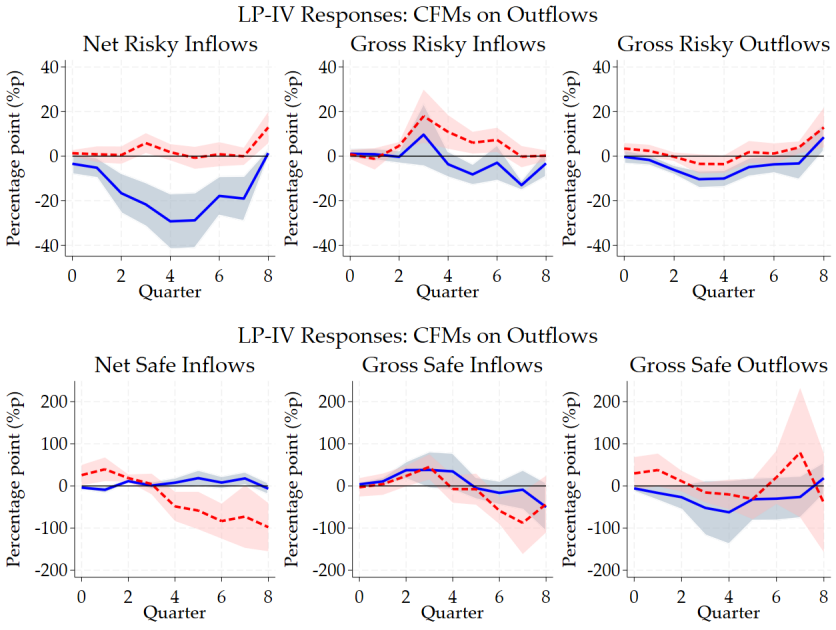

Figure 17: LP-IV IRFs for Risky and Safe capital flows: CFM measures on Outflows

B.2 Results for additional robustness checks

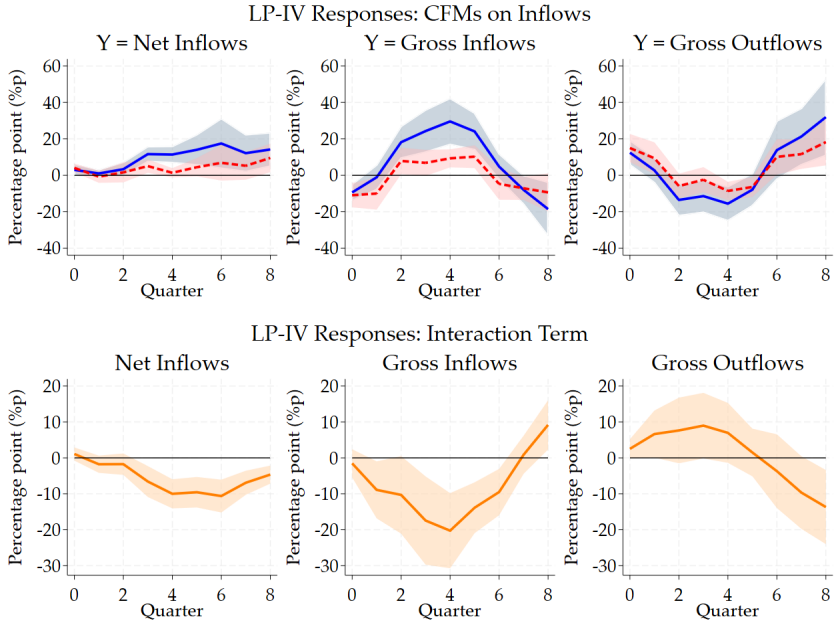

Figure 18: LP-IV IRFs to 1% in US MP Shock (with CFMs on Inflows and Excluding Domestic Interest Rates)

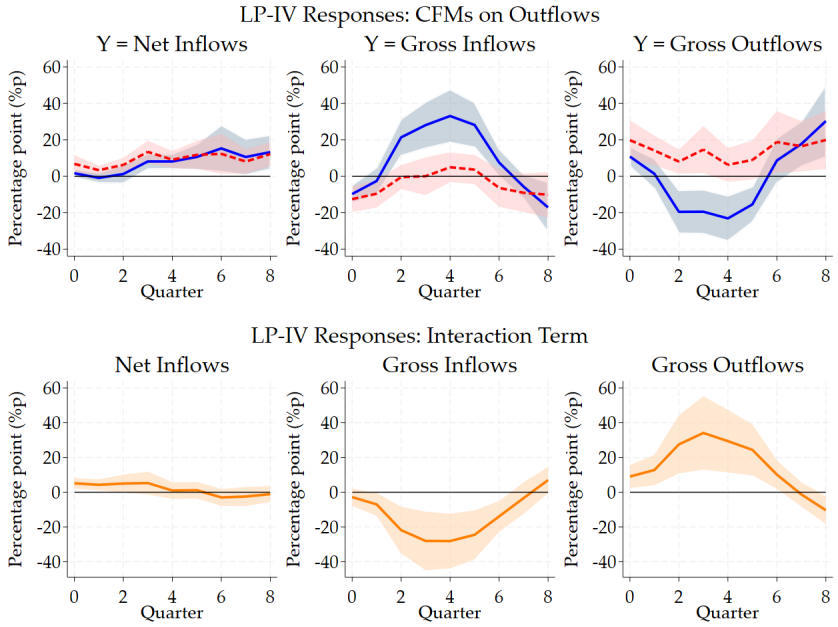

Figure 19: LP-IV IRFs to an Increase of 1% in US MP Shock (with CFMs on Outflows and Excluding Domestic Interest Rates)

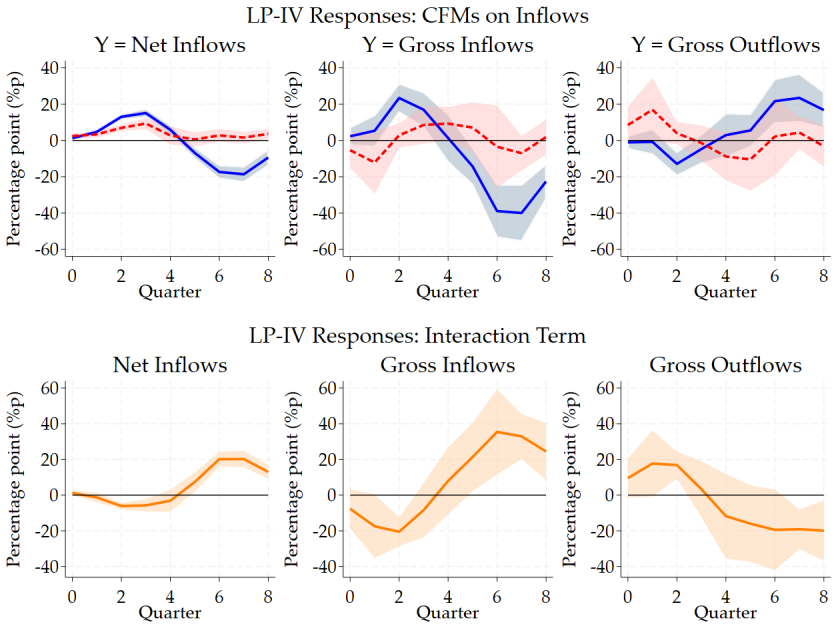

Figure 20: LP-IV IRFs to an Increase of 1% in US MP Shock (with CFMs on Inflows and No Time Dummy)

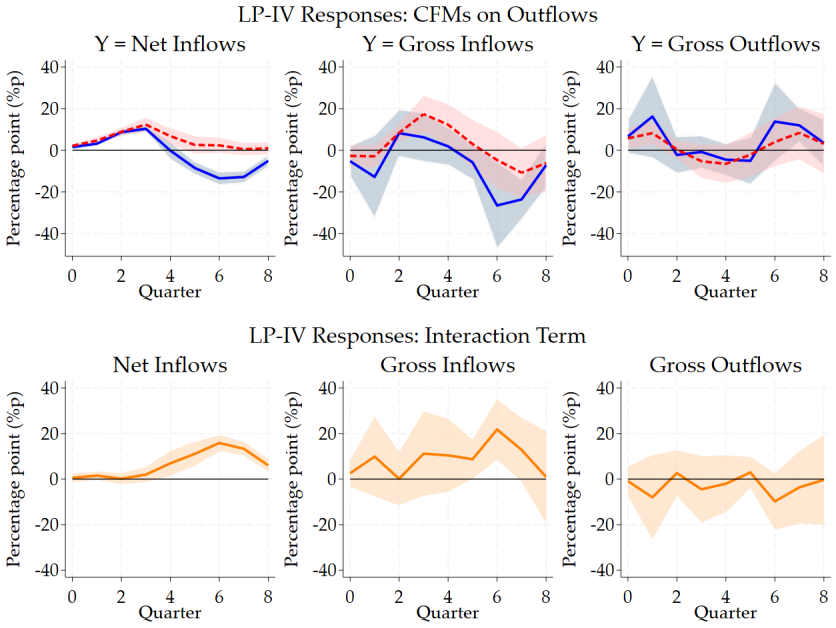

Figure 21: LP-IV IRFs to an Increase of 1% in US MP Shock (with CFMs on Outflows and No Time Dummy)

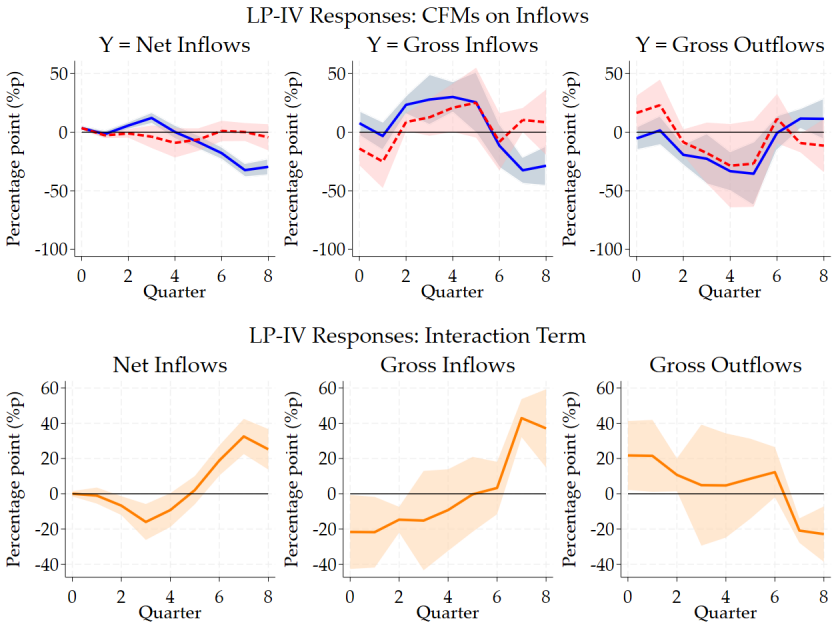

Figure 22: LP-IV IRFs to an Increase of 1% in US MP Shock (CFMs on Inflows and 6 Quarters Lagged Terms)

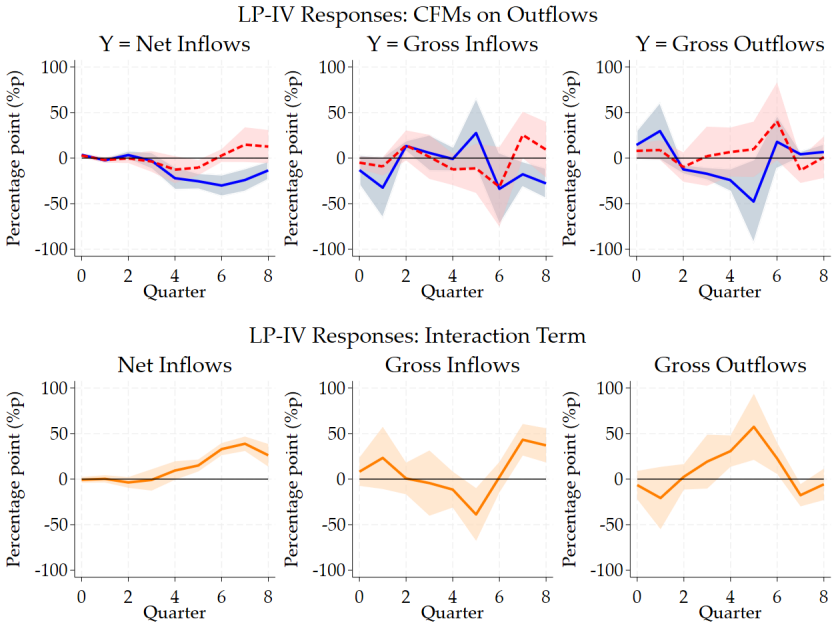

Figure 23: LP-IV IRFs to an Increase of 1% in US MP Shock (CFMs on Outflows and 6 Quarters Lagged Terms)

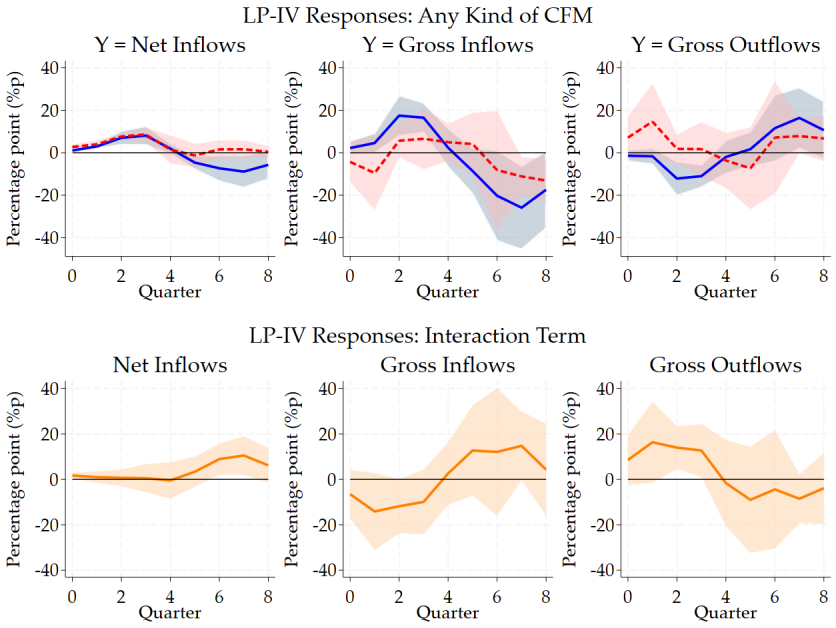

Figure 24: LP-IV IRFs (with Canada included)

B.3 Alternative specifications for OLS estimates or specific types of CFMs

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 (1). In this case, we use the monetary policy rates directly (effective federal funds rate). 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.

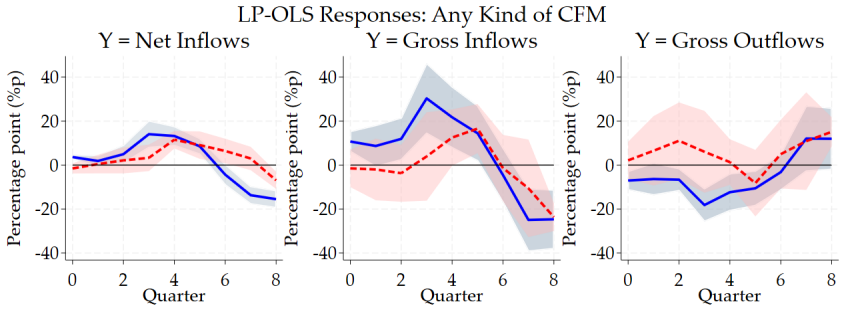

Figure 25: LP-OLS IRFs to an Increase of 1% in the US MP Shock

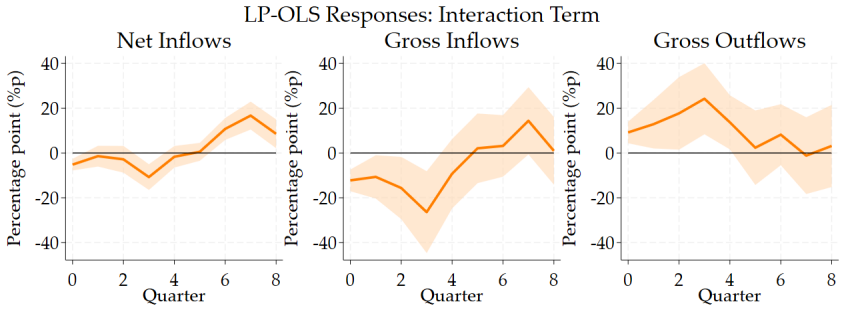

Figure 26: LP-OLS IRFs (Coefficient of Interaction Term)

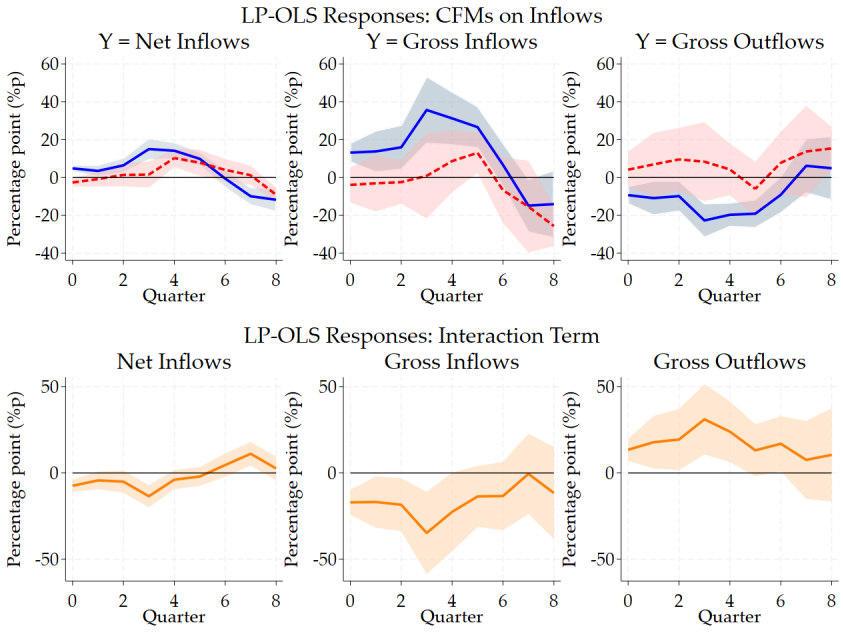

Figure 27: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Inflows only)

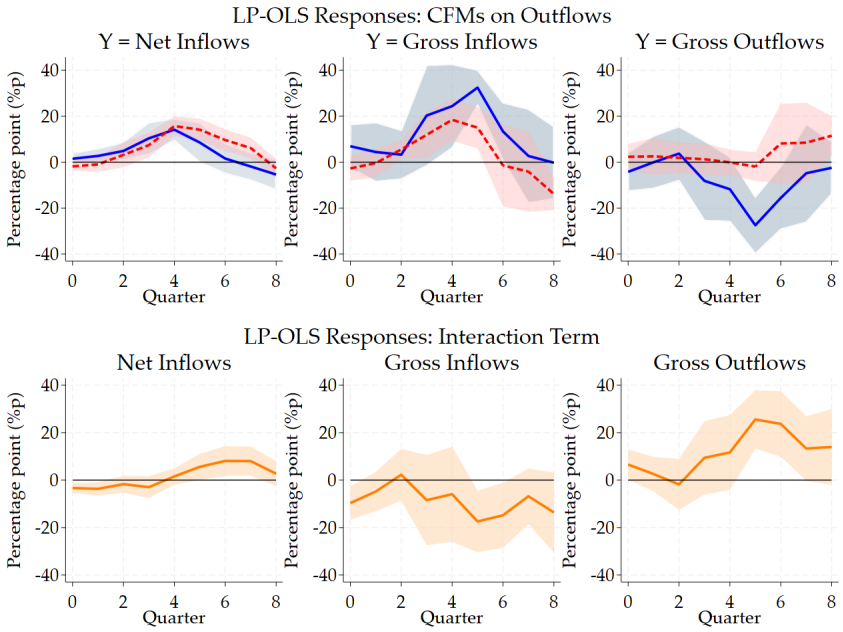

Figure 28: LP-OLS IRFs to an Increase of 1% in US MP Shock s (with CFMs on outflows only)

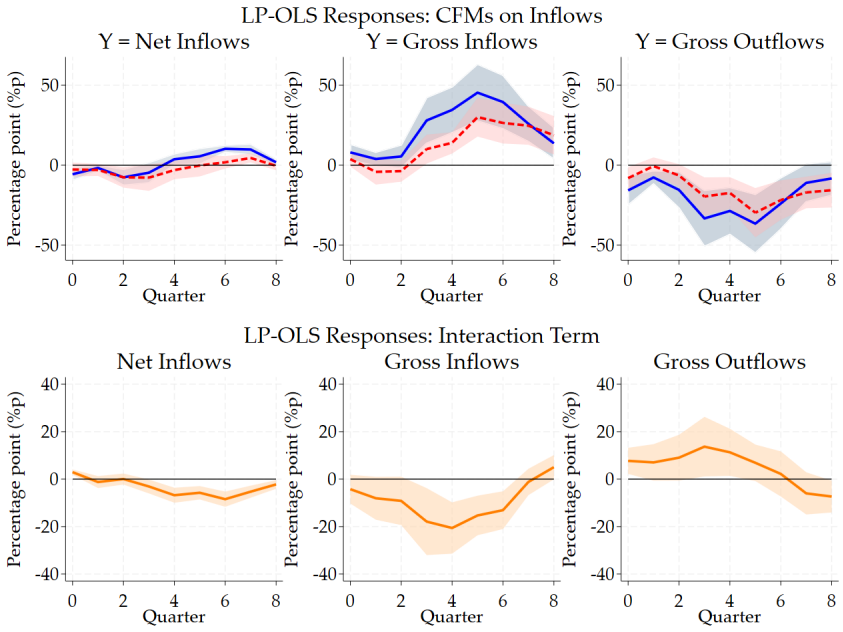

Figure 29: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Inflows and Excluding Domestic Interest Rates)

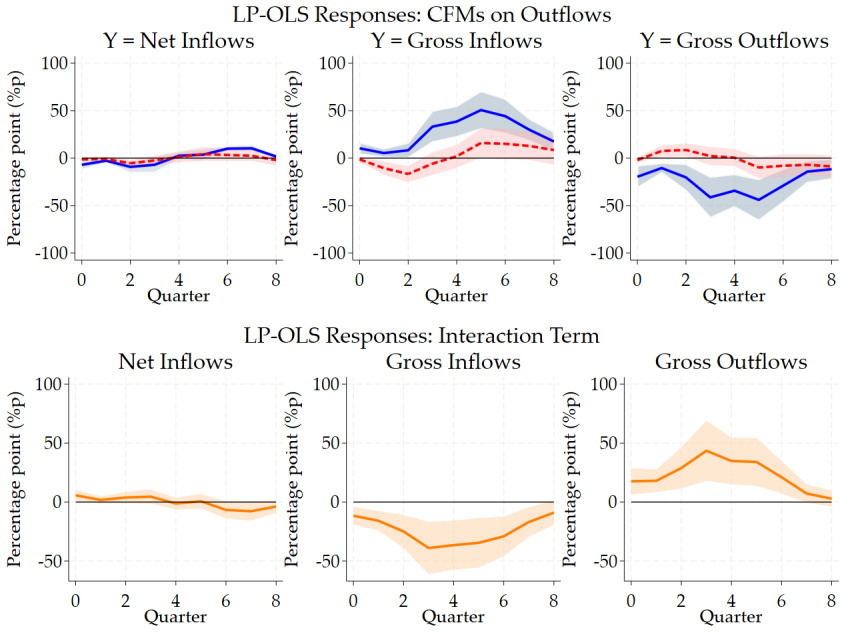

Figure 30: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Outflows and Excluding Domestic Interest Rates)

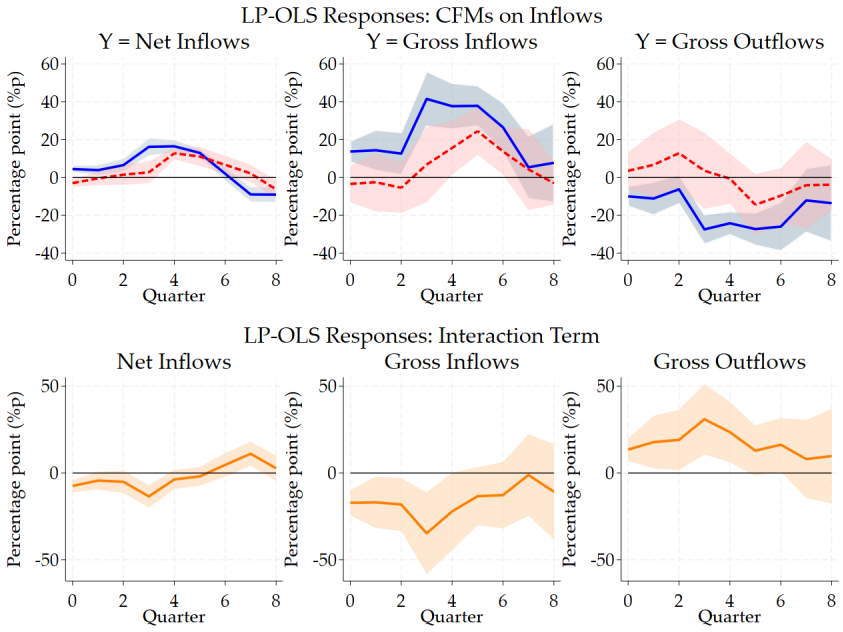

Figure 31: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Inflows and No Time Dummy)

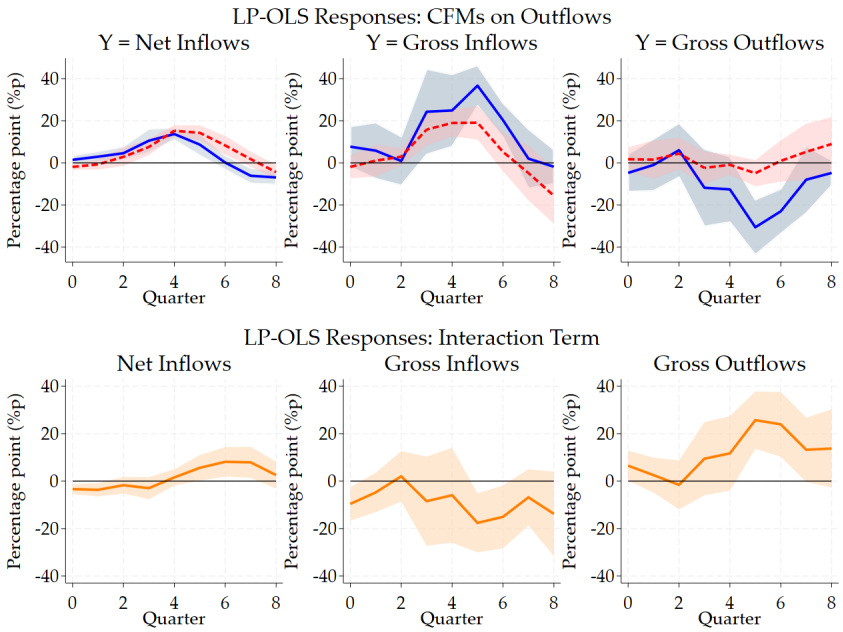

Figure 32: LP-OLS IRFs to an Increase of 1% in US MP Shock (with CFMs on Outflows and No Time Dummy)

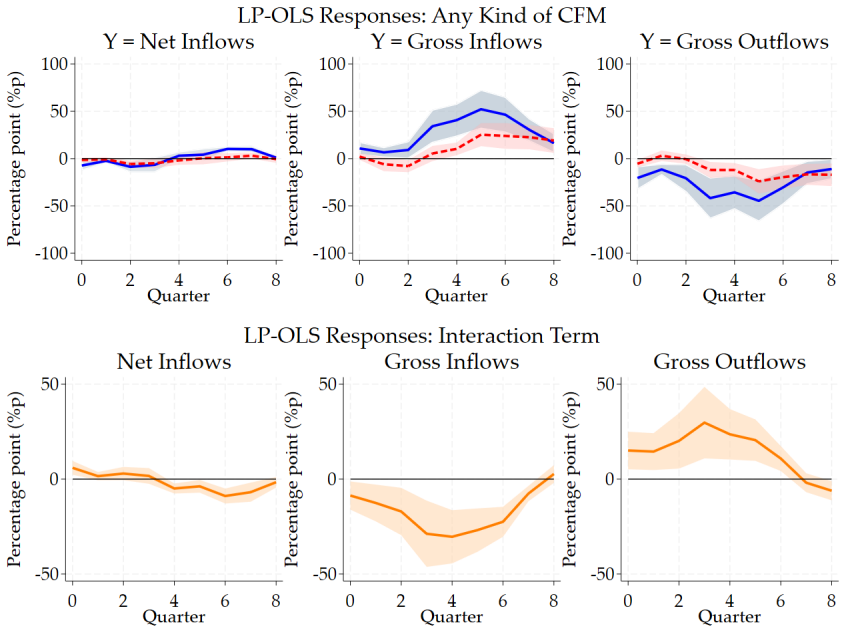

Figure 33: LP-OLS IRFs (Excluding Domestic Interest Rates)

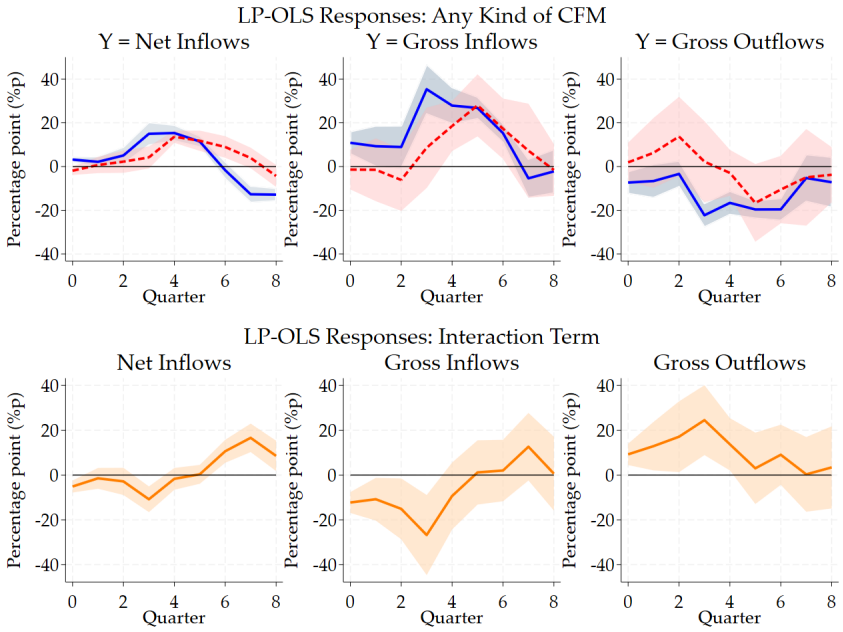

Figure 34: LP-OLS IRFs (No Time Dummy)

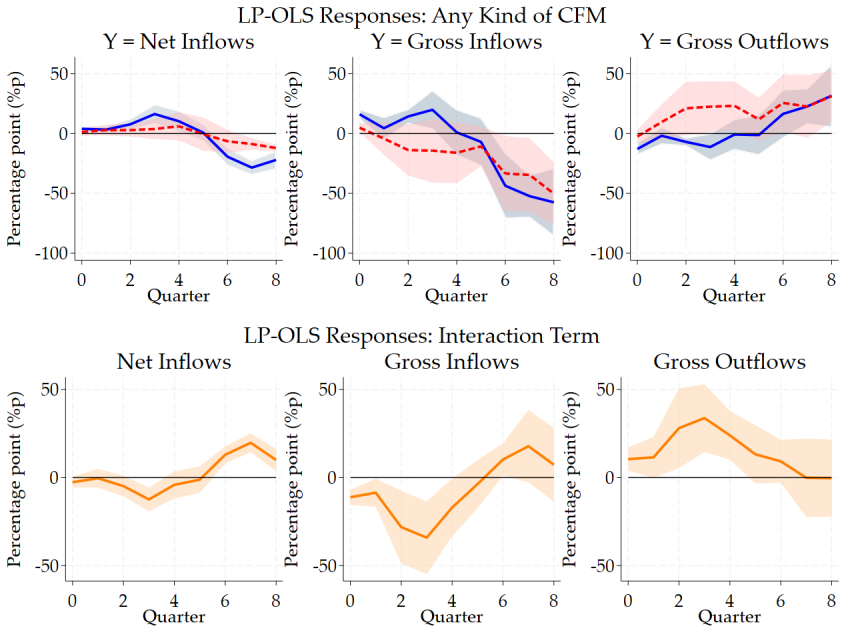

Figure 35: LP-OLS IRFs (6 Quarters Lagged Terms)