Catalytic IMF? A Gross Flows Approach*

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Abstract

The financial assistance provided by the International Monetary Fund is assumed to act as a catalyst for fresh investment. By reassuring private agents, official lending should facilitate access to international capital markets. Such catalytic effect has proved empirically elusive. This paper deviates from the standard approach based on the net capital inflow to study the catalytic role of the IMF in the context of gross capital flows. Using instrumental variables and linear projection methods, we find significant differences to the implementation of IMF programs in the reaction of both resident and foreign investors and inward and outward flows. While the IMF does not appear able to catalyse foreign capital, we show that it affects the behaviour of resident investors, who are both less likely to place their savings abroad and more likely to repatriate their foreign assets. As this effect is largely driven by domestic banks' flows, we conclude that IMF catalysis appears to work best vis-a-vis domestic banks.

Keywords: IMF, Catalysis, Gross Flows, Linear Projections

JEL Codes:

Introduction

Many crises feature, as part of the resolution strategy, the involvement of the International Monetary Fund (IMF). In such cases, the Fund takes on the role of an International Lender of Last Resort and provides crisis-hit economies with subsidised funding, made available conditional on implementing a macroeconomic adjustment program. The objective of granting financial assistance is to give these economies breathing space while they solve their temporary external financing problems.

This framework has both opponents and supporters. A main argument used by the Fund itself to defend this approach is that it reassures private creditors about the existence of an orderly exit

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of the crisis, reducing the potential for a drastic reaction (Cottarelli and Giannini, 2002). This is the so-called *catalytic effect* of official financing. An extensive literature has assessed the importance of this effect by looking at the net flow of capital entering/exiting countries under an IMF program. On the theoretical front it has been shown that IMF lending has the potential to catalyse foreign capital inflows (Corsetti et al., 2006). Discomfortingly, from an empirical perspective, many studies put in doubt the existence of any such positive effect. The absence of strong evidence regarding a positive impact of official lending has served IMF critics to argue that such policies generate moral hazard on both debtors and creditors (IMF, 2013).[1] IMF (2013) argues that, increasingly, official resources simply replace private financing. This private sector-bail-out could prevent the materialisation of any catalytic effect.

In parallel, the literature on capital flows has recently brought its focus on the gross components underlying the behaviour of the financial account. According to this literature, the gross flows composing a country´s net capital inflow react differently to different factors. Along these lines, Forbes and Warnock (2012) and Broner et al. (2013) show that resident and foreign investors' reaction functions are different.[2] These papers show that gross capital flows are very large and volatile, especially relative to net capital flows, and pro-cyclical. Moreover, they shed light on the sources of fluctuations driving capital flows by showing that crises can affect domestic and foreign agents asymmetrically.

In this paper, we bridge these two literature strands by looking at the catalytic effect of IMF lending through the lenses of the gross flows composing the current account. We distinguish varieties of capital flows entering and exiting an economy and study how they react to the signing of an IMF program. We follow Broner et al. (2013) and separate flows according to the investors' residence. Additionally, as in Janus and Riera-Crichton (2015), we study the effect of official funding on a breakdown of capital flows into those in and out-of the economy, regardless of the nationality of the investors.

We compile a detailed dataset of IMF interventions and quarterly gross capital flows for over 50 economies and use it to analyse whether the signing of IMF programs has distinct effects on gross flows. Non-random selection into official support obscures the interpretation of the relation between official credit and gross capital flows. We tackle this concern employing an instrumental variables approach. We follow Barro and Lee (2005) and a large literature on the political and geo-strategic determinants of IMF lending. This literature provides us with an easy and powerful way of instrumenting official support programs. Additionally, we use a linear projections method (Jorda, 2005) to gauge the dynamic reaction of the various types of capital flows to the enactment of IMF programs.

Our results show significant differences in the reaction of resident and foreign investors to the implementation of IMF programs. While the IMF does not appear able to catalyse foreign capital, there is substantial evidence that it does affect the behaviour of resident investors. Remarkably, the strength of the effect of IMF loans on resident investors' behaviour is such that we find evidence of both, more muted domestic capital flight and an increased repatriation of residents' savings placed abroad. When we look at the reaction by types of flows, we find that most of the

[1] Similarly, according to Jeanne et al. (2008), official assistance can delay necessary policy actions.

[2] According to Janus and Riera-Crichton (2015) this is also the case for inward and outward flows.

catalytic effect relates to domestic banking flows, making us conjecture that IMF catalysis is "a banking story".

Finally, taking advantage of the flexibility of linear projections methods, we investigate whether the effect of IMF lending varies with the underlying shock (bank, fiscal or currency crises). Both, the instrumental variables and linear projection estimates show that the type of crisis the financial assistance program is addressing affects the reaction of both resident and foreign investors. The IMF appears to be better able to catalyse domestic savings during sovereign defaults and has the least catalytic effect on foreign investors during currency and banking crises.

Catalytic IMF Lending: A review of the literature

Defenders of the catalytic effect argue that, by reassuring private creditors about the existence of an ordered exit of the crisis, these interventions can stimulate private flows when most needed. A number of theoretical contributions support this positive view. Corsetti et al. (2006) and Morris and Shin (2006) theoretically show that IMF lending is shown able to reduce the incidence of panic driven liquidity crises. Similarly, Peñalver (2004) shows that subsidized lending can induce the borrowing country to exert effort to avoid default. This in turn, by raising future rates of return on investment, encourages larger private capital flows. De Resende (2007) shows that if conditionality forces countries to save more, the resulting lower probability of default can induce private lenders to relax their borrowing constraints. Instead, opponents argue that such policies generate moral hazard both on debtors and creditors, and that the Fund's seniority status is detrimental for the debtor-creditors relationship as it might dilute private obligations (Saravia, 2013). In a framework with panic driven liquidity runs, Zwart (2007) qualifies the results in Corsetti et al. (2006) by showing that catalysis should not be taken as given, as IMF support can be, through its signalling effect, a mixed blessing.

An extensive literature has studied empirically the significance of the IMF´s catalytic effect, providing, at best, mixed evidence. So far, the literature has focused on current accounts and the net inflow of capital into the economy. A majority of studies, either regression analyses or case studies, put in doubt the existence of any such positive effect (Ghosh et al, 2002), although a catalytic effect has been found in some circumstances. Eichengreen and Mody (2003) find a stronger catalytic effect for intermediate economic fundamentals. Various papers have tested whether different types of capital flows react differently to IMF lending. Edwards (2003) finds no catalytic effect on bond issuance. The opposite is true for Eichengreen et al. (2005), who argue that the IMF's role as a vigilante is more likely to manifest in bond markets. Diaz-Cassou et al. (2006) argue that conditionality is the strongest channel of IMF catalysis. Mody and Saravia (2003) find that larger programs associate with stronger catalysis and that a continued IMF presence in a country reinforces this effect. However, if excessively lengthy, such presence can be perceived as a sign of failure, discouraging capital flows. Similarly, Eichengreen et al. (2005) find that, in high debt countries, is the size of the assistance rather than the presence what attracts private capital.

Focusing on the volatility of net capital flows, Broto et al. (2011) show that larger availability of Fund resources lowers net flows' volatility. Mina and Martinez-Vazquez (2002), using aggregate country data, find that IMF lending reduces the countries reliance of short-term debt flows. Saravia (2013) presents evidence on the relation between IMF lending and countries' private and

public debt maturity choices. Using a 1990- 2001 sample, Saravia (2013) finds the opposite effect: IMF loans reduce the maturity of new debt. He argues that this is due to the IMF's senior status. In turn, Erce (2012) shows that, depending on the source of the crisis, IMF lending can reduce countries' incentives to minimize rollover risk.

All in all, the absence of stronger evidence regarding a positive impact of official lending has served IMF critics to claim that overestimation of its catalytic role has led the Fund to impose excessively contractionary policies (Birds and Rowlands, 2002).

Data

Information on International Monetary Fund´s interventions was collected from the IMF´s webpage and various programme reviews. While information is available since the 50s, the data used in this paper is restricted in two dimensions. First, we do not go back beyond the 1990 due to the scarcity of information on a sufficiently granular (quarterly) basis and stop in 2008, given that both the Balance of Payments methodology and the portfolio of crisis resolution tools of the IMF both changed in 2009. Secondly, we only focus on programs funded using the general resources of the Fund (GRA programs) and associated with crisis resolution, that is, EFF and SBA programs. The two IMF's traditional credit lines of crisis resolution are the IMF Stand-By Arrangement (SBA) and the IMF Extended Fund Facility (EFF). The SBA was established in 1952 and it is the IMF's workhorse lending instrument for emerging and advanced market countries. The SBA aims to help member countries addressing their short-term balance of payments problems, emerge from crisis and restore sustainable growth. Differently from the SBA, the Extended Fund Facility (EFF) aims to help countries overcoming their medium/longer-terms balance of payments problems. This implies a longer program engagement (up to 4 years instead of three under the SBA) and a longer repayment period (up to 10 years instead of the 5 years allowed for the SBA).[3] After this selection, we finish with a sample of over 140 programs.[4]

The capital flows data comes from the analytic presentation of the IMF's Balance of Payments Statistics Yearbooks (BOP). The IMF's BOP data set provides detailed disaggregated country-level data, on a quarterly basis since 1970 for a different set of capital flows measured in U.S. dollars. This dataset allows us to construct various measures of Gross Capital Flows, including by type of Flow. In order to understand the true catalytic effect of assistance programs into capital flows we have to be careful defining what is being "catalyzed". In this sense, just looking at a typical measure of Net Capital Flows (i.e. changes of all liabilities - changes of all assets) could be misleading. To see this, simply imagine that the impact of international assistance programs has an asymmetric effect on the behavior of domestic resident investors and foreign investors, aggregating these, potentially opposite, effects could hide the true nature of the catalyzing role of those programs. Furthermore, asymmetric effects could arise in the direction of the flows

[3] The other GRA-programs are geared towards specific circumstances.

[4] The data set includes the date of the arrangement, the original (programmed) expiration date and the actual date at which the program finished (end of the arrangement). Actual and programed end dates may differ due to either a program extension or an early cancellation. Using these dates we computed both the program duration on approval and actual duration. Additional information includes the type of program, the original size of the program, the volume of funds finally drawn under the program, the size (and date) of any augmentation to the program, and information about the precautionary character of the program.

regardless of the residency of the investors or even among the different type of flows. More importantly, from a policy perspective, not all flows are the same. The negative economic effects of sudden net inflows reversals are well documented.[5] Additionally, shocks to specific components of the net inflow, i.e. foreign investment reversals or domestic retrenchment could, potentially lead to external crisis (Janus and Riera 2015). In order to capture this set of potential asymmetries, we use two different decompositions of the net inflow to create our gross measures of capital flows. On the one hand, we use the typical decomposition:

$$Net\ Inflow_{it} = \Delta Liabilities_{it} - \Delta Assets_{it}$$

This decomposition allows us to distinguish between capital outflows by domestic agents (COD), marked by changes in foreign assets held by domestic residents, and capital inflows by foreigners (CIF), which are measured as changes in liabilities of the reporting country's residents held by foreign nationals (See Broner et al. 2013).

Alternatively, given that negative or positive values on the change of assets and liabilities denote a specific direction of the capital flow, we can decompose the net inflow as:

$$Net\ Inflow_{it} = Gross\ Inflows - Gross\ Outflows =$$

$$(\Delta Liabilities_{it}^{+} + \Delta Assets_{it}^{-}) - (\Delta Assets_{it}^{+} + \Delta Liabilites_{it}^{-}) \qquad (1)$$

Where now we aggregate flows based on their direction (in/out) and not on the residency of the transaction originators.[6] In other words, in this aggregation, gross inflows accumulate flows of capital invested in the country by foreign investors ($\Delta Liabilities_{it}^{+}$) plus the capital being repatriated by domestic residents ($\Delta Assets_{it}^{-}$). On the other hand, gross outflows accumulate purchase of foreign assets by domestic investors ($\Delta Assets_{it}^{+}$), plus repatriation of capital from the domestic economy by foreign nationals ($\Delta Liabilities_{it}^{-}$)

Using these two definitions of the net inflow, we build nine basic series of gross capital flows: Total Gross Flows, Capital Outflows by Domestic Residents, Capital Inflows by Foreign Residents, Total Private Inflows, Total Private Outflows plus the four components of definition (1) individually.

Finally, our dataset includes additional variables that are used as controls, either in the panel regressions or as instruments when implementing our instrumental variables strategy. The controls include the High Yield Index and the Federal Funds Rate that we obtained from DataStream, the Chinn-Ito Index of capital account liberalization and nominal GDP growth that we obtained from the World Economic Outlook database.

Empirical Analysis

Stylized Facts on Financial Assistance and Gross Capital Flows

Table 1 shows the summary statistics for IMF programs. As mentioned above we have a large number of programs (147 program onsets) but, a maybe more impressive quantum is the fact

[5] See Calvo (2003) or Hutchinton and Noy (2006)

[6] See Janus and Riera-Crichton (2015).

that approximately 23 percent of our observations correspond to an ongoing IMF program. Countries in our sample underwent, in average, three IMF programs during our sample period. There is a large variation in the size of the programs both, in absolute terms and relative to the countries quota with an average of 1.3 billion SDRs or 121 percent of the country's quota at the Fund. To complete the dynamic view to our Fund Program data, Table 2 presents a transition probability matrix. This matrix shows that there is around 3 percent chance of an onset among countries without an ongoing program, and around 90 percent probabilities of continuation for countries undertaking a program.

In the last part of the paper, we study the interaction between IMF assistance programs (AP) and different crisis types. While, by construction, IMF presence is tightly related to balance of payment problems, in a large number of cases these episodes are not associated with the standard crisis indicators (currency, banking or debt crises). This may be because the country avoided a deeper deterioration of its macroeconomic situation or because the Fund was present in a (successful) preventive role. In the events when the countries do descent into macroeconomic turmoil, the reaction of capital flows to a Fund program could be very different across different types of underlying crisis. In this paper, we focus on four types of crisis: currency crisis, banking crisis and sovereign debt crises from both a domestic and a foreign perspective. Our data on economic crises is based on Carmen Reinhart's variety of crises dataset. As her dataset did not cover all of our sample countries, we have also used information from S&P, Laeven and Valencia (2013) and Broner et al. (2013). Table 3 gives us an idea of the number and distribution of AP onsets across our sample as well the interaction between AP onsets and economic turmoil. From this table we observe that around 56 percent of the Fund program onsets are embedded in a crisis scenario.[7] Conditional to be signed during a crisis, the AP would be entered in the midst of a currency, banking, external sovereign debt and domestic sovereign debt crisis 61, 50, 43 and 18 percent of the times respectively. This table also provides information on the average number of AP onsets per country and the total amount of countries with at least one onset. We have a total of 39 countries with some type of AP onset and, among these, each country has an average of 3.7 onsets during the sample period.

Table 4 shows the summary statistics for the different measures of Capital Flows and explanatory variables used in the paper. We observe that Total Gross Flows (sum of the four components of equation 1) hoover, in average, around 25 percent of GDP. Most of these flows originated from the private sector (21 percent). If we split the sample purely by the direction of the flow, we observe that, in our sample, out the total private flows are divided as 12 percent inflows and 9 percent outflows. If we split the flows by residence of origination, we have that the volume of CIF revolts around 6 percent of GDP while COD is 4 percent. Splitting the sample by type of flow, we observe that most of the recorded flows correspond to the category of "Other Investment" (12 percent of GDP), which is dominated by international banking transactions. FDI with 5 percent and Portfolio Investment with 3 percent follow.

When looking at the four components from our net inflows (NI) decomposition, we observe that the "typical" flows, inflows from increases in foreign liabilities and outflows from increases in foreign assets are the largest components with 9 and 7 percent of GDP respectively. Investment

[7] Nothing precludes that an AP could be in place on the backdrop of a twin or triple crisis.

reversals (outflows from decreases in foreign liabilities) and domestic retrenchment (inflows from decreases in foreign assets) follow with 2.5 percent of GDP each.

Figure 1 shows the evolution of gross flows against the backdrop of the number of programs in effect. Decomposing Total Gross flows into Private and Public Gross Flows, we identify among Private flows two distinct waves of financial integration. The first wave runs from the end of the EMS crisis in 1993 to the beginning of the Asian Crises in 1997. After the Asian and Russian Crises (1997-98), private gross flows slowly declined until the end of the Argentinean crisis in 2002. The second wave arrives in the later part of the so-called "Great Moderation" (2004-08). During this period, total private gross flows averaged 30 percent of GDP in our sample. At the same time, the number of ongoing programs declined from an average of around 12 to 2. The series of Official Gross Flows shows an interesting break in its volatility around the time of the Asian crises. Before the crises, high levels of volatility characterized the official flows reaching peaks above 10 percent of GDP. After 1997, the series remains subdued around 3 per of GDP. Another interesting decomposition of Gross Flows shown in Figure 1 focuses on Gross Inflows and Outflow by residence and by direction of flow. Looking at the Inflow/Outflow decomposition by residence we observe the collapse of both measures, but especially of inflows, during strong external turmoil episodes. This, of course, follows on the footsteps of the Sudden Stops literature. On the other hand we can see that looking just at the direction of the flow, we observe large surges in outflows and, in lesser size, inflows driven by foreign investment reversals (outflows) and domestic retrenchment (inflows) during this crises episodes.

Instrumental Variables

Eichengreen and Mody (2003) argues that, when trying to understand the effect of IMF programs on macroeconomic outcomes, it is necessary to control for the fact that selection into such programs is non-random, as this could bias the estimated coefficients. In this section, we apply an instrumental variables approach to tackle this problem. As described below, our choice of instruments is guided by a significant body of research that has focused in understanding the political and geo-strategic determinants of IMF lending. As noted by Edwards and Santaella (1993), Barro and Lee (2005) or Saravia (2013), the literature has uncovered a set of geo-political and institutional determinants of IMF lending, which have the potential to help researchers address endogeneity concerns. More specifically, we base our identification in four different sets of political factors: internal IMF politics, borrowing country's politics, geo-politics and official sector politics.

As regards the role of internal IMF politics, Barro and Lee (2005) and Saravia (2011) argue that a country's quota at the IMF is also a significant determinant of IMF financial support. Country's quotas can serve as an instrument to the extent that they indicate the country's political power within the institution.[8] In turn, we model the borrowing country's political factors as follows. According to Vreeland (2006) countries where the political system has more veto power are more likely to have IMF programs and that countries are less likely to sign IMF programs when elections

[8] Relatedly, Dreher and Vaubel (2004) and Copelovich (2004) include the total amount of resources available to the Fund as a determinant of IMF lending. Also overall resources and fresh injections of resources can be used as instruments as they may reflect IMF-bureaucrats incentives to lend (Dreher and Sturm, 2006).

are close. Relatedly, Dreher (2002) shows that IMF program are more likely to go off-track ahead of elections. In turn, Edwards and Santaella (1993) find that dictatorial regimes are less likely to engage with the IMF. They rationalize such result as follows. An important role of international organizations is to do national governments' "dirty work." By involving multinational bodies in the decision-making process, local politicians can shield themselves from the political fallout associated with unpopular policies. This implies that governments with a more unstable political base, and thus subject to suffering more heavily from unpopular policies, will recur more frequently to the IMF. A second implication of this public choice view is that, with other things given, countries with dictatorial regimes will have a smaller incentive to request IMF assistance. This is because dictatorial regimes, in general, can withstand unpopular adjustment programs without suffering serious political consequences. In turn, Tacker (2000), Barro and Lee (2005) and Dreher and Sturm (2006) provide us with geo-political instruments. They argue that political proximity, as measured by the various countries' voting alignment with the US (and other advanced economies) at the United Nations and other international fora, is important to explain IMF lending.[9] Finally, we use two variables associated with the politics of the official sector. First, we use the signing of an agreement with the Paris Club, which mechanically forces the signing of an IMF program. In turn, Papi et al. (2014) analysis of the effect of IMF lending on banking crises successfully uses flows of development assistance (ODA flows) into the economy as an instrument for IMF lending. We follow them and include that instrument in our estimations.

With this identification strategy in mind, we estimate the following model of the effects of IMF programs on gross capital flows:

$$IMF\_Program_{it} = \alpha_i + \delta_t + \gamma Z_{it-1} + \varphi X_{it-1} + \varepsilon_{it} \qquad (2)$$

$$Y_{it} = \alpha_i + \delta_t + \sum_{n=1}^{4} \theta_n \widehat{IMF\_Program}_{it-n} + \beta X_{it-1} + \mu_{it} \qquad (3)$$

Equation (2) models the presence of the International Monetary Fund. Equation (3) models the determinants of gross flows. Equation (2) is estimated using a lineal panel data model. *Y* represents de different types of capital flows used in the analysis. *X* covers a set of lagged controls including output growth, foreign interest rates, capital control measures and crisis dummies. In turn, Z contains the political and geo-strategic factors used to instrument the IMF presence. The variable $\widehat{IMF\_Program}$ defines the estimated likelihood of signing a program with the Fund obtained from equation (2). Our regressions include country fixed effects, time (quarter) effects and a time trend in an effort to capture the increases in global financial integration. We use HEC errors clustered by country. Finally, we also interact the onset dummy with the set of underlying crisis described before.

We include in *Z* all of the indicators in our first step estimation. The first step results are presented in Table 5. Most of our instruments are highly significant. Even more importantly, they have the expected signs. Thus, countries with more influence (via IMF quota, their presence on the UN Security Council or their alignment with the US at the UN voting) are more likely to be granted assistance. Also as expected, while dictatorial regimes are less likely to ask for support than democracies. In turn, as expected, these are less likely to do so during and prior to elections.

[9] http://www.uni-heidelberg.de/fakultaeten/wiso/awi/professuren/intwipol/datasets.html

Finally, also higher ODA assistance and negotiations with the Paris Club show as robust predictors of countries accessing IMF resources.

In the second step, we regress our various gross capital flows measures against the instrumented lag of the IMF indicator and a set of exogenous determinants of the gross flows. These additional variables include four lags of GDP growth, the HY Index, the Fed Funds rate, the Chinn-Ito Index of capital openness and a crisis dummy indicator.

Tables 6 to 8 show the results for the gross flows equation (second step). Every cell represents a single IV regression. The point estimated is the sum of the coefficients of the four lags on every IMF lending agreement (AP). We measure significance with a Wald Test of the null of the sum of the four coefficients being zero. From these tables, we immediately observe a number of interesting results. As shown in Table 6, when we focus on the direction of the flows, we find that IMF programs are accompanied by a stronger reduction on the volume of private capital flowing in (be it from resident or foreign origin). In this dimension, one could argue that the IMF is not capable of catalyzing the entry of capital into the intervened economy. In turn, there is no evidence of significantly higher capital outflows. This means that, at least, the signing of an IMF program does not accelerate the exit of capital already invested in the economy.

From a residence perspective (last two columns), we also obtain very stark and interesting results. While the IMF is able to catalyze domestic capital flows (reducing the domestic capital drain), it does not seem to be able to reduce the capital flight by foreigners. In fact, if anything, IMF programs apparently triggers further foreign capital flight. Table 7, which presents our estimates when domestic and foreign flows are broken down into those entering and those exiting the economy, further reinforces the idea that the IMF affects significantly the behavior of domestic investors. The estimated coefficients show that resident investors are more likely to repatriate their foreign assets, compensating somehow for the reduced entry of fresh foreign capital.

Finally, Table 8 repeats the analysis but this time using the categorisation of the capital flows. Thus we distinguish flows of entry and exit for FDI, portfolio investment and other investment. Although we also find a significant negative effect in the flow of foreign FDI, the results show that it is in the other investment category where the effect of the program are stronger. As this indicates that the results obtained when looking at broader gross flows measures are largely driven by domestic banks' flows, we conclude that IMF catalysis appears to work best vis-a-vis domestic banks.

Dynamic Cumulative effects through linear projection methods

So far, we have not focused on the rich dynamic responses of capital flows to the inception of an assistance program. In this section, we study such dynamics by presenting a set of representative cumulative impulse response functions using the local projections methodology.

In our cumulative impulse response function estimation strategy, we follow Jorda (2005), Stock and Watson (2007), and others in the use of linear "local projections" (LP) for the construction of our IRFs. This methodology allows us to directly project the behavioral reaction of gross private capital flows to the signing of a financial assistance program with the IMF other controls by computing estimates of the h-step ahead cumulative average treatment effect on the gross flows

variables.[10] This methodology provides a flexible alternative to VAR approaches. As described by Jorda (2005) linear projections can be estimated by simple single regression techniques (LSDV in our case) and they are more robust to misspecification.

While widely used in the literature, as explained in Ramey (2014), Jorda's method does not consistently dominate the standard Structural VAR method for calculating impulse responses of endogenous variables with contemporaneous effects. Since Jorda's LP does not impose any restrictions linking the impulse responses at h and h+1, estimates can display an erratic behavior due to the loss of efficiency. Additionally, as the horizon increases, one loses observations from the end of the sample. Finally, the impulse responses sometimes display oscillations at longer horizons. Comparing Jorda to a standard SVAR and a dynamic simulation, Ramey (2012) finds that the results are qualitatively similar for the first 16 quarters. For longer horizons, however, the Jorda method tends to produce statistically significant oscillations not observed in the other two methods. Since, in this study, we are interested at the short and medium horizon effects of fund programs on Gross Flows we can safely disregard these drawbacks.

Additionally, given the potential endogeneity issue described above, we follow Jorda et al. 2014 using an instrumental variables approach in our local projection regressions.

In our basic linear specification, each response of Changes in Capital Flows to contemporaneous onset of financial assistance programs at horizon h is obtained from the following equation:

$$\Delta Y_{i,t+h} = \alpha_{i,h} + \beta_{E,h} \widehat{IMF\_Program_{it}} + \chi_{E,h}(L)\Delta Y_{i,t-1} + \Psi_{E,h}(L)\Delta X_{i,t-1} + \sigma_{1t} + \mu_{i,t,h},$$

where $\Delta Y_{i,t+h} = Y_{i,t+h} - Y_{i,t+h-1}$, and $Y_{i,t+h}$ represents the accumulated capital flow measure over GDP at time $t+h$, $\widehat{IMF\_Program_{it-n}}$ proxies for the signing of an assistance program, instrumented using the variables introduced in the previous section, *X* covers a set of lagged controls including real output growth, foreign interest rates, capital control measures and crisis dummies. Finally, we include a full set of country and year dummies. Every equation for each *h* is estimated using a standard LSDV approach. We use robust Driscoll and Kraay (1998) standard errors for our coefficients to correct for potential heteroskedasticity, autocorrelation in the lags and error correlation across panels.

Figures 2 to 8 give us the projected reaction of different flows to the onset of an AP program from the Fund. Looking at Figure 2, we observe a steady increase in total gross flows over time after the onset of a program. This increase is driven entirely by official gross flows since the aggregated private flows stay flat and even start to decrease after year (although the coefficient remains statistically insignificant. As shown before, the interesting results appear after decomposing the gross private flows into inflows and outflows. As we can see from figure 3, the first asymmetry between inflows and outflows responses is represented by the fact that CIF react faster to the onset of the program; we observe a significant drop in CIF on impact, around 5 percent of GDP. Meanwhile, COD only start to react after 2 quarters of the establishment of the fund with a similar size drop. A second clear asymmetry is observed on the size and standard deviation. CIF peaks close to an accumulated drop of 8.5 percent of GDP but it displays larger standard errors. COD peaks at an accumulated drop around 13 percent of GDP with tighter errors. This complements

[10] Linear projections are, in practice, regression-adjusted difference-in-difference estimates that collapse the time series information in a pre and a post period for each step ahead.

our previous story in a dynamic setting, we observe that the presence of the fund has a significant catalyzing effect on domestic outflows in the medium run while it also seems to significantly discourage foreign inflows only in the very short run. Looking at the decomposition of private flows by their direction regardless of the residence of the originators gives us a more muted version of the same story. Figure 4 shows how inflows react strongly an immediately while outflows seem decrease mildly only after six quarters. The fact that we found relatively less robust results using all flows by direction is another indication that the presence of the fund affects the decisions of domestic and foreign agents differently. This can be shown in more detail in figure 5, where we decompose the Net Inflow into four components by direction and origin of flow. Looking at the four panels of figure 5, we see that while the presence of the fund deters new inflows from foreigners in the short run and, less statistically significantly, in the medium run (panel A), it does not lead to capital flight (Panel D). If anything, capital withdrawals from foreigners seem to be reduced in the medium run (albeit not in a statistically significant way). On the other hand, the presence of the fund not only seems to help prevent domestic residents sending their capital abroad (panel C), but also seems to lead to domestic retrenchment in the medium run (panel B).

Figures 6 to 8 look at the IRFs for each type of flow. Interestingly, the pattern described for aggregate flows seems to be strongly driven by the "other investment" component. With cross-country bank loans representing the bulk of this type of flows, we seem to be looking at a "banking story". Figure 6 shows the reaction of Foreign Direct Investment (FDI) CIF and COD to the onset of an IMF program. Given the long-term nature of these flows, its not surprising that the point estimates of the IRFs remain relatively stable after the shock. In any case, we do observe an increase in outflows in the medium run peaking around 2 percent of GDP after 5 quarters and a statistically significant accumulated decrease of FDI inflows around 3 percent of GDP after 2 quarters.

Figure 7 turns to the reaction of Portfolio (Debt and Equity) flows to an IMF program onset. Not surprisingly given the short-term nature of these flows, we observe larger variations among the point estimates of these IRFs. Interestingly, The IMF seems to be successful at reducing significantly the amount of COD in the first four quarters with an accumulated reduction peaking close to 4 percent of GDP. Again, the IMF presence seemed ineffective promoting portfolio CIF although we do observe an increase in these flows after 2 years.

Finally, figure 8 shows the reaction of "Other Investment Flows" (OI) to the onset of an IMF program. "Other Investment" flows are composed by international loans, trade credits, currency and other flows. The bulk of these flows lay accumulated in the international loans category. Figure 8 shows how the reactions of both OI CIF and OI COD seem to be an order of magnitude larger than what we observed with FDI and PI. In this case, the pattern of both IRFs mimics the general pattern described in the beginning of this section. CIF decrease around 5 percent of GDP on impact and peak after five quarters at 6.5 percent of GDP. COD take 2 quarters to react but then, after just five quarters, peak at an accumulated decrease around 13 percent of GDP. While the reduction of both CIF and COD is statistically significant at 95% confidence level, errors are smaller for COD.

Dynamic reaction and underlying vulnerabilities

As mentioned above, IMF presence can lead to very different effects depending on the underlying macroeconomic circumstances of the country requesting the program. In figures 9 to 18 we capture these differences showing the IRFs of the effects of programs under a set of different economic crises and we compare them to a baseline IRF under no crisis. In order to calculate these non-linear effects we upgrade our original local projection estimation to include an interaction term with each type of crisis. Thus, our new estimation strategy is based on the following equation:

$$\Delta Y_{i,t+h} = \alpha_{i,h} + \beta_{1,h} AP_{i,t} + \beta_{2,h}(AP_{i,t} * CD_{i,t}) + \chi_{E,h}(L)\Delta Y_{i,t-1} + \Psi_{E,h}(L)\Delta X_{i,t-1} + t + \sigma_t + \mu_{i,t,h}$$

Where CD is our crisis dummy and AP proxies for the signing of an assistance program, instrumented as detailed above. We test the effects of program onsets during five types of economic turmoil: Currency Crisis, Banking Crisis, Domestic Sovereign Debt Crisis, and External Sovereign Debt Crisis and a dummy capturing any type of crisis. We build the baseline IRF from the coefficients $\beta_{1,h}$ (where we assume CD=0) and we compare these results to the sum of $\beta_{1,h} + \beta_{2,h}$ (equivalent to assuming CD=1). Finally, we test the statistical significance of the differences between the effects under crisis and under no crisis. This test is equivalent to test for $\beta_{2,h} = 0$. We include a yellow marker in y-axis if the difference is significant at a 90% confidence level.

Figure 9 shows the reaction of COF to a program onset under the presence of any type of crisis. As in the baseline specification, the effects on outflows of a program onset during a crisis do not appear until the second quarter after the shock. Interestingly, while the final accumulated response is similar during and outside crisis episodes, the size of these responses in the medium run is not. During crisis, the reduction in COD is much sharper after only 3 quarters, dropping beyond an accumulated 10 percent of GDP. Both series converge around 10 percent of GDP after a year and a half.

When we break the analysis to the different types of crises, we observe a range of interesting asymmetries. As shown in figure 10, the effects of program onsets on COD during currency crises are very similar to those of the baseline model and not as large as other type of crises. IRF under these periods lead to an accumulated drop in COD around 10 percent of GDP after five quarters. Similarly, to currency crises but displaying lower point estimates, banking crises do not present statistically larger effects of program onsets on COD than the baseline model. In periods of banking crises, the response peaks with an accumulated drop around 10 percent after five periods. Responses during domestic sovereign defaults show a very different story. During these types of events, fund intervention seems to lead towards a large and significant catalyzing effect on COD compare to the baseline model. Our estimates show an ever-decreasing point estimates for COD that reaches a whopping 40 percent of GDP after 7 quarters. Finally, the effects on COD of IMF programs during sovereign external crises seem significantly larger than the baseline model in the medium run (3 and 4 quarters out) but collapse to similar point estimates two years. The COD responses during those episodes peak at an accumulate drop of 20 percent of GDP after 3 quarters.

The IRF of CIFs draw a very interesting set of results as well. While, in general, the presence of the fund lowers CIFs during crises beyond the estimates found in the baseline (no crises) estimation, opposite to COD, these differences show large and significant effects during currency and banking

crisis and smaller or insignificant differences during domestic and external sovereign crises. To display these effects we turn to figures 14 to 18.

In figure 14, we observe that the response of CIF to program onsets during any type of crises is always larger than the baseline estimates. Once the program is in place, CIF drops by 5 percent of GDP on impact and the response peaks after 5 quarters around 20 percent of GDP. In contrast, the baseline estimates are very close to zero. In any case, the differences between these two responses are only statistically significant at a 90% confidence level during the 4^{th} quarter. When we turn to currency crises in figure 15, the differences in CIF responses to program onsets against the baseline estimates are much larger and statistically significant. During these crises, CIF drop near 10 percent of GDP on impact after the program is put in place and the effect peaks at 22 percent of GDP after 5 quarters. As shown by figure 16, the CIF responses during banking crises are very similar to those during currency crises with a decrease of 10 percent on impact and peaking at an accumulated drop in CIF of 26 percent after 5 quarters.

Figures 17 and 18 show that, similarly to the baseline estimates, the presence of the fund during sovereign crises (domestic or external) does not lead to statistically significant drops in CIF.

Conclusions

In this paper, we study the catalytic effect of IMF lending from a gross flows perspective. Our results show significant differences in the reaction of resident and foreign investors to the implementation of IMF programs. While the IMF does not appear able to catalyse foreign capital, there is substantial evidence that it does affect the behaviour of resident investors. Remarkably, the change comes from both a more muted domestic capital flight and an increase repatriation of residents' savings placed abroad. We also find that most of the catalytic effect relates to banking flows. Thus, we posit that IMF catalysis seems to be "a banking story".

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APPENDIX

Table 1: IMF Program Summary Stats

Variable	Observations	Mean	Std. Dev	Min	Max
IMF Ongoing Dummy	4332	0.231	0.421	0	1
IMF Program Size (SDR Mill)	147	1318.1	3229.9	11.6	22821.1
IMF Program Size (Rel Quota)	147	121.7	223.8	15	1938.5
IMF Amount Drawn (SDR Mill)	105	1459.3	3266.4	4	17199.6
IMF Amount Drawn (Rel to Total)	105	0.74	0.55	0.06	4.05
IMF Original Program Duration (Months)	147	20.1	9.4	5	36
IMF Actual Program Duration (Months)	147	20.6	10.2	5	49
Final - Original Duration (Months)	147	0.48	5.6	-26	17
Paris Club Program Size ($US Mill)	51	4382	7651.2	58	40160

Table 2: Transition probability Matrix for Ongoing Fund Programs

Origin/End	0	1	Total
0	96.79	3.21	100
1	10.71	89.29	100
Total	76.68	23.32	100

Table 3: IMF programs and economic crises

	Total Onsets	Onsets per Country	Countries with Onsets
IMF Onset_Total	147	3.77	39
Paris Club Programs_Total	52	2.17	24
IMF_Onset during All Crisis	83	2.59	32
IMF_Onset during Currency Crisis	51	1.89	27
IMF_Onset during Banking Crisis	41	1.78	23
IMF_Onset during Sovereign Dom. Crisis	15	1.67	9
IMF_Onset during Sovereign Ext. Crisis	36	2.25	16

Table 4: Summary Statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Total Gross Flows over GDP	3308	0.256	0.317	0	6.187
Private Gross Flows over GDP	3308	0.208	0.299	0	6.03
Official Gross Flows over GDP	3308	0.046	0.086	0	2.661
Standard Private Inflows over GDP	3308	0.064	0.127	-0.534	2.787
Standard Outflows Inflows over GDP	3308	0.042	0.169	-2.037	2.817
JR Private Inflows over GDP	3308	0.115	0.156	0	3.187
JR Outflows Inflows over GDP	3308	0.093	0.177	0	2.845
FDI flows over GDP	3308	0.046	0.081	0	1.787
Portfolio Investment flows over GDP	3308	0.032	0.084	0	1.615
Other Investment flows over GDP	3308	0.129	0.2	0	4.037
Private Outflows form Liabilities over GDP	3308	0.026	0.046	0	0.626
Private Inflows form Liabilities over GDP	3308	0.09	0.128	0	3.034
Private Outflows form Assets over GDP	3308	0.067	0.166	0	2.832
Private Inflows form Assets over GDP	3308	0.025	0.071	0	2.064
Federal Reserve Funds Rate	3308	5.276	3.44	0.14	22
Number of IMF Programs	3308	3.108	2.309	0	8

Figure 1

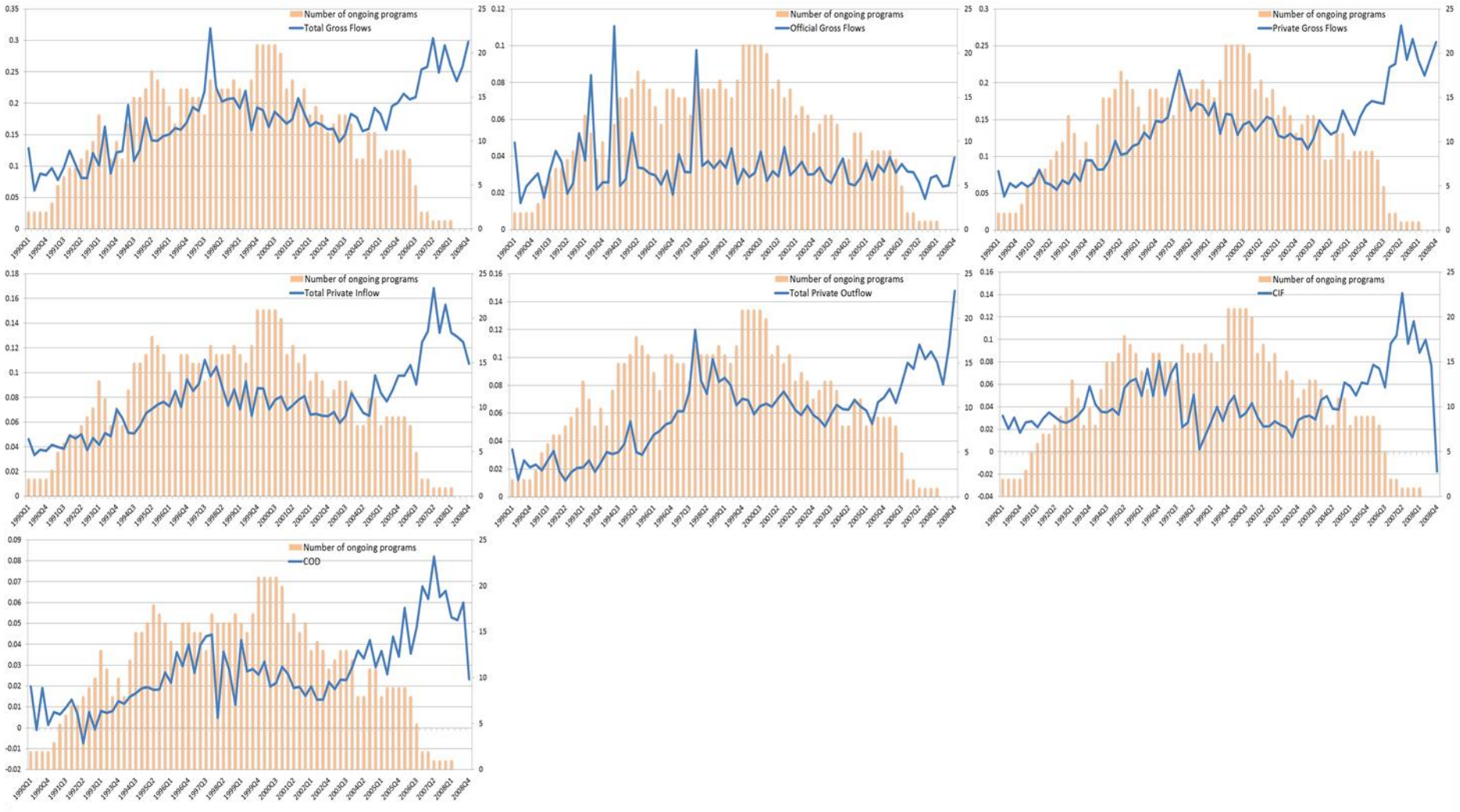

Number of ongoing programs
Total Gross Flows
Number of ongoing programs
Official Gross Flows
Number of ongoing programs
Private Gross Flows
Number of ongoing programs
Total Private Inflow
Number of ongoing programs
Total Private Outflow
Number of ongoing programs
CIF
Number of ongoing programs
COD

Table 5: IV Estimation (first stage): Determinants of IMF lending

		IMF presence	IMF presence	IMF presence	IMF presence
Domestic politics	Dictatorship dummy	-0.1216	-0.1162	-0.1071	-0.1082
		[0.025]***	[0.026]***	[0.026]***	[0.026]***
	Elections dummy	-0.0118	-0.0121	-0.0112	-0.0115
		[0.006]**	[0.006]**	[0.006]**	[0.006]**
Geo-politics	Presence in UN Security Council		0.0185	0.0205	0.0199
			[0.011]*	[0.011]*	[0.011]*
	Alignment with the US at UN voting		0.5029	0.5351	0.539
			[0.266]*	[0.260]**	[0.268]**
Official sector politics	Paris Club deal dummy			0.3092	0.3108
				[0.053]***	[0.053]***
	ODA provided by the US			14,348	16,639
				[0.427]***	[0.368]***
IMF internal politics	Quota at the IMF				0.0096
					[0.033]
Observations		3,849	3,777	3,767	3,767
Number of countries		57	56	56	56

Standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. All regressions also include also four lags of real GDP growth, the high yield index, Federal funds rate, Chinn-Ito Index and a crisis dummy.

Table 6: IV Estimation (second stage): Impact of AP on Aggregate Gross Flows

	Total Gross Flows	Private Gross Flows	Private Gross Inflows	Private Gross Outflows	CIF	COD
IMF Onset	-0.356	-1.072	-1.673	-0.565	-2.469	-1.357
P-Value of Joint Significance	0.636	0.146	0.041**	0.511	0.004***	0.008***

Regressions include also four lags of real GDP growth, the high yield index, Federal funds rate, Chinn-Ito Index and a crisis dummy.

Table 7: IV Estimation (second stage): Impact of AP - Four-way Gross Flows

	Private inflow from Liabilities	Private inflow from Assets	Private outflow from Assets	Private outflow from Liabilities
IMF Onset	-2.526	1.64	-0.468	-0.389
P-Value of Joint Significance	0.002***	0.022**	0.527	0.602

Regressions include also four lags of real GDP growth, the high yield index, Federal funds rate, Chinn-Ito Index and a crisis dummy.

Table 8: IV Estimation (second stage): Impact of AP on Gross Flows by type

	FDI inflows	FDI outflows	Portfolio investment inflows	Portfolio investment outflows	Other investment inflows	Other investment outflows
IMF Onset	-1.1776	0.654	-0.64	-0.676	-1.632	-1.68
P-Value of Joint Significance	0.024**	0.9239	0.417	0.413	0.034**	0.041**

Regressions include also four lags of real GDP growth, the high yield index, Federal funds rate, Chinn-Ito Index and a crisis dummy.

Figure 2: Total and Private Gross Flows IRFs to IMF AP Onset

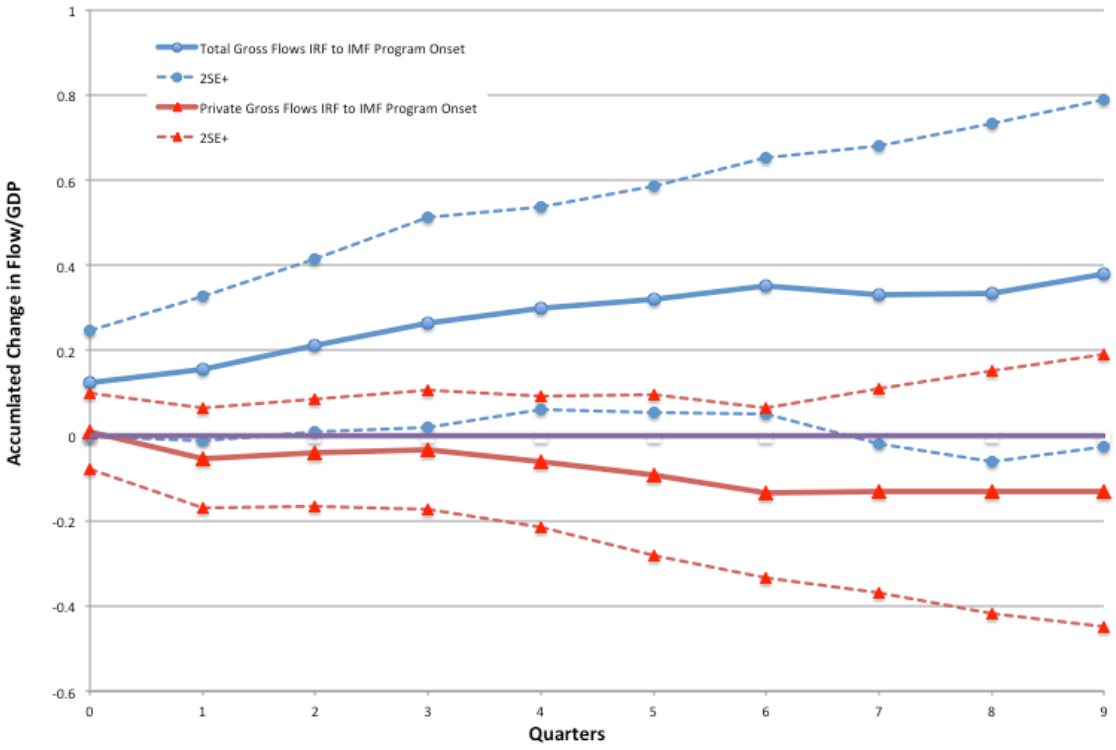


Figure 3: CIF and COD IRFs to IMF AP Onset

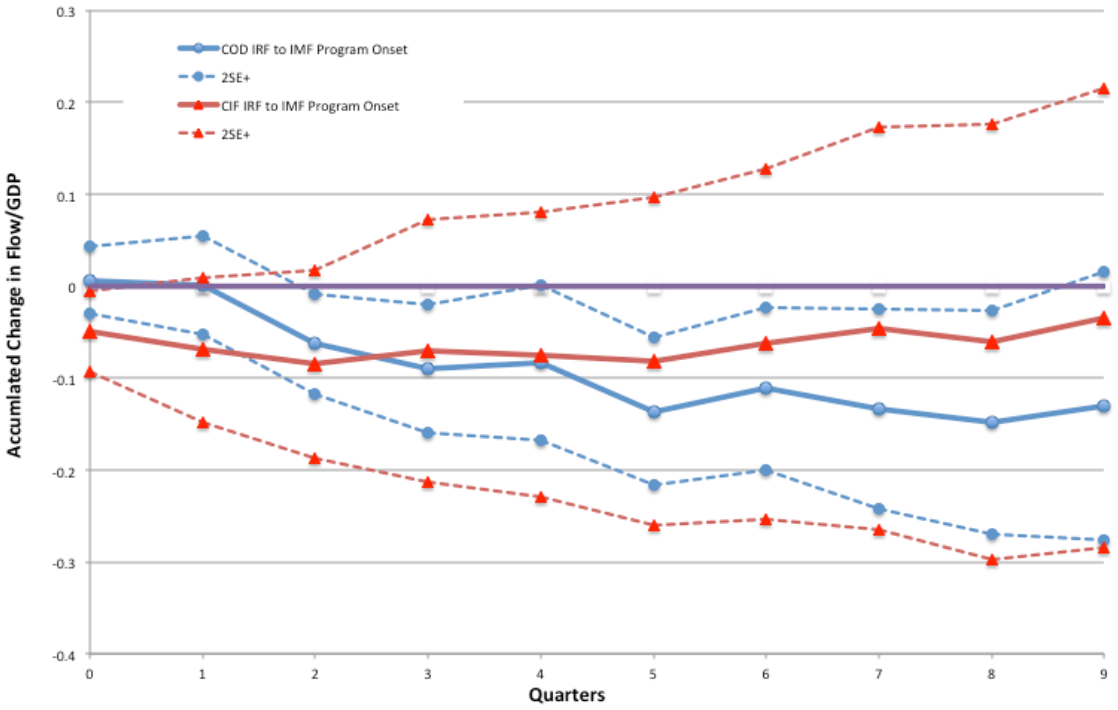


Figure 4: Gross Private Outflows/Inflows IRFs to IMF AP Onset

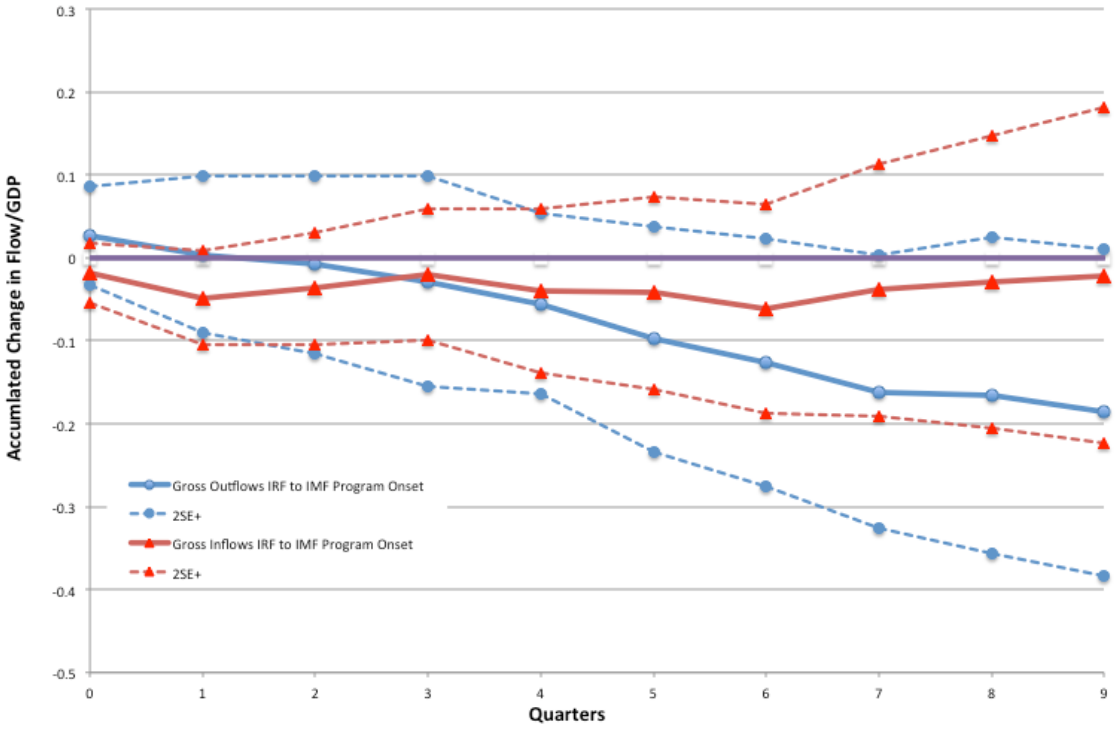
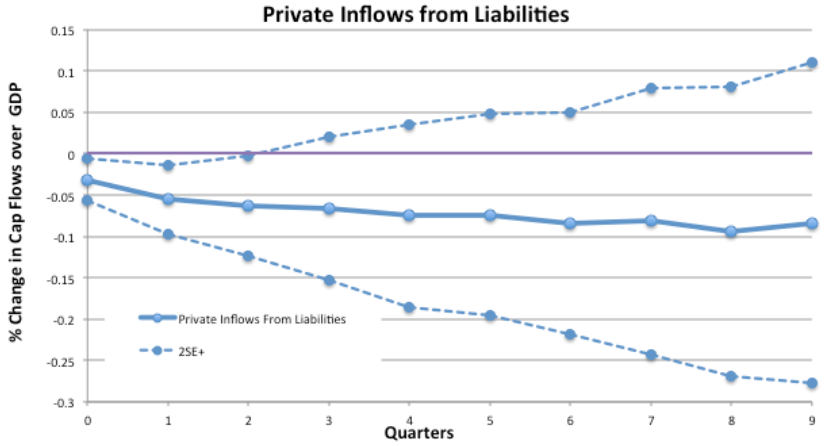
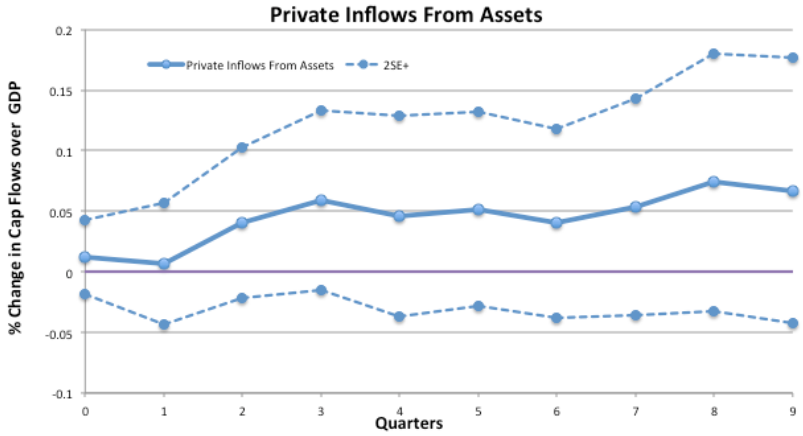


Figure 5: INDIVIDUAL COMPONENTS OF THE NET INFLOW IRFs to IMF AP Onset

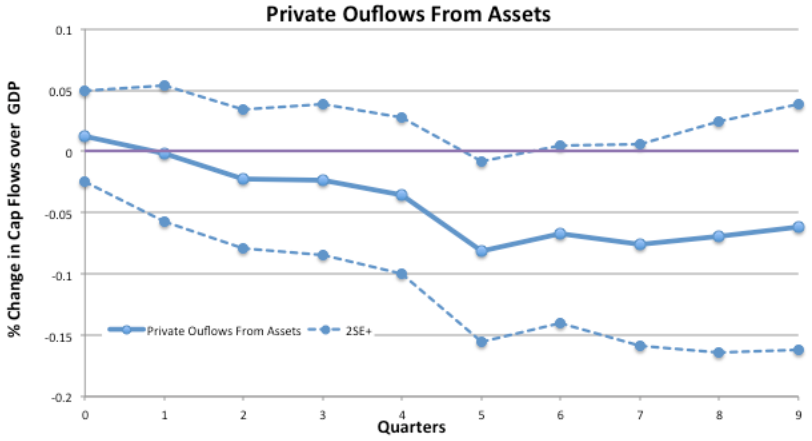
Panel A



Panel B



Panel C



Panel D

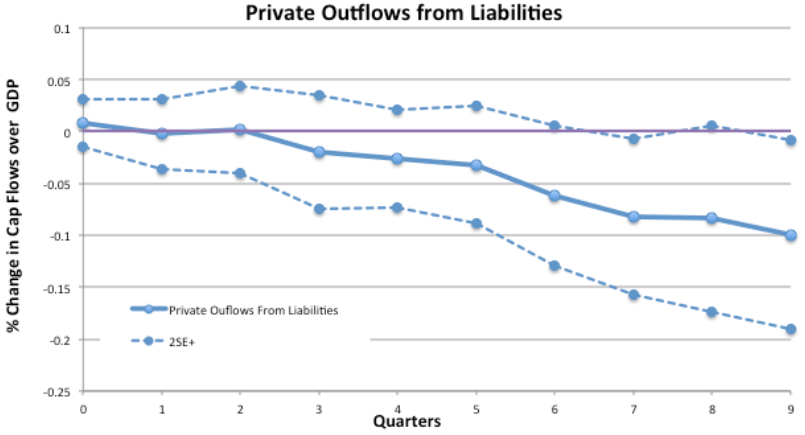


Figure 6: FDI CIF/COD IRFs to IMF AP Onset

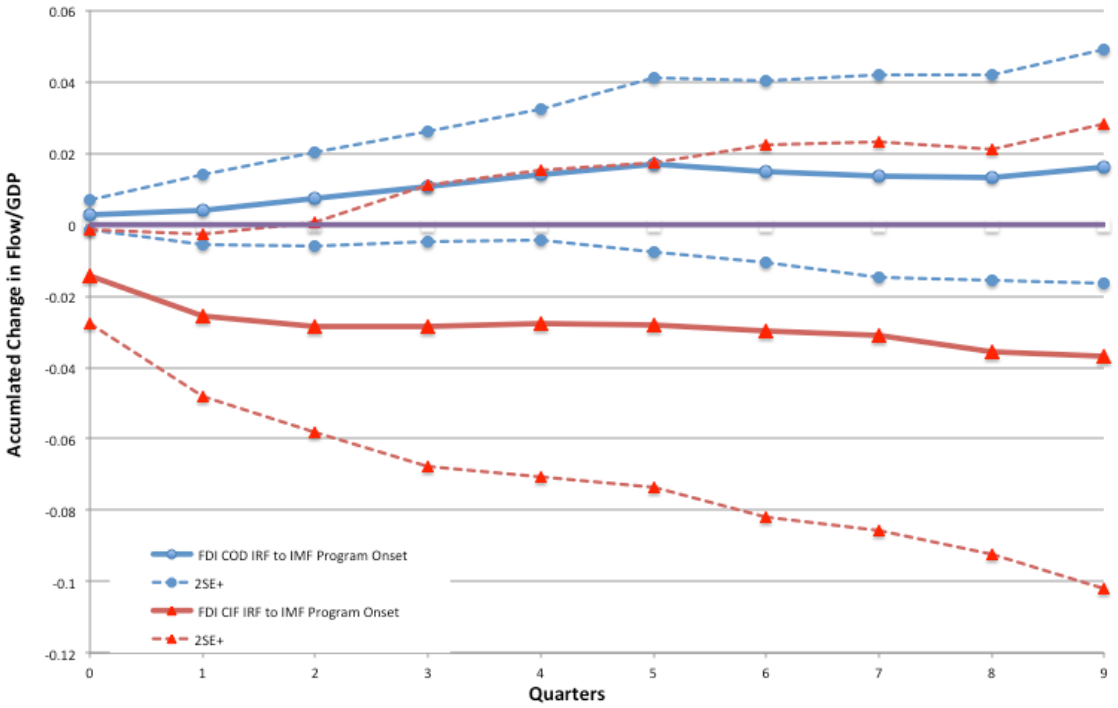


Figure 7: Portfolio Investment CIF/COD IRFs to IMF AP Onset

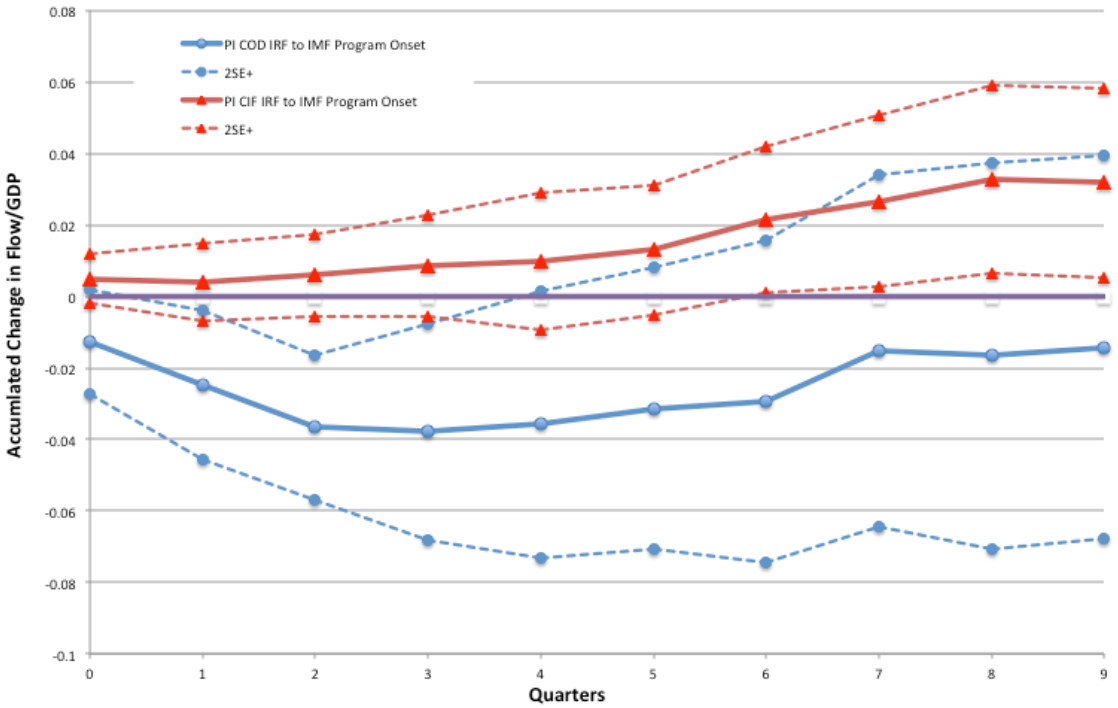


Figure 8: Other Investment CIF/COD IRFs to IMF AP Onset

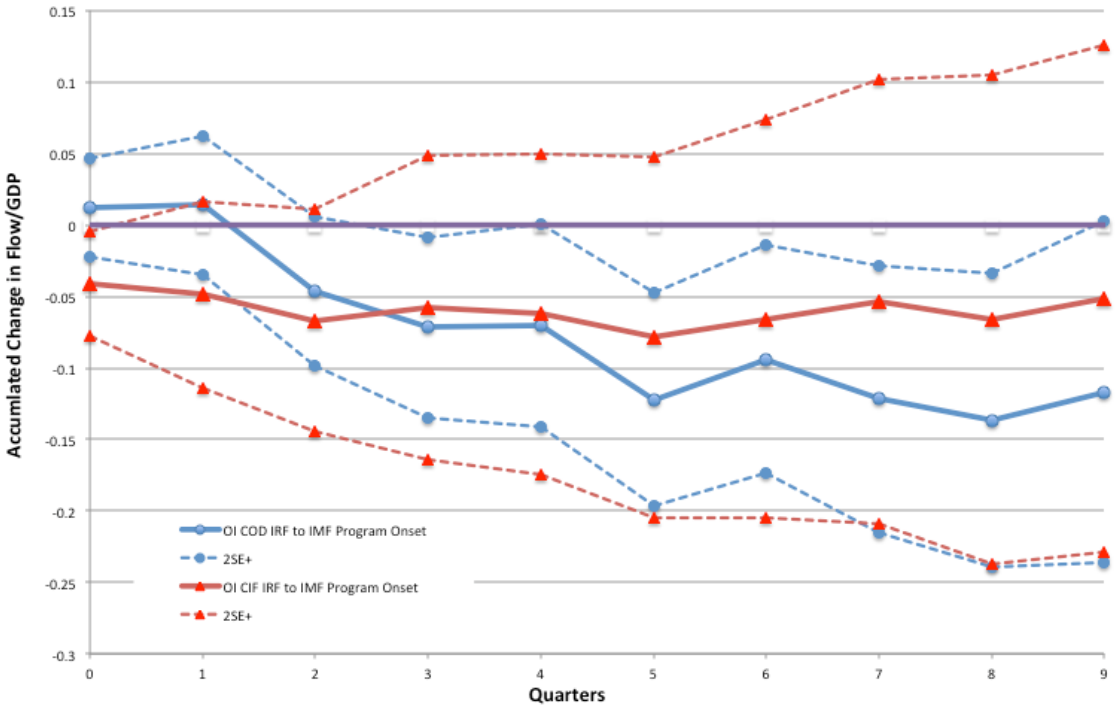


Figure 9: Gross outflows reaction to an IMF program during any type of crisis

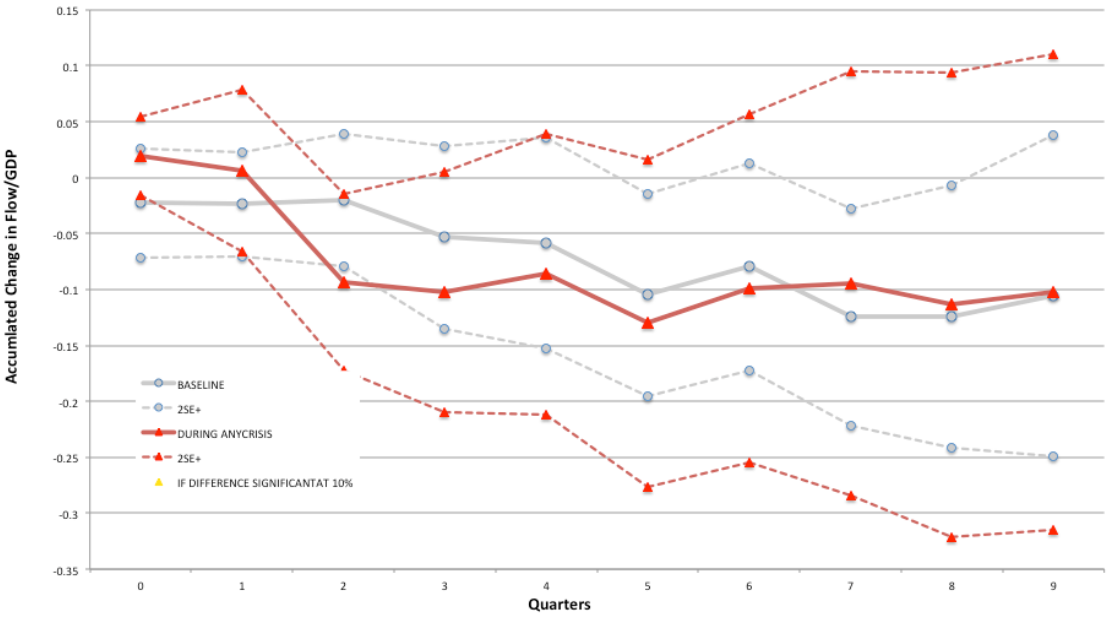


Figure 10: Gross outflows reaction to an IMF program during currency crisis

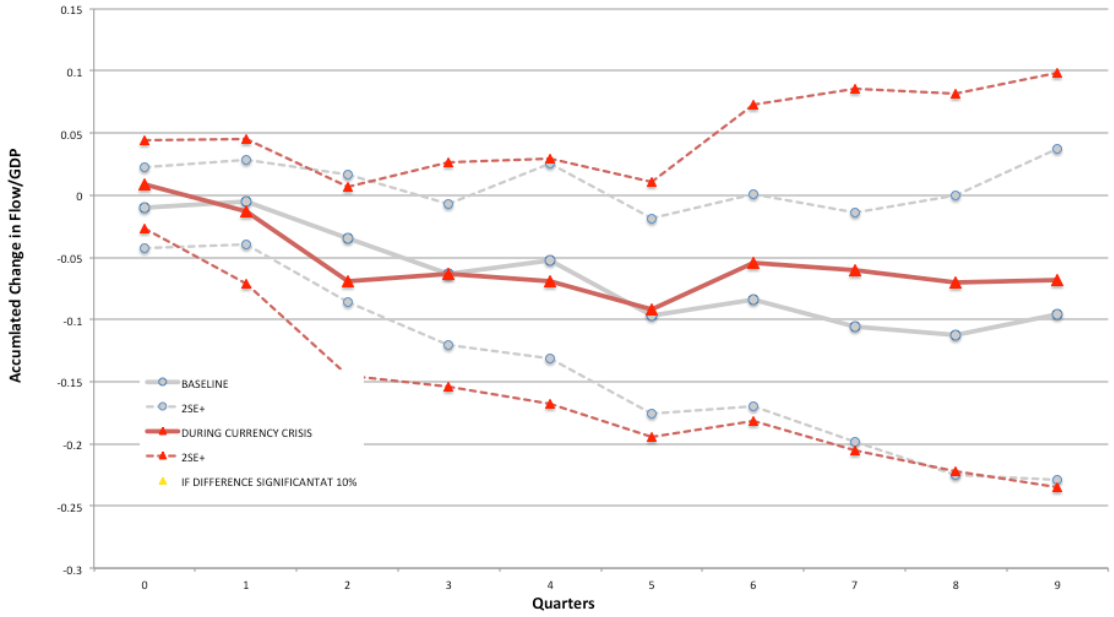


Figure 11: Gross outflows reaction to an IMF program during banking crisis

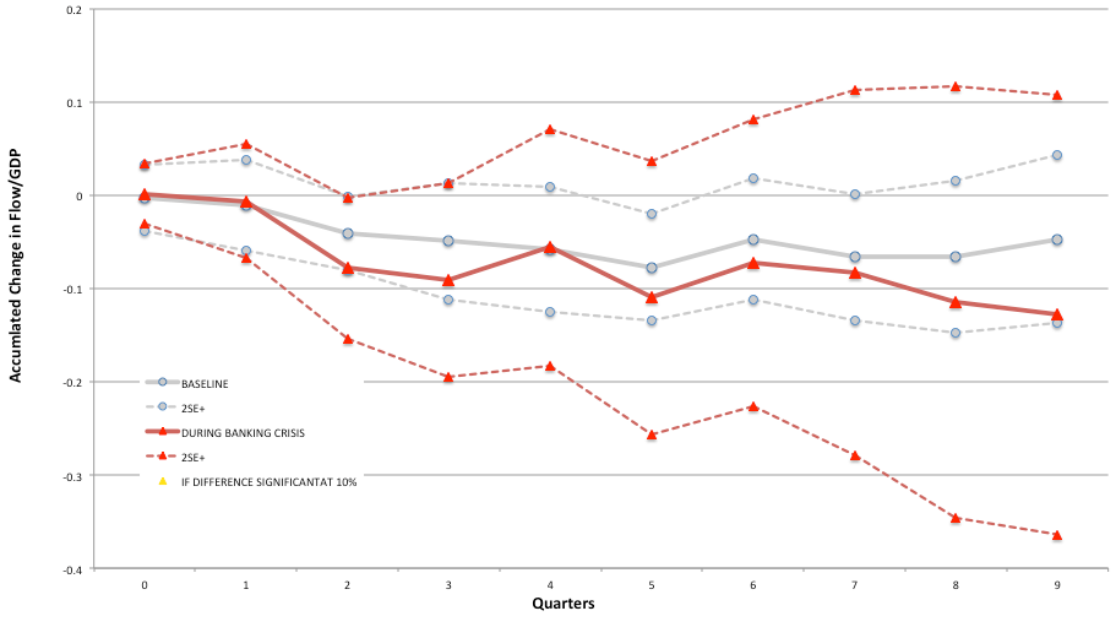


Figure 12: Gross outflows reaction to an IMF program during sovereign domestic debt crisis

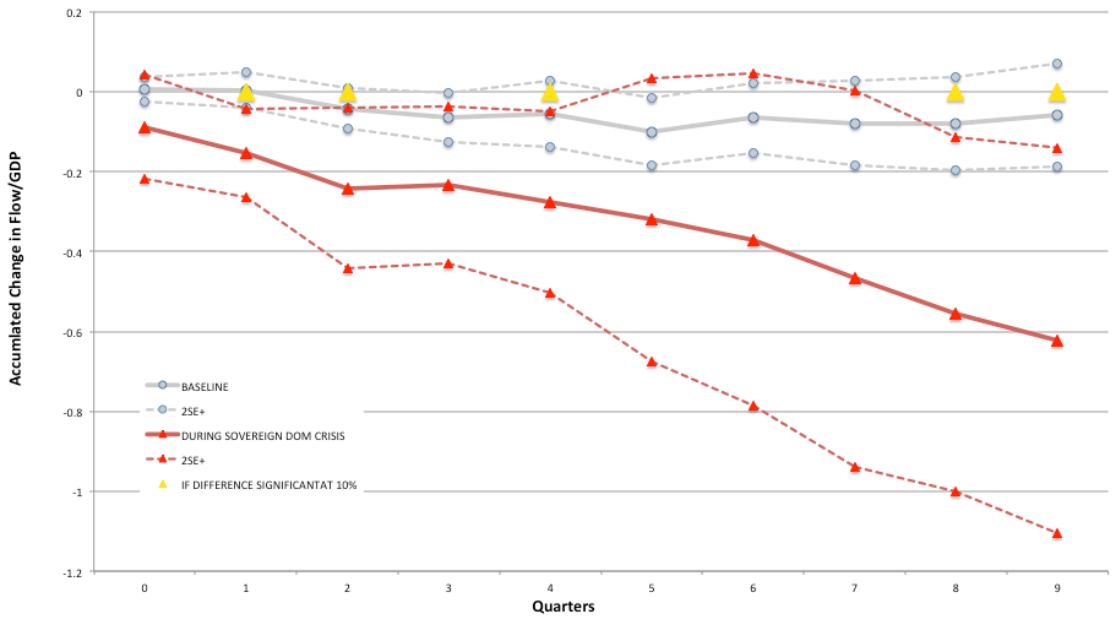


Figure 13: Gross outflows reaction to an IMF program during sovereign external debt crisis

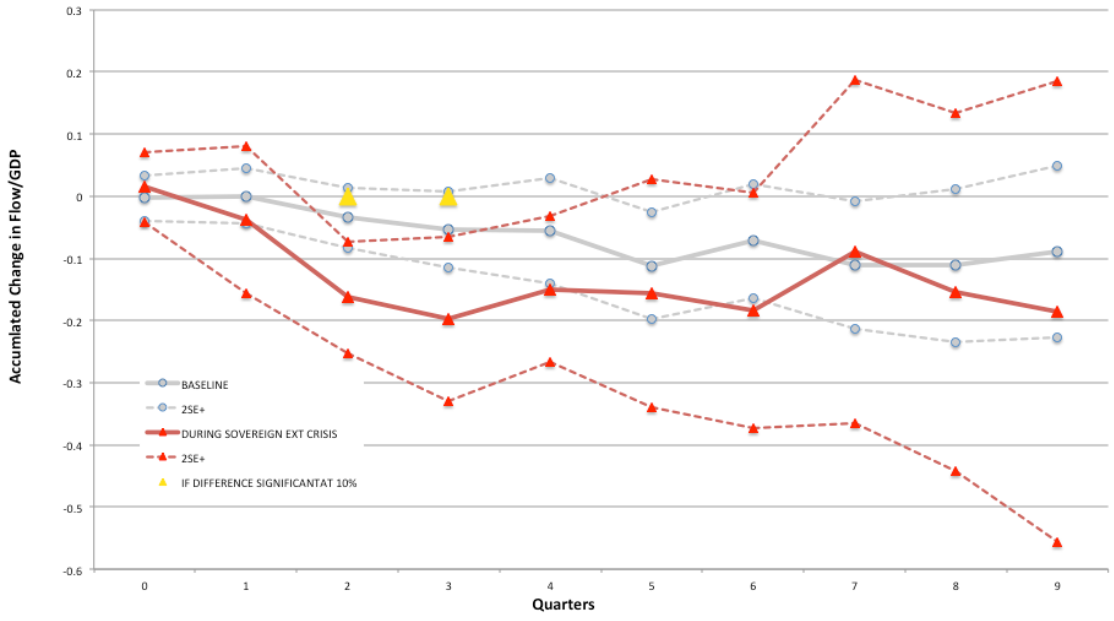


Figure 14: Gross inflows reaction to an IMF program during any type of crisis

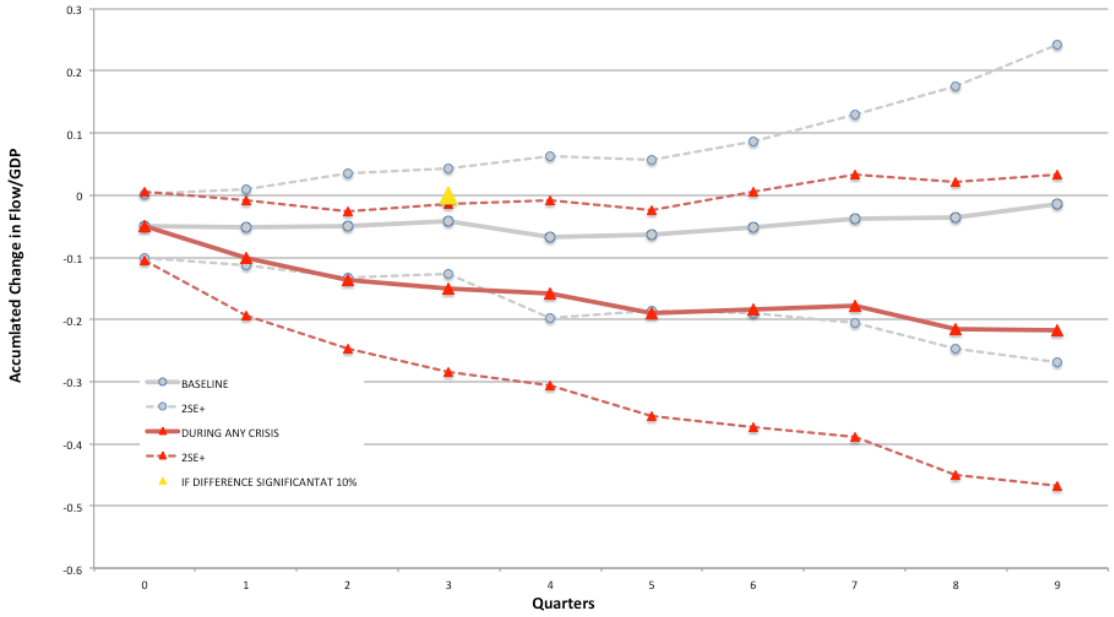


Figure 15: Gross inflows reaction to an IMF program during currency crisis

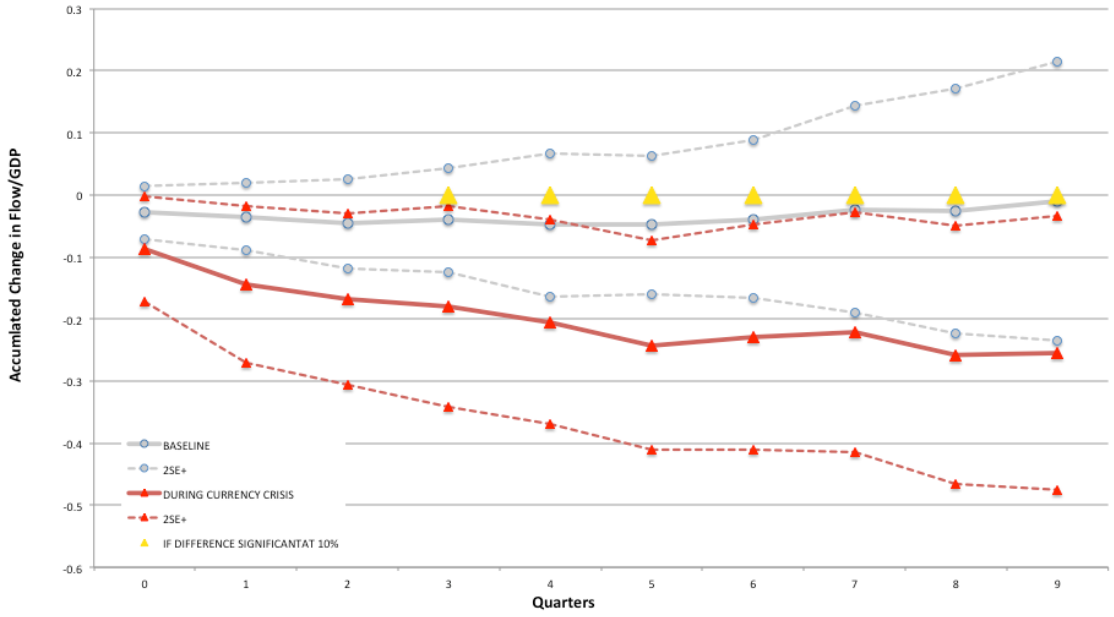


Figure 16: Gross inflows reaction to an IMF program during banking crisis

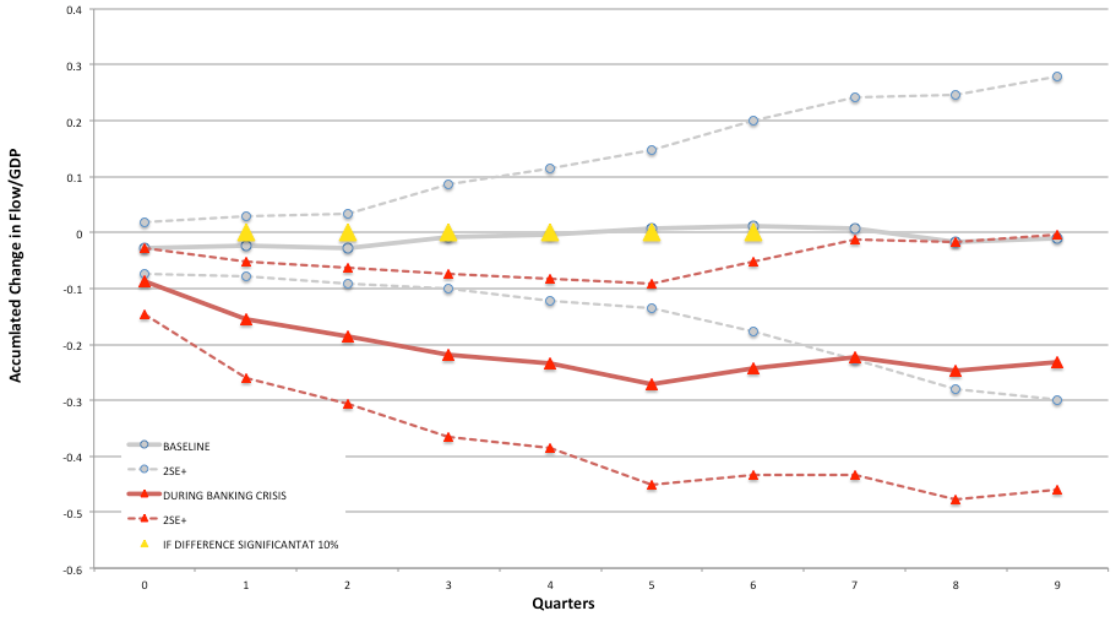


Figure 17: Gross inflows reaction to an IMF program during sovereign domestic debt crisis

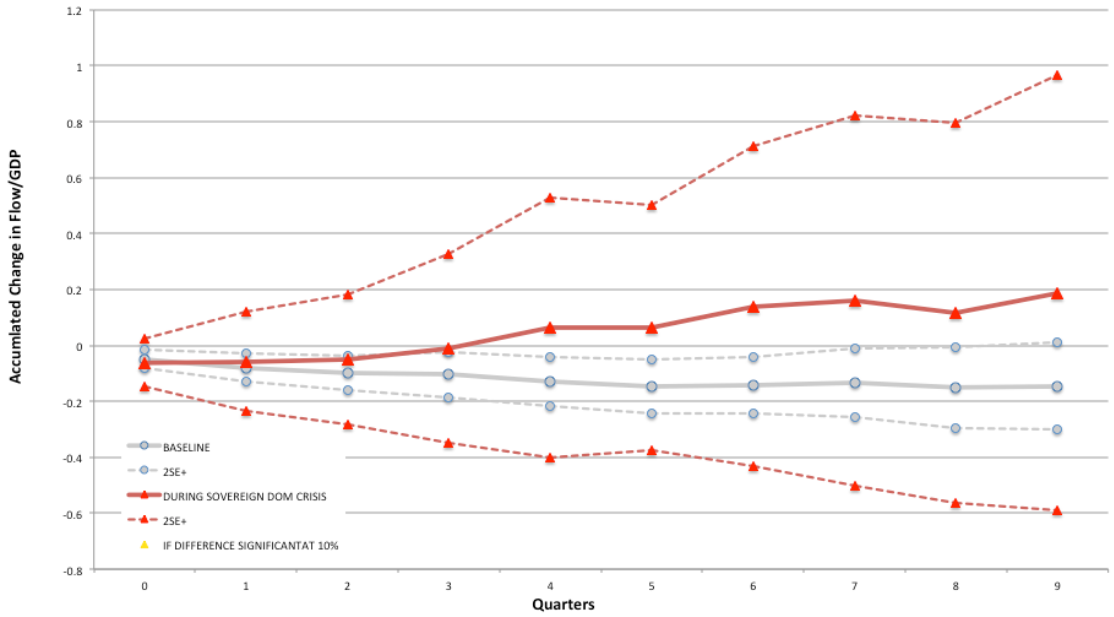


Figure 18: Gross inflows reaction to an IMF program during sovereign external debt crisis