

Banking Crises, External Turmoil and the Role of Gross Foreign Investment Reversals

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Abstract

Financial crises are linked to large output declines, but the potential links between different types of crises remains unclear. To enhance understanding we study the interdependencies between domestic banking crises, on one hand, and external financial crises, including currency and sudden stop crises, on the other in a quarterly global panel. We further ask how the different crises relate to *gross foreign investment reversals* (GIR), that is, foreign disinvestment in the home economy. Our main findings are the following. First, like previous work we find that banking crises predict currency crises while the converse is false. Second, banking crises predict sudden stop crises and again the converse is false. Third, currency and sudden stop crisis predict each other. Fourth, GIR predict banking crises, but neither currency nor sudden stop crises conditional on banking crisis. Fifth, using GIR to instrument for banking crises supports a causal effect of banking on external crises in emerging markets. We further find that it is FDI reversals rather than foreign portfolio or other reversals which are linked to banking crises. This suggests that GIR may ‘hit’ banks from the asset side more than the liability side emphasized in bank run models. However, any kind of GIR *prolongs* banking crises. Finally, we relate our findings to theories of financial crises and present a simple model consistent with the main findings.

Keywords: banking crises; currency crises; sudden stops; investment reversals.

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1. Introduction

A large body of evidence links financial factors to economic stability and growth. First, measures of financial sector development, such as the ratio of M2 or private credit to GDP, have been robustly, positively and causally linked to growth (King and Rebelo 1993, Levine 2005). Second, rapid credit *expansions* can lead to financial vulnerabilities and crises (Demirgüç-Kunt and Detragiache 1998, Reinhart and Rogoff 2008). Third, there is mixed evidence linking financial *openness* to growth (Eichengreen 2001, Obstfeld 2009). Fourth, it seems that unrestricted financial openness can promote crises at least when economies are financially underdeveloped or have preexisting distortions (Velasco 1987, Calvo et al. 1996, Prasad et al 2003).²

Apart from acknowledging that the international and domestic financial systems on which a country relies can each affect the real economy, we further note that the two may be interdependent. First, domestic and international financial systems are directly linked to the extent that one borrows from the other due to financial integration. Second, the two may be substitutes in financing domestic entrepreneurs. Third, they could be complementary if domestic financial development increases economic growth and stability, in turn attracting and stabilizing foreign investment. Conversely, financial openness may enhance financial development (Chinn and Ito 2006) while sudden stops in capital inflows are associated with large output drops (Hutchison and Noy 2006). From an empirical point of view, on one hand, countries with underdeveloped financial systems, including developing countries and emerging markets, tend to rely heavily on foreign capital. Hence, when financial systems fail during financial crises, FDI inflows may actually rise and presumably put a floor under asset prices (Krugman 1998, Aguiar and Gopinath 2005). These observations suggest that foreign and domestic capital may be substitutes in some contexts. On the other hand, supporting complementarities banking crises have been linked to sudden stops and currency crises (Glick and Hutchison 2000, Bordo et al.

² Hutchison and Noy (2006) and Bordo et al. (2010a,b) study the output costs of crises and Fallon and Lucas (2002) and Chen and Ravallion (2009) discuss the micro-level effects of crises. Apart from decreasing output crises may be politically destabilizing, as in Indonesia 1997-8 and Argentina 2001-2, limit future access to international credit, or cause a backlash against globalization and openness.

2010a,b) whereas foreign portfolio capital seems to rapidly abandon countries during tumultuous times (Alfaro et al. 2004).

Our goal in this paper is to understand these interdependencies between the domestic and international financial systems. In particular, we study the empirical relationships between domestic banking crises, on one hand, and, on the other hand, external financial crises in the sense of currency and sudden stop crises. We further ask how these crises relate to *gross foreign investment reversals* (GIR), that is, foreign disinvestment in the home economy. The reason we focus on GIR is our belief that changing foreign engagement with the domestic economy may have disruptive effects beyond what is captured by existing literature's focus on *net* capital inflows (aggregate capital inflows minus outflows). After all, if gross capital in- and outflows were perfect substitutes; then presumably the very large two-way capital flows taking place between countries empirically would be unnecessary.

Our principal empirical findings can be summarized as follows. First, like Kaminsky and Reinhart (1999) and Glick and Hutchison (2000) we find that banking crises predict currency crises while the converse is false. Second, banking crises predict sudden stop crises and again the converse is false. Third, currency and sudden stop crisis predict each other. Fourth, GIR predict banking crises, but neither currency nor sudden stop crises conditional on banking crisis. The predictive power of GIR may be important to the extent banking crises are costly but anticipating their onset can help prevent them or lower their costs. Fifth, using GIR to instrument for banking crises supports a causal effect of banking crises on external crises in emerging markets. We further find that it is FDI reversals rather than foreign portfolio or other reversals which are linked to banking crises. This suggests that GIR may 'hit' banks from the asset side rather than the liability side emphasized in bank run models. However, any kind of GIR *prolongs* banking crises. Finally we relate the evidence to theories of financial crises and present a simple model consistent with the main findings.

The paper relates to the large empirical literatures on banking crises (Goldstein and Turner 1996, Demirgüç-Kunt and Detragiache 1998, Reinhart and Rogoff 2008) as well as external financial crises (Calvo et al. 1996, Prasad et al 2003, Bordo and Meissner 2010a,b). However, unlike most

of the previously mentioned papers our goal is to link the onsets of banking and external financial crises rather than study each type of crisis in isolation. Most closely related to our work, Kaminsky and Reinhart (1999) and Glick and Hutchison (2000) both study the links between banking and currency crises. The principal ways in which our paper differs are, first, that we study sudden stop crises as well as currency and banking crises. This is important since sudden stops have been linked to large output declines (Hutchison and Noy 2006, Bordo et al. 2010a,b). Second, we use a quarterly global panel rather than annual data. We believe that using quarterly data enhances our understanding of short-term macroeconomic dynamics and allows for more precise empirical estimates of the links between various crises. We further note that in our dataset financial crises are highly persistent. Consequently, unlike previous work we study dynamic panels. Finally, perhaps our main contribution is to document a novel role for GIR in preceding banking crises and, via the banking crisis channel, currency and sudden stop crises. This may be important to the extent banking crises are costly, therefore, being able to predict them based on GIR may help to avoid them or lower their costs. Moreover, by using GIR to instrument for banking crises we go beyond the correlations found in previous work to support a causal effect of banking crises on external crises.³

The rest of the paper is organized as follows. Section 2 reviews the theoretical basis for linking banking crises to external financial crises. Section 3 explains our measure of gross investment reversals and their possible connection to banking crises. Section 4 presents our dataset and estimation methodology. Section 5 contains the empirical results. Section 6 provides a simple model, consistent with the main empirical findings. Section 7 concludes the paper. With a few exceptions, all variable definitions, data sources, tables and figures can be found in the appendix.

³ Table 6 in Glick and Hutchison (2000) does present evidence of two-way causality between contemporaneous banking and currency crises in emerging markets. However, the assumptions they use to establish causality are not discussed in detail in the paper and include that at least two contemporaneous macroeconomic variables do not affect either banking or currency crises conditional on the other type of crisis. For example, they assume that economic growth and inflation can only cause currency crises via banking crises, which is hardly obvious. Additionally, if crises only help to predict other *contemporaneous* crises, then they are not a good early-warning indicator of future crises. Finally, the panel regressions in Glick and Hutchison's paper do not include an autoregressive components even though our data suggests that crises are persistent both across quarters and years.

2. The Links between Banking and External Crises

To the extent domestic financial development increases growth and stability, a banking crisis may decrease the returns perceived by foreign investors. If the latter respond by running on the country's currency or assets then the banking crisis may cause a currency or sudden stop crisis (Sachs et al. 1996). While potentially foreign investors could buy domestic projects cheaply during a banking crisis, such international bailouts may at most apply to FDI and not foreign portfolio or other capital flows (Razin et al. 1999, Alfaro et al. 2004, Aguiar and Gopinath 2005). On a microeconomic level, asset transfers from domestic to foreign hands may be hindered by adverse selection; domestic and foreign investors may hold claims on the same firms and banking distress can lead to firm distress; or else, the firms on which banks and foreign investors hold claims can be related via backward/forward linkages or external economies (Grossman and Helpman 1991, Markusen and Venables 1999). More directly banking crises may cause external crises if foreign agents lend to domestic banks and respond to a banking crisis by withdrawing their loans. In all of these cases, foreign cut-and-run behavior may be more likely if foreign investors fear that the country has insufficient international reserves to repay them all (Goldstein 2005, Nakata 2010); that the government will bail out the banking system at the cost of exchange rate stability (Velasco 1987, Miller 1996, Burnside et al. 2001, Chang and Velasco 2002); or that emergency capital controls may be imposed.

In the other direction, external financial crises may lead to banking crises for similar reasons. For example, a fall in foreign investment due to external crisis may destabilize growth and thereby erode banks' balance sheets. Domestic investors may hesitate to buy foreign-projects due to adverse selection concerns; because they are less capable of managing the projects; or because they lack the required liquidity (Caballero and Krishnamurthy 2001). Firms whose foreign credit is suddenly gone may pass their distress to domestic banks to which they are already indebted, or to other firms, in turn indebted to the banks. If foreign investors lent directly to the banking sector and suddenly ask for repayment, then banks may suffer on the liability side due to maturity, liquidity and currency mismatches. During a crisis, government attempts to defend the currency or attract investment by raising interest rates or expending reserves can cause a credit crunch and again banking distress (Eichengreen 1992, Obstfeld 1994, Stoker 1994). Nonetheless,

if the government does *not* defend the currency; then depreciation can raise the domestic-currency value of banks' foreign-currency denominated liabilities. This is known as the balance-sheet effect (Mishkin 1996, Sachs et al. 1996, Cespedes et al. 2003, 2004, Choi and Cook 2004). Even expected depreciation may cause a banking crisis if foreign lenders fear that banks' foreign-currency denominated liabilities would rise sufficiently due to depreciation to make them insolvent. Thus a joint banking and currency crisis can be self-fulfilling (Goldstein 2005).

3. The Role of Gross Foreign Investment Reversals

An important goal of this paper is to describe the role of gross foreign investment reversals (GIR) in contributing to both external and domestic financial turmoil. On one hand, to the extent the price of currency depends on the gap between its demand and supply at each price level currency crises may be a function of net rather than gross capital flows. Likewise, sudden stops are defined precisely in terms of declining *net* inflows rather than gross flows. Consequently, we expect that neither currency nor sudden stop crises may depend directly on changing gross capital flows for a given *net* capital inflow. In contrast, there are several reasons why gross investment reversals could lead to banking crisis even controlling for a country's net inflow. On the asset side, as noted domestic banks may hold claims on firms distressed by a foreign loan withdrawal or foreign-indebted firms' distress may spill over to domestically-indebted firms. Even if the country's net capital inflow stays constant, capital market imperfections, such as adverse selection or lack of liquidity may prevent firms from replacing lost foreign credit with domestic credit (Caballero and Krishnamurthy 2001). Alternatively, even if firms manage to raise domestic funds domestic capital may be less productive than foreign capital.⁴ In fact we show later that it is precisely FDI reversals – rather than foreign portfolio or other types of reversals – which are linked to banking crises. Nonetheless, gross foreign investment reversals can in principle also harm banks on the liability side to the extent banks lack sufficient reserves to repay their foreign creditors (Sachs et al. 1996). In any case, once an initial amount of foreign

⁴ While a foreign productivity advantage is most obvious for FDI, it may also be true for foreign bank or portfolio lending. For example, according to Dooley et al. (2004, p.6) “...international financial intermediation facilitates periphery growth because it channels domestic savings in the periphery through superior financial markets in the center” (Galindo et al. 2005, Caballero and Farhi 2008) and international banking services are a major source of global trade and investment.

creditors cause a banking crisis by withdrawing loans, others may follow to limit their exposure. The result could then be a vicious cycle of declining domestic and foreign credit. Simultaneous distress of many banks may also be worse than the sum of its parts to the extent fire sales of domestic assets lead to collapsing asset prices (Shleifer and Vishny 1992).

4. Data and Methodology

We estimate the probability of banking and external financial crises using discrete choice models and a large quarterly panel dataset spanning from 1970 to the last quarter of 2009, although most countries only report data from the mid 1980s onwards. Tables 1-3 introduce the sample countries and summary statistics. Although our principal interest to link different crises to one another, previous empirical work has related crises to a variety of other factors. For example, banking crises have shown correlation with slow output growth, inflation, high real interest rates, financial liberalization, deposit insurance, booms in domestic credit, foreign borrowing and asset prices (Goldstein and Turner 1996, Demirgüç-Kunt and Detragiache 1998, Kaminsky and Reinhart 1999, Reinhart and Rogoff 2008). Additionally, currency crises are related to slow growth, credit booms, high foreign interest rates, low FDI/debt ratios and exchange rate overvaluation (Frankel and Rose 1996, Glick and Hutchison 2000). Finally, sudden stops are linked to the current account, foreign debt and foreign currency denominated debt, reserves, a pegged exchange rate, and trade openness (Frankel and Cavallo 1994, Prasad et al. 2003, Edwards 2004). Despite the empirical findings, the literature has not provided so far any definitive list of determinants of either banking or external financial crises. Consequently, our selection of empirical specifications for banking, currency and sudden stop crises responds to those factors we find robustly related to crises as well as commonly used in the literature. Our main results are robust to a range of alternative control variables and estimation techniques.⁵

Estimating the Probability of Crisis

When estimating the probability of financial crises, we consider two characteristics of our data. First, Table 4 shows that all our crises measures, and especially banking crises, are highly persistent. Second, our time series for crises contain a large amount of zero values compared to

⁵ Some of these alternative results are shown below, while others are available on request.

ones. In order to address these issues, we rely on three empirical models. First, we use a dynamic panel logit model with random effects. Second, given the relatively small number of financial crises, we use the extreme value function to fit a dynamic panel complementary log-log model with random effects. These models can be written as:

$$\textbf{Logit Model:} \quad \text{Log}\left(\frac{p_t}{1-p_t}\right) = X_{it-1}\beta \quad (1)$$

$$\textbf{Complementary Log-Log Model:} \quad \text{Log}(-\text{Log}(p_t)) = X_{it-1}\beta \quad (2),$$

where X_{it-1} is a vector of lagged covariates (including the dynamic term) and p_t represents the conditional probability of success $p_t = \Pr(Y_{it} = 1 | X_{it-1})$ ⁶. Third, we fit a linear probability random-effects model. Since the dynamic term may be correlated with the unit random effect, and therefore including fixed effects may yield biased estimates (Nickell 1981), we employ Hausman-Taylor (1981) estimators of the form:⁷

$$y_{it} = \delta_0 + \delta_1 y_{i(t-1)} + \delta_2 \text{GIR}_{i(t-1)} + \beta_1' \bar{x}_{1i(t-1)} + \beta_2' \bar{x}_{2i(t-1)} + \alpha z_i + \mu_i + \varepsilon_{it} \quad (3)$$

In the last model, y_{it} represents country i 's binary crisis at time t . On the right hand side, we introduce a dynamic component $y_{i(t-1)}$, capturing the persistence of the episode. Among the covariates, $\bar{x}_{1i(t-1)}$ and $\bar{x}_{2i(t-1)}$ are vectors of lagged time-variant control variables, the former, correlated and the latter uncorrelated with the country random effect μ_i . The vector \bar{z}_i contains all time-invariant effects and ε_{it} is an i.i.d. error term. Foreign inflow reversals represent the

⁶ In this case success represents the presence of a crisis.

⁷ See Greene (2002) for a detailed textbook derivation of Hausman-Taylor estimators. Compared to the Hausman-Taylor approach, a potentially more efficient General Methods of Moments (GMM) procedure for dynamic panels is available through the Arellano and Bond estimator (Arellano and Bond 1991, 1998). This procedure is usually employed in estimation of panels with a large number of individuals and short time-series. For our quarterly dataset, however, where on average we deal with 80 quarters per country, and a number of time periods exceeding the number of countries, this procedure becomes unfeasible

decrease in a country's external liabilities from the preceding quarter in the balance of payments:

$$GIR_{it} = \sum_k \text{Max}\{0, \Delta L_{ikt}\}, \text{ where } \Delta L_{ikt} \text{ is the country's change in external liabilities of type } k,$$

deflated by nominal GDP. Specifically, the balance of payment data allow us to distinguish k =portfolio, FDI and other capital flows, where the latter includes foreign loans, foreign currency, trade credits and other foreign investments. While in most of the paper we focus on aggregate GIR, we later study the links between each component and financial crises.

Our sets of control variables $\bar{x}_{1i(t-1)}$ and $\bar{x}_{2i(t-1)}$ include inflation, trade openness, international reserves, total gross capital flows, the current account, real exchange rate appreciation and domestic credit growth among others as changes in these variables may precede financial crises. When choosing exogenous and endogenous covariates in the HT estimation procedure, we assume that the dynamic AR(1) component of growth, total gross flows and all of its components, the current account balance, the change in international reserves and all crisis dummies are endogenous. Conversely, the rest of controls, including lags of domestic credit growth, increase in fiscal expenditures, real appreciation, inflation and its square and trade openness are considered exogenous. Finally, we add country, regional and non-emerging-OECD country dummies as time-invariant exogenous covariates.⁸

Banking Crises

In order to document banking crises, we use the data for systemic banking crises provided by Laeven and Valencia (2010, LV).⁹ The classification scheme employed by these authors is explained in detail in the appendix. The authors record a systemic banking crisis episode whenever, loosely speaking, some combination of bank runs, losses in the banking system, bank liquidations reflecting systemic distress, or policy interventions responding to banking failures in the economy occur. Merging LV data with our sample identifies 53 banking crises episodes in 90 countries in the period from 1973 to 2008. Although LV's original data has yearly frequency, we

⁸ The choice of endogenous variables is somewhat arbitrary and could lead to overidentification problems. For robustness we run the same regression declaring all variables endogenous. This does not affect our main results.

⁹ This dataset represents an updated version of the widely used databases on banking crises due to Caprio and Klingebiel (1996) and Caprio et al. (2005).

take advantage of their qualitative descriptions of crisis episodes to narrow down the start and finish in terms of quarters.¹⁰

Currency Crises and Sudden Stops

We focus on two types of external financial turmoil: currency crises and sudden stops. Following Hutchison and Noy (2006), a sudden stop is defined as the simultaneous occurrence of a currency crisis and a current account reversal. While other authors conceive sudden stops only as a current account reversal, Calvo (1998) shows that the output loss from such a reversal increases the greater is the real depreciation with which it is associated. Hutchison and Noy (2006) provide empirical evidence for this claim. For robustness, we use two measures of current account reversals, and therefore, sudden stop crises. First, a rise in the current account-to-GDP ratio of more than twice the country-specific standard deviation of that ratio; and second, an increase of three percentage points or more in the current account-to-GDP ratio compared to the same quarter the previous year.¹¹ By currency crisis we understand a departure of two standard deviations or more in the level of exchange market pressure (Eichengreen et al. 1996), formulated as follows for each country i and time period t : $EMP_{it} = \frac{\% \Delta R_{it}}{\sigma_{i\% \Delta R}^2} + \frac{\% \Delta E_{it}}{\sigma_{i\% \Delta E}^2}$. In this expression, $\% \Delta R_{it}$ is the percent change in official reserves from last period, $\% \Delta E_{it}$ stands for the percent change in the real exchange rate, and $\sigma_{i\% \Delta R}^2$ and $\sigma_{i\% \Delta E}^2$ represent the respective country-specific variances of the percent change over the sample years. Unlike Eichengreen et al. (1996), but in line with Hutchison and Noy (2006), we use the real rather than the nominal exchange rate, as we are interested in real shocks. Eichengreen et al. also include nominal interest rate deviations in the EMP index, whereas most of the subsequent literature has focused on reserve and exchange rate changes due to data limitations. Similarly, we center on reserves and exchange rates in order to maximize data availability. In sum, we have one measure of currency crises, two measures of current account reversals and two measures of sudden stops. The incidence of each of the five types of crisis in the data is available in the working paper version.

¹⁰ If the description is not clear on the starting quarter of the crisis we assign the start of the crisis to the first quarter.

¹¹ Hutchison and Noy (2006) and Milesi-Ferretti and Razin (1998) use a measure similar to our second definition.

5. Results

For brevity, we solely report the estimates for our linear probability (Hausman-Taylor) model. All the results reported below are also obtained in the other two models. Our first set of regressions in Tables 5 and 6 reveal that external financial crises, including currency and sudden stop episodes, play a small or no role at all in predicting banking crises. In stark contrast, banking crises are strong predictors of both, currency crises and sudden stops. Similarly, Kaminsky and Reinhart (1999) as well as Glick and Hutchison (2000) conclude that banking crises predict currency crises and there is no evidence for the converse. In addition, our results show that GIR are closely linked to banking crises, whereas rarely significantly linked to external crises conditional on banking crises. This is, as a matter of fact, quite surprising, considering that GIR are gross international capital flows. Since our findings for control variables are generally consistent with the large body of literature on banking and external crises and our main results are robust to changing controls in a variety of ways, we omit a detailed discussion here.

2SLS Results for Banking Crises and External Financial Crises

In this section, we proceed to link external financial crises to banking crises using GIR to instrument for banking crises. Using a two-stage procedure allows us to argue that banking crises not only precede but in fact cause currency and sudden stop episodes. The first stage results¹² in Table 7 show that GIR are correlated with banking crises. Specifically, based on the first stage F-statistics, we can reject both under-identification and the true size of our five percent significance tests exceeding ten percent due to weak instruments as defined in Stock and Yogo (2002). The first stage results also confirm that, as expected, the marginal effect of GIR on the likelihood of banking crises is much larger in emerging compared to OECD economies. The findings for the second stage support a causal effect of banking crises on both currency and sudden stop crises. Finally, regressing currency or sudden stop crises on banking crises and GIR yield insignificant results for GIR, supporting the instrument's exclusion restriction.¹³

¹² For brevity, Table 7 only displays the IV estimates of interest. However, the estimated models include all previous control variables except for the dynamic crisis term. We exclude the latter as inclusion of country fixed effects together with dynamic panels with fixed effects yield biased estimates (Nickell 1981).

¹³ These results are available on request.

Plausible Exogeneity of Instrument

Although our IV approach calls for an exogenous instrument, we cannot rule out that GIR may have a direct effect on external crises. In this section, we follow Conley et al. (forthcoming) in order to delimit the potential bias due to quasi-exogeneity. Specifically, if we believe that the correct linear probability model of external crises is $Y_{it} = u_i + \beta X_{it} + \gamma Z_{it} + \varepsilon_{it}$, where X represents the instrumented variable (banking crises dummy) and Z the instrument (the lag of Gross Investment Reversals), then, we can approximate the distribution $\hat{\beta}^{\text{approx}} \sim N(\beta, V_{2SLS}) + A\gamma$, where $A = (X'Z(Z'Z)^{-1}Z'X)^{-1}(X'Z)$ and V_{2SLS} is the 2SLS variance-covariance estimator. Since we can easily solve for A , we are able to delimit the bias in our estimate of β by determining the distribution of γ . Conley et al.'s local-to-zero approximation using prior information on the moments of an assumed Gaussian distribution for γ , help us solve the issue. We assume $\gamma \sim N(0, \delta)$, where δ should not be larger than the magnitude of the largest coefficient on the current account effect in Table 5 (about 0.2). That is to say, with 95% probability, the direct effect of GIR - a *gross* capital flow - on external crises can not be larger than the maximum estimated effect of *net* capital flows on those crises. We believe that this is a very plausible scenario since, as discussed in Section 3, both currency crises and sudden stop episodes are theoretically more easily linked to net rather than gross capital flows. Using this methodology, Figure 1 shows the 95% confidence intervals for the effect of banking crises on external crises where δ ranges from 0 to just over 0.2. Given these confidence intervals, we conclude that any direct effect of GIR on external crises does not derail our use of GIR as a valid instrument. In fact, the point estimates for beta inside the confidence interval are positive and significant for all the values of δ considered.

Why do GIR Cause Banking Crises?

To further explore why gross foreign investment reversals precede banking crises we now decompose our data on reversals into FDI, portfolio investment and other investment reversals as allowed by the IFS dataset. Results are shown in Table 8. Contrary to our expectations, banking crises are surprisingly *not* significantly related to either foreign portfolio or other investment reversals – even though the latter includes borrowing by domestic banks. On the other hand, banking crises are closely linked to FDI reversals even after controlling for currency and sudden

stop episodes as well as the current account. The evidence suggests that GIR does not cause crises via creditor or depositor ‘runs’ – in that case “other investment reversals” should precede these episodes – but rather from the asset side. As we discussed earlier, several reasons could explain this correlation: banks might hold claims (directly or via other domestic agents) on the firms that foreign lenders abandon as the latter reverse investments, if banks do not hold direct claims, firms’ distress may spill over to other ones more closely linked to banks. Alternatively, banks may lack the funds or skill to buy loans and sustain production once foreign investors leave. Nonetheless, we are not confident ruling out effects via the liability side. For example, in many emerging markets, a sizable share of FDI targets the financial sector where banks with a fifty-percent-or-greater foreign ownership share often control half or more of the country’s total bank assets (Agenór 2001, Coppel and Davies 2003). If FDI reversals amount to foreigner investors selling off domestic banks, the latter could still be affected from the liability side. Similarly, FDI reversals could raise liquidity demand when domestic investors are interested in buying foreign firms or otherwise prompt them to collect outstanding claims on domestic banks, again affecting banks from the liability side. We leave a more detailed analysis of these issues to future work. Table 9 shows the results from regressing external crises on banking crises with decomposed GIR. As expected, results for GIR remain insignificant.

Effect of GIR on Bank Credit

In order to better understand the effects of GIR on domestic banks, we briefly look at the evolution of domestic credit. Table 10 shows the Hausman-Taylor estimates from regressing domestic credit on lagged decomposed GIR. Interestingly, in the first quarter after a banking crisis, gross FDI reversals coupled with banking crises seem to have a positive effect on domestic credit. Then, in the second quarter, the relationship turns negative. One possible, if admittedly speculative, interpretation may be that the exit of foreign investors lead surviving domestic banks to invest in either foreign projects, projects of bankrupt domestic banks and/or their own distressed projects. To the extent domestic capital is an imperfect substitute for foreign capital, banks get overexposed or they buy up low-quality projects due to adverse selection. As a result, there can be non-performing loans and a credit retraction in the second quarter after a banking crisis. This suggests that, first, even though FDI reversals promote future banking crises (Table 8), when coupled with a contemporary banking episodes, they nonetheless lead to future

credit growth (Table 10). Second, even if FDI reversals enhance domestic credit after a banking crisis, they can decrease domestic credit (two quarters) later on.

Effect of GIR on Banking Crisis Persistence

When banks are distressed from the liability side, the main problem may be potential short term liquidity rather than serious insolvency problems associated with asset price collapses. Bearing this in mind and recalling our findings above that GIR seem to affect banking crises from the asset side, it is worth exploring whether banking episodes associated with GIR are more persistent than those resulting from other factors. In Figure 2, we compare the persistence of banking crises under large initial GIR to those under small GIR. Persistence is computed as the incidence of future banking crises conditional on current banking crisis in the data. The graph shows that not just FDI reversals but actually any form of GIR leading up to a banking crisis is associated with a more persistent episode. Nevertheless, table 11 shows that, in part, the persistence of the effect of PI and OI GIR on Banking Crises may respond to a much higher autocorrelation of these variables in comparison to FDI GIR. While these issues appear consistent with GIR affecting banks from the asset side seriously causing problems for banks, as we have conjectured, we leave a detailed exploration to future work.

6. A Simple Model of GIR and Financial Crises

This section links gross foreign investment reversals to banking and external crises in a simple model. As discussed in Section 5, it is unclear whether gross investment reversals cause banking distress from the asset or the liability side, since our the model allows for both interpretations. Let us imagine a three-period economy in which a single domestic bank funds a project and a single international lender does so with a second one. Both projects require a unit investment in period zero. If both are completed, then, aggregate output across the projects in period two is $DF/2$. On the other hand, due to complementarities (see the discussion above), failure to complete one of the projects yields zero aggregate output. The bank raises its funds domestically and has a unit opportunity cost of funds. In period one, the foreign-owned project turns out to be ‘good’ with probability p , in which case, $F = F_g$, and ‘bad’ with probability $1 - p$, where $F = 0$. As in Razin et al. (1999), only the foreign lender observes the project’s type. The foreign

opportunity cost of funds in period zero is one. But in period one, such cost either remains one or rises to $R > 1$ with probability q due to a foreign liquidity shock. Only the foreign investor observes the liquidity shock and we assume $qp/(qp + (1 - q)(1 - p)) < 1/2$. Finally, in period one, the domestic bank, or perhaps a domestic government willing to finance the bank, has a liquidity stock of w , with the potential to purchase the foreign project. Alternatively, the foreign investor can liquidate her project and receive $l > 0$. Assuming $RI > DF_g/2 > \max\{w, l\}$, she completes the project if its opportunity cost of funds is one; Otherwise, she either liquidates or sells the project.

Equilibrium

In period one, the foreign investor can sell, liquidate, or complete her project. If the project is “good”, she does not suffer a high liquidity cost, thus, completing the project. In that case, there is no FDI reversal and both the bank and the foreign investor get $DF_g/2$ in period two. Conversely, if the foreign investor either suffers a high liquidity cost or discovers a “bad” project, she would prefer selling or liquidating rather than completing. The best option depends on the bank’s willingness to pay for the foreign project, expressed as $D\tilde{p}F_g$, where $\tilde{p} \equiv qp/(qp + (1 - q)(1 - p)) < 1/2$ represents the likelihood the project is “good” provided that the foreign investor sells it. Since $\tilde{p} < 1/2$ and, therefore, $D\tilde{p}F_g < DF_g/2$, she would not sell a “good” project without a liquidity shock. Since the most the bank can actually pay is w , if $\min\{w, D\tilde{p}F_g\} < l$, then, she prefers liquidation. In such case, output in period two is zero, the value of the bank’s assets drops to zero and provided that $w < 1$ then it cannot repay its depositors. In this case, the FDI reversal leads to a banking crisis ‘from the asset side’. Alternatively, suppose that the foreign-owned project is in itself a bank, where liquidation implies that two banks rather than just one are distressed. Now, if $q - p$ is large then the foreign bank’s distress is most likely caused by its owners collecting claims too fast on an otherwise healthy institution. This instance is interpreted as a banking crisis from the liability side. Nonetheless, as a consequence, the *domestic* bank will suffer on the asset side. It is worth noting that even when the domestic bank rescues the foreign bank, paying $\min\{w, D\tilde{p}F_g\}$ to buy it from foreigners, to the extent that this bailout requires government assistance, it could still be recorded

as a banking crisis in our dataset. Finally, notice that independently of the foreign project being a bank, the absence of an FDI reversal implies future expected aggregate output DF_g and zero likelihood of a banking crisis. Conversely, an FDI reversal is either followed by liquidation, zero future output and a banking crisis (if the foreign investor liquidates); or else by domestic agents buying the project, future expected output of $D\tilde{p}F_g < DF_g$ and a banking crisis with probability $1 - \tilde{p}$ (if the foreign investor sells). Either way, FDI reversals and banking crises are correlated as our data indicates.

7. Conclusion

Financial crises are known to have large negative output effects. However, the relationship between various forms of crises remains unclear. In order to enhance a deeper understanding, we study the interdependencies between domestic banking crises, on one hand, and external financial crises, including currency and sudden stop episodes, on the other. We further examine the way these crises relate to gross foreign investment reversals (GIR), that is, foreign disinvestment in the home economy. Our main empirical findings are summarized as follows. First, banking crises predict currency crises, while the converse is false. Second, banking crises predict sudden stop crises, whereas the converse is false. Third, currency and sudden stop crisis predict each other. Fourth, GIR predict banking crises, but neither currency nor sudden stop episodes conditional on banking crisis. The predictive power of GIR may be important to the extent that banking crises are costly. Therefore, anticipating their onset can help prevent them or lower their costs. Fifth, using GIR to instrument for banking crises supports a causal effect of such episodes on external crises in emerging economies. Interestingly, FDI reversals, rather than foreign portfolio or other gross investment reversals, are linked to banking crises. We also conclude that any kind of reversal *prolongs* banking crises. Finally, we have related these findings to the theoretical literature on crises and presented a simple model consistent with our main results.

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DATA APPENDIX

Variable Definitions and Sources

Banking Crisis Dummy: Laeven and Valencia (2010) identify the start of the systemic banking crisis when at least three out of the following five policies are deployed

a) Extensive liquidity support (ratio of central bank claims on the financial sector to deposits and foreign liabilities exceeds five percent and more than doubles relative to its pre-crisis level),

b) Large bank restructuring costs (at least three percent of GDP, excluding asset purchases and direct liquidity assistance from the treasury),

c) Significant asset purchases or bank nationalizations (treasury or central bank asset purchases exceeding five percent of GDP),

d) Significant guarantees put in place (excluding increases in the level of deposit insurance coverage), or

e) Deposit freezes and bank holidays.

When a country has faced financial distress but less than three of these measures have been used, the authors classify the event as a crises if one of the following two conditions have been met: (i) a country's banking system exhibits significant losses resulting in a share of nonperforming loans above twenty percent or bank closures of at least twenty percent of banking system assets, or (ii) fiscal restructuring costs of the banking sector exceed five percent of GDP. Since the quantitative thresholds used in this definition of banking crises are ad hoc, the authors classify as borderline events that almost met the criteria.

Real GDP Growth: Our output growth measure is based on the yearly percentage change of real \$US GDP (Y_i) for each country $i = \ln(Y(t)) - \ln Y(t-4)$). The main source is IFS dataset where we use the deflator provided by the IMF to deflate the nominal value of domestic currency GDP for each country, then we transform that value in US\$ using the nominal exchange rate provided in IFS. Other sources used in the paper for real GDP are OECD Source, Economic Intelligence Unit (EIU), DataStream (DS) and CEIC.

Gross Capital Flows:

-Total Gross Flows: Total gross flows are calculated adding up the absolute value of all liability increases and decreases plus total asset increases and decreases from the capital and financial balance of each country.

-Gross Investment Reversals (GIR): Defined as the absolute value of all decreases in foreign liabilities from private domestic residents in the financial and capital accounts.

Net Inflows: Net Inflows is defined as the current account deficit minus the increase in international reserves.

The main source for balance of payment data is BOPS from IMF. Data for Taiwan and Switzerland was obtained from CEIC.

Domestic Credit: Stock of domestic credit is measured as bank lending to public and private sectors, plus bank lending in domestic currency overseas (Line 32 in IFS). The Main source is IFS but we also use data from EIU, DS and CEIC.

Terms of Trade (TOT): Net barter terms of trade are the ratio of the export price index to the corresponding import price index measured relative to the base year 2000.

Sources:

-Constructed. We use export and import value data from IFS. We use two kinds of proxies for export/import price indices.

a. Indices for export and import prices compiled from survey data for wholesale prices or directly from the exporter or importer (called “direct pricing”). See IFS line 76.

b. Indices for Unit Value of Exports (see IFS line 74) and Unit Value of Imports (see IFS line 75) are Laspeyres, with weights derived from the data for transactions.

We use indices based on direct pricing when available since these are generally preferable to unit value indices, as problems of unit value bias are reduced.

-Other Sources: DS, OECD Source, CEIC, EIU

Stock of Reserves: Total stock of International reserves minus gold. Sources are IFS, DS and EIU.

Inflation: Domestic CPI Inflation. Main sources are IFS, DS, EIU and CEIC.

Trade Openness (TO): Trade openness is the sum of merchandise exports and imports divided by twice the value of nominal GDP, all in current U.S. dollars. Data for Imports and Exports was extracted from IFS, DS, EIU and CEIC.

Effective Terms of Trade (EToT): EToT proxies the actual effects in changes in ToT into any economy. The extend of these effects is determined by the degree of trade openness the country is subject to so EToT is defined as ToT x To.

Fiscal Expenditure Growth: Corresponds to increases in Government Consumption Expenditure (IFS line 91f). Government Expenditures consists of expenditure incurred by general government on both individual-consumption goods and services and collective-consumption services. The main source is IFS, but we also use data from EIU and CEIC.

Real Effective Exchange Rates (REER): The real effective exchange rate index represents a nominal effective exchange rate index adjusted for relative movements in national price or cost indicators of the home country,

$$REER = \Pi_i^t [(e / e_i)(P / P_i)]^{w_i}$$

Where e : Exchange rate of the subject currency against the US dollar (US dollars per rupee in index form); e_i : Exchange rates of currency i against the US dollar (US dollars per currency i in index form); w_i : Weights attached to the country/ currency i in the index; P : Consumer Price Index (CPI) of Subject country and P_i is the Consumer price index of country i .

An Increase in REER corresponds to a Real Domestic Appreciation. Data belongs to the IFS dataset, OECD and JP Morgan.

Table 1: Summary Statistics for main variables

Variable	Observations	Mean	Std. Dev.	Min	Max
Real GDP Growth	3980	-0.00782	0.251224	-4.39009	0.89835
Nominal GDP	3980	436089.2	1561852	139.042	1.45E+07
Total Gross Flows*	3980	0.406699	0.690595	0.001566	9.464774
Gross Investment Reversals*	3980	0.03984	0.117225	0	3.144324
FDI GIR*	3980	0.006616	0.034384	0	1.1797
PI GIR*	3980	0.009181	0.049414	0	1.809367
OI GIR*	3980	0.024001	0.078843	0	1.907537
Current Account Balance*	3980	-0.01126	0.06476	-0.64946	0.262216
Change in Reserves*	3980	0.010298	0.04522	-0.34958	0.497381
Domestic Credit*	3980	2.677649	1.836652	0.00876	16.40984
Fiscal Expenditure*	3904	0.175699	0.06242	0.001939	0.5
Real Effective Appreciation	3948	0.006988	0.089525	-0.90054	0.908714
Inflation	3980	0.168864	1.483623	-0.03903	56.0493
Trade Openness	3974	0.277218	0.177023	0.00191	2.83045
Financial Liquidity	3498	1.922555	1.336826	0.003981	7.285704
Stock of International Reserves*	3980	0.374331	0.326573	0.001904	2.236984
Currency Crisis Dummy	3980	0.040704	0.197627	0	1
Sudden Stop 1 Dummy	3900	0.022051	0.146869	0	1
Sudden Stop 2 Dummy	3900	0.047949	0.213685	0	1
Banking Crises	3980	0.08995	0.286146	0	1

* Variables are deflated by Nominal GDP, Financial Liquidity is measured as the sum of money and quasi-money (M2) deflated by nominal GDP. Current Account reversal 1 corresponds to positive jumps in the current account in excess of 2 standard deviations. Current Account reversal 2 establishes the threshold in 3 percent of nominal GDP.

Table 2: List of Countries Used in the Regressions*

All Countries (75)			
Argentina	Ecuador	Kyrgyz Republic	Russian Federation
Armenia	Estonia	Latvia	Singapore
Australia	Finland	Lithuania	Slovak Republic
Austria	France	Macedonia, FYR	Slovenia
Belarus	Georgia	Malaysia	South Africa
Belgium-Luxembourg	Germany	Mauritius	Spain
Bolivia	Greece	Mexico	Sri Lanka
Brazil	Guatemala	Morocco	Sweden
Bulgaria	Hungary	Netherlands	Switzerland
Cambodia	Iceland	New Zealand	Thailand
Canada	India	Norway	Turkey
Chile	Indonesia	Pakistan	Ukraine
Hong Kong	Ireland	Panama	United Kingdom
Colombia	Israel	Paraguay	United States
Costa Rica	Italy	Peru	Venezuela
Croatia	Japan	Philippines	Vietnam
Cyprus	Jordan	Poland	Taiwan
Czech Republic	Kazakhstan	Portugal	
Denmark	South Korea	Romania	

* Some countries are dropped in different specifications

Table 3: Country Groups

Emerging Markets*	Developed OECD	Latin America	Emerging Asia	East Europe
Argentina	Australia	Argentina	Hong Kong	Bulgaria
Brazil	Austria	Bolivia	India	Croatia
Chile	Belgium-Luxembourg	Brazil	Indonesia	Czech Republic
Hong Kong	Canada	Chile	South Korea	Estonia
Colombia	Denmark	Colombia	Malaysia	Hungary
Czech Republic	Finland	Costa Rica	Pakistan	Latvia
Hungary	France	Ecuador	Philippines	Lithuania
India	Germany	Mexico	Singapore	Poland
Indonesia	Greece	Peru	Thailand	Romania
Israel	Iceland	Venezuela	Taiwan	Russian Federation
South Korea	Ireland			Slovak Republic
Malaysia	Italy			Slovenia
Mexico	Japan			Ukraine
Philippines	Netherlands			
Russian Federation	New Zealand			
Singapore	Norway			
Slovak Republic	Portugal			
South Africa	Spain			
Thailand	Sweden			
Turkey	Switzerland			
Venezuela	United Kingdom			
Taiwan	United States			

* Emerging markets are selected from countries belonging to Standard and Poor's Emerging Market Index and IMF list of emerging markets.

Table 4: Transition Probability Matrices for Crisis Dummies

	Banking Crises			Currency Crises		
	0	1	Total	0	1	Total
0	4,165 98.91	46 1.09	4,211 100	4,857 95.93	206 4.07	5,063 100
1	35 8.33	385 91.67	420 100	199 83.97	38 16.03	237 100
Total	4,200 90.69	431 9.31	4,631 100	5,056 95.4	244 4.6	5,300 100
	Current Account Reversal 1			Current Account Reversal 2		
	0	1	Total	0	1	Total
0	5,264 97.81	118 2.19	5,382 100	4,443 91.95	389 8.05	4,832 100
1	107 69.48	47 30.52	154 100	379 53.84	325 46.16	704 100
Total	5,371 97.02	165 2.98	5,536 100	4,822 87.1	714 12.9	5,536 100
	Sudden Stops 1			Sudden Stops 2		
	0	1	Total	0	1	Total
0	4,839 98.86	56 1.14	4,895 100	4,667 97.92	99 2.08	4,766 100
1	50 49.5	51 50.5	101 100	91 39.57	139 60.43	230 100
Total	4,889 97.86	107 2.14	4,996 100	4,758 95.24	238 4.76	4,996 100

First row corresponds to the frequency and second to the row probability

Table 5: Dynamic Linear Probability (Hausman-Taylor Estimators); External Crises on Banking Crises

Type of External Crisis	Currency Crises	CU Reversal (1)	CU Reversal (2)	Sudden Stop (1)	Sudden Stop (2)
External Crisis (t-1)	0.0703*** [0.0161]	0.2713*** [0.0163]	0.3040*** [0.0159]	0.4961*** [0.0147]	0.5568*** [0.0141]
Banking Crisis (t-1)	0.0600*** [0.0118]	0.0634*** [0.0104]	0.0373** [0.0189]	0.0478*** [0.0081]	0.0396*** [0.0108]
Gross Investment Reversal (t-1)*	0.0077 [0.0351]	0.0649** [0.0316]	0.043 [0.0573]	-0.0105 [0.0245]	-0.0287 [0.0330]
Total Gross Flows (t-1)*	0.0043 [0.0078]	-0.0098 [0.0070]	-0.0153 [0.0134]	-0.0022 [0.0048]	0.0130* [0.0067]
Current Account (t-1)*	-0.1370** [0.0646]	0.0254 [0.0556]	-0.0513 [0.1081]	-0.0528 [0.0421]	-0.1999*** [0.0575]
Δ Int. Reserves (t-1) *	-0.1489** [0.0734]	0.028 [0.0639]	-0.0836 [0.1164]	-0.1464*** [0.0499]	-0.1194* [0.0672]
Stock of Int. Reserves (t-1)*	-0.0064 [0.0139]	-0.0281** [0.0112]	-0.0318 [0.0266]	-0.0092 [0.0085]	-0.0043 [0.0123]
Inflation (t-1)	0.0092 [0.0067]	0.0196** [0.0078]	0.0579*** [0.0142]	-0.0027 [0.0059]	0.0150* [0.0080]
Inflation^2 (t-1)	-0.0002 [0.0002]	-0.0005** [0.0002]	-0.0015*** [0.0004]	0.0001 [0.0002]	-0.0004* [0.0002]
%Δ Domestic Credit (t-1)*	0.0223 [0.0167]	0.0153 [0.0144]	-0.0591** [0.0264]	0.0111 [0.0111]	0.0002 [0.0149]
Stock of Dom. Credit (t-1)*	0.003 [0.0029]	0.0031 [0.0023]	0.0166*** [0.0059]	0.000 [0.0017]	0.0031 [0.0026]
GDP Growth (t-1)	-0.275 [0.1798]	-0.5140*** [0.1631]	-1.9029*** [0.2986]	-0.1365 [0.1255]	-0.7014*** [0.1707]
REER (t-1)	0.0525** [0.0245]	-0.0211 [0.0207]	-0.1002** [0.0390]	0.0118 [0.0162]	0.0059 [0.0220]
OECD	-0.0131 [0.0161]	-0.0168 [0.0112]	-0.1395*** [0.0423]	-0.0092 [0.0089]	-0.0376*** [0.0141]
Latin America	-0.0016 [0.0153]	-0.0073 [0.0109]	-0.0705 [0.0442]	-0.0048 [0.0085]	-0.0182 [0.0134]
East Asia	0.0072 [0.0173]	-0.0014 [0.0119]	-0.0234 [0.0506]	0.0079 [0.0093]	0.0055 [0.0150]
Eastern Europe	-0.0072 [0.0153]	0.0162 [0.0109]	0.0052 [0.0417]	0.0038 [0.0086]	-0.0087 [0.0133]
Observations	3968	3945	3945	3843	3843
Number of country	53	55	55	53	53
Pseudo R-Squared	0.0358	0.1037	0.1262	0.2738	0.3499

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. *Denotes variables deflated by GDP. Year, quarter and region dummies included but not reported

Table 6: Dynamic Linear Probability (Hausman-Taylor) Estimates for Banking Crises on External Crises

Type of External Crisis Dependent Variable	Currency Crises Banking Crisis	CU Reversal (1) Banking Crisis	CU Reversal (2) Banking Crisis	Sudden Stop (1) Banking Crisis	Sudden Stop (1) Banking Crisis
Banking Crisis (t-1)	0.8860*** [0.0080]	0.8880*** [0.0080]	0.8874*** [0.0079]	0.8842*** [0.0082]	0.8851*** [0.0081]
External Crisis (t-1)	0.0059 [0.0107]	-0.0077 [0.0121]	0.0017 [0.0066]	0.0195 [0.0149]	0.0104 [0.0105]
Gross Investment Reversal (t-1)*	0.0571** [0.0233]	0.0504** [0.0227]	0.0501** [0.0227]	0.0549** [0.0234]	0.0544** [0.0234]
Total Gross Flows (t-1)*	0.0039 [0.0047]	0.0042 [0.0048]	0.0042 [0.0048]	0.0049 [0.0048]	0.0047 [0.0048]
Current Account (t-1)*	-0.0733* [0.0388]	-0.0709* [0.0390]	-0.0764* [0.0396]	-0.0840** [0.0395]	-0.0843** [0.0395]
Δ Int. Reserves (t-1) *	-0.0582 [0.0488]	-0.0556 [0.0484]	-0.056 [0.0484]	-0.0558 [0.0503]	-0.0569 [0.0503]
Stock of Int. Reserves (t-1)*	-0.0326*** [0.0098]	-0.0285*** [0.0099]	-0.0282*** [0.0098]	-0.0294*** [0.0099]	-0.0294*** [0.0099]
Inflation (t-1)	0.0090** [0.0045]	0.0162*** [0.0061]	0.0157*** [0.0060]	0.0155** [0.0061]	0.0153** [0.0062]
Inflation^2 (t-1)	-0.0002* [0.0001]	-0.0004** [0.0002]	-0.0004** [0.0002]	-0.0004** [0.0002]	-0.0004** [0.0002]
%Δ Domestic Credit (t-1)*	-0.0113 [0.0112]	-0.0117 [0.0111]	-0.0118 [0.0111]	-0.0115 [0.0114]	-0.0114 [0.0114]
Stock of Dom. Credit (t-1)*	0.0094*** [0.0025]	0.0093*** [0.0025]	0.0092*** [0.0025]	0.0087*** [0.0024]	0.0086*** [0.0024]
GDP Growth (t-1)	-0.1479 [0.1203]	-0.2292* [0.1251]	-0.2165* [0.1248]	-0.2071 [0.1283]	-0.2014 [0.1295]
REER (t-1)	0.0340** [0.0146]	0.0344** [0.0146]	0.0349** [0.0146]	0.0376** [0.0149]	0.0370** [0.0149]
OECD	-0.0125 [0.0123]	-0.0078 [0.0123]	-0.0068 [0.0124]	-0.0089 [0.0126]	-0.0079 [0.0126]
Latin America	0.0102 [0.0115]	0.0135 [0.0119]	0.0139 [0.0118]	0.0112 [0.0118]	0.0116 [0.0118]
East Asia	0.0086 [0.0131]	0.0119 [0.0136]	0.0123 [0.0135]	0.0099 [0.0135]	0.0105 [0.0134]
Eastern Europe	0.0205* [0.0113]	0.0219* [0.0114]	0.0217* [0.0113]	0.0213* [0.0116]	0.0216* [0.0116]
Observations	3980	3998	3998	3900	3900
Number of country	53	55	55	53	53
R-Squared	0.7901	0.7915	0.7915	0.7889	0.7889

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. *Denotes variables deflated by GDP. Year, quarter and region dummies included but not reported

Table 7: Summary Coefficients for Panel IV approach

All Sample	Currency Crisis	CU Reversal 1	CU Reversal 2	Sudden Stop 1	Sudden Stop 2
Banking Crisis	0.0848	0.2144**	0.1392	0.0545**	0.0456
	[0.0731]	[0.1049]	[0.1343]	[0.0271]	[0.0865]
Observations	3497	3489	3489	3393	3393
Number of country	52	54	54	52	52
Underidentification test: Kleibergen-Paap rk LM statistic	40.0883	31.1336	31.1336	30.8914	30.8914
Chi-sq P-val	0.000	0.000	0.000	0.000	0.000
Weak identification test: Kleibergen-Paap rk Wald F statistic	63.5615	51.7486	51.7486	47.0391	47.0391
Emerging Markets	Currency Crisis	CU Reversal 1	CU Reversal 2	Sudden Stop 1	Sudden Stop 2
Banking Crisis	0.3345**	0.3275***	0.7223***	0.4070***	0.5956***
	[0.1372]	[0.1265]	[0.2601]	[0.1339]	[0.1879]
Observations	1178	1160	1160	1152	1152
Number of country	17	17	17	17	17
Underidentification test: Kleibergen-Paap rk LM statistic	29.8415	27.8626	27.8626	27.5843	27.5843
Chi-sq P-val	0.000	0.000	0.000	0.000	0.000
Weak identification test: Kleibergen-Paap rk Wald F statistic	27.7203	25.7593	25.7593	25.2691	25.2691
OECD Countries	Currency Crisis	CU Reversal 1	CU Reversal 2	Sudden Stop 1	Sudden Stop 2
Banking Crisis	0.1089	0.1403	0.0218	-0.0034	0.006
	[0.0868]	[0.1247]	[0.1568]	[0.0201]	[0.0778]
Observations	1551	1525	1525	1513	1513
Number of country	18	18	18	18	18
Underidentification test: Kleibergen-Paap rk LM statistic	31.4287	23.2324	23.2324	23.5318	23.5318
Chi-sq P-val	0.000	0.000	0.000	0.000	0.000
Weak identification test: Kleibergen-Paap rk Wald F statistic	52.4321	40.5467	40.5467	40.9904	40.9904
Stock-Yogo weak ID test critical values	Maximal IV Size	10%	16.38		
		15%	8.96		
		20%	6.66		
		25%	5.53		
Fist Stage LSDV	All Sample	Emerging Markets	OECD Countries		
	Banking Crises	Banking Crises	Banking Crises		
Gross Investment Reversals	0.5302***	2.2149***	0.4408***		
	[0.0744]	[0.5936]	[0.0631]		
Observations	3592	1188	1560		
Number of country	54	17	18		
Adjusted R-squared	0.1429	0.1818	0.2631		

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%
Full list of covariates included but not reported. Time trend and quarter dummies included but not reported. Fixed effects are used in all regressions. Common Instruments in the first stage regressions not shown

Table 8: Banking Crises on External Crises by Decomposed GIR

Type of External Crisis Dependent Variable	Currency Crises Banking Crisis	CU Reversal (1) Banking Crisis	CU Reversal (2) Banking Crisis	Sudden Stop (1) Banking Crisis	Sudden Stop (1) Banking Crisis
Banking Crisis (t-1)	0.8874*** [0.0080]	0.8894*** [0.0080]	0.8888*** [0.0079]	0.8857*** [0.0082]	0.8867*** [0.0081]
External Crisis (t-1)	0.0072 [0.0107]	-0.0081 [0.0121]	0.0011 [0.0066]	0.0196 [0.0148]	0.009 [0.0105]
FDI GIR (t-1)*	0.3182*** [0.0743]	0.2665*** [0.0701]	0.2654*** [0.0702]	0.3148*** [0.0747]	0.3120*** [0.0748]
PI GIR (t-1)*	0.0387 [0.0484]	0.0414 [0.0471]	0.0407 [0.0471]	0.0375 [0.0486]	0.0373 [0.0486]
OI GIR (t-1)*	0.0299 [0.0305]	0.0238 [0.0295]	0.0239 [0.0295]	0.0279 [0.0306]	0.0275 [0.0306]
Total Gross Flows (t-1)*	-0.0006 [0.0050]	0.0004 [0.0050]	0.0005 [0.0050]	0.0004 [0.0050]	0.0003 [0.0050]
Current Account (t-1)*	-0.0721* [0.0391]	-0.0701* [0.0393]	-0.0751* [0.0400]	-0.0824** [0.0398]	-0.0823** [0.0398]
Δ Int. Reserves (t-1) *	-0.0624 [0.0488]	-0.061 [0.0485]	-0.0612 [0.0485]	-0.0614 [0.0504]	-0.0627 [0.0504]
Stock of Int. Reserves (t-1)*	-0.0326*** [0.0098]	-0.0283*** [0.0099]	-0.0280*** [0.0099]	-0.0294*** [0.0100]	-0.0294*** [0.0100]
Inflation (t-1)	0.0091** [0.0045]	0.0164*** [0.0060]	0.0159*** [0.0060]	0.0156** [0.0061]	0.0156** [0.0062]
Inflation^2 (t-1)	-0.0002* [0.0001]	-0.0004** [0.0002]	-0.0004** [0.0002]	-0.0004** [0.0002]	-0.0004** [0.0002]
%Δ Domestic Credit (t-1)*	-0.0137 [0.0112]	-0.014 [0.0111]	-0.014 [0.0111]	-0.0138 [0.0114]	-0.0136 [0.0114]
Stock of Dom. Credit (t-1)*	0.0096*** [0.0025]	0.0094*** [0.0025]	0.0093*** [0.0025]	0.0089*** [0.0024]	0.0088*** [0.0024]
GDP Growth (t-1)	-0.1427 [0.1202]	-0.2253* [0.1250]	-0.2132* [0.1247]	-0.2026 [0.1282]	-0.1997 [0.1294]
REER (t-1)	0.0361** [0.0147]	0.0356** [0.0147]	0.0361** [0.0147]	0.0397*** [0.0150]	0.0389*** [0.0149]
OECD	-0.012 [0.0125]	-0.0075 [0.0126]	-0.0067 [0.0127]	-0.0086 [0.0128]	-0.0078 [0.0129]
Latin America	0.0106 [0.0117]	0.0137 [0.0122]	0.0141 [0.0122]	0.0116 [0.0121]	0.0118 [0.0120]
East Asia	0.0084 [0.0134]	0.0117 [0.0139]	0.0121 [0.0139]	0.0096 [0.0138]	0.0102 [0.0138]
Eastern Europe	0.0204* [0.0116]	0.0217* [0.0117]	0.0215* [0.0116]	0.0212* [0.0119]	0.0215* [0.0118]
Observations	3980	3998	3998	3900	3900
Number of country	53	55	55	53	53
R-Squared	0.7909	0.7923	0.7923	0.7898	0.7897

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. *Denotes variables deflated by GDP. Year, quarter and region dummies included but not reported

Table 9: External Crises on Banking Crises by Decomposed GIR

Type of External Crisis	Currency Crises	CU Reversal (1)	CU Reversal (2)	Sudden Stop (1)	Sudden Stop (2)
External Crisis (t-1)	0.0723*** [0.0161]	0.2715*** [0.0162]	0.3037*** [0.0159]	0.4960*** [0.0147]	0.5557*** [0.0141]
Banking Crisis (t-1)	0.0617*** [0.0118]	0.0635*** [0.0104]	0.0389** [0.0189]	0.0479*** [0.0081]	0.0407*** [0.0108]
FDI GIR (t-1)*	0.2813** [0.1102]	0.0311 [0.0921]	0.1758 [0.1680]	0.01 [0.0718]	0.1277 [0.0976]
PI GIR (t-1)*	0.0737 [0.0726]	0.2010*** [0.0677]	0.2965** [0.1233]	-0.0041 [0.0526]	0.0722 [0.0708]
OI GIR (t-1)*	-0.0576 [0.0456]	0.0145 [0.0408]	-0.0767 [0.0740]	-0.0157 [0.0319]	-0.0907** [0.0430]
Total Gross Flows (t-1)*	-0.0027 [0.0081]	-0.0117 [0.0072]	-0.0221 [0.0137]	-0.0028 [0.0050]	0.0076 [0.0071]
Current Account (t-1)*	-0.1326** [0.0648]	0.0361 [0.0558]	-0.0354 [0.1083]	-0.052 [0.0423]	-0.1908*** [0.0579]
Δ Int. Reserves (t-1) *	-0.1572** [0.0734]	0.0211 [0.0640]	-0.0985 [0.1165]	-0.1471*** [0.0500]	-0.1269* [0.0673]
Stock of Int. Reserves (t-1)*	-0.0065 [0.0139]	-0.0283** [0.0111]	-0.0335 [0.0267]	-0.0092 [0.0086]	-0.0052 [0.0125]
Inflation (t-1)	0.0093 [0.0067]	0.0197** [0.0078]	0.0586*** [0.0142]	-0.0027 [0.0059]	0.0154* [0.0080]
Inflation^2 (t-1)	-0.0002 [0.0002]	-0.0005** [0.0002]	-0.0015*** [0.0004]	0.0001 [0.0002]	-0.0004* [0.0002]
%Δ Domestic Credit (t-1)*	0.02 [0.0167]	0.0159 [0.0144]	-0.0589** [0.0264]	0.011 [0.0111]	-0.0008 [0.0150]
Stock of Dom. Credit (t-1)*	0.0034 [0.0029]	0.0033 [0.0023]	0.0164*** [0.0059]	0.0001 [0.0017]	0.0035 [0.0026]
GDP Growth (t-1)	-0.2661 [0.1798]	-0.5205*** [0.1630]	-1.9175*** [0.2985]	-0.1367 [0.1256]	-0.7090*** [0.1707]
REER (t-1)	0.0537** [0.0245]	-0.0207 [0.0207]	-0.0992** [0.0390]	0.0119 [0.0162]	0.0066 [0.0220]
OECD	-0.0126 [0.0162]	-0.0185* [0.0112]	-0.1414*** [0.0429]	-0.0092 [0.0089]	-0.0385*** [0.0146]
Latin America	-0.0014 [0.0154]	-0.0086 [0.0109]	-0.0732 [0.0450]	-0.0048 [0.0085]	-0.0187 [0.0138]
East Asia	0.0063 [0.0174]	-0.0034 [0.0119]	-0.0259 [0.0514]	0.0078 [0.0093]	0.0043 [0.0155]
Eastern Europe	-0.0071 [0.0153]	0.0158 [0.0109]	0.004 [0.0424]	0.0038 [0.0086]	-0.0085 [0.0137]
Observations	3968	3945	3945	3843	3843
Number of country	53	55	55	53	53
Pseudo R-Squared	0.0383	0.105	0.1277	0.2739	0.3511

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. *Denotes variables deflated by GDP. Year, quarter and region dummies included but not reported

Table 10: Hausman-Taylor Random Effects Estimates for GIR Shocks vs. Domestic Credit

	-1	-2	-3	-4	-5
	Δ Domestic Credit	Δ Domestic Credit	Δ Domestic Credit	Δ Domestic Credit	Δ Domestic Credit
Domestic Credit (t-1)	0.0004 [0.0037]	-0.0034 [0.0037]	-0.0079** [0.0037]	0.0100*** [0.0038]	0.0093** [0.0037]
FDI GIR (t-1)	-0.0718 [0.1275]	0.6978*** [0.1020]	0.037 [0.1292]		
FDI GIR * Banking Crisis (t-1)	2.1247*** [0.1962]		1.6596*** [0.1911]		
FDI GIR (t-2)	0.1387 [0.1280]			-0.5440*** [0.1032]	-0.0445 [0.1289]
FDI GIR * Banking Crisis (t-2)	-1.7453*** [0.2013]				-1.1304*** [0.1949]
PI GIR (t-1)	0.6717*** [0.1260]	0.1796*** [0.0680]	0.7583*** [0.1278]		
PI GIR * Banking Crisis (t-1)	-0.153 [0.1536]		-0.8703*** [0.1490]		
PI GIR (t-2)	-0.1519 [0.1414]			-0.2461*** [0.0757]	0.4904*** [0.1360]
PI GIR * Banking Crisis (t-2)	-0.8781*** [0.1684]				-0.9142*** [0.1620]
OI GIR (t-1)	0.2133*** [0.0637]	-0.0464 [0.0407]	0.1453** [0.0610]		
OI GIR * Banking Crisis (t-1)	-0.1437* [0.0816]		-0.2818*** [0.0781]		
OI GIR (t-2)	-0.2108*** [0.0598]			-0.3664*** [0.0432]	-0.2386*** [0.0611]
OI GIR * Banking Crisis (t-2)	-0.2035** [0.0827]				-0.1567* [0.0823]
Banking Crisis (t-1)	0.0358 [0.0235]	-0.0203* [0.0123]	-0.0094 [0.0127]		
Banking Crisis (t-2)	-0.0136 [0.0233]			0.009 [0.0123]	0.0322** [0.0127]
Current Account (t-1)	-0.2113*** [0.0525]	-0.1939*** [0.0549]	-0.2082*** [0.0545]	-0.1764*** [0.0565]	-0.2042*** [0.0544]
Δ International Reserves (t-1)	0.0076 [0.0628]	-0.0514 [0.0652]	-0.0331 [0.0646]	-0.0376 [0.0649]	-0.0195 [0.0643]
GDP Growth (t-1)	0.0694*** [0.0144]	0.0652*** [0.0143]	0.0652*** [0.0142]	0.0685*** [0.0150]	0.0728*** [0.0148]
Real Effective Appreciation (t-1)	-0.0849** [0.0348]	-0.0824** [0.0361]	-0.0807** [0.0357]	-0.0868** [0.0359]	-0.0915** [0.0355]
Observations	4965	4993	4993	4971	4971
Number of country	67	67	67	67	67
R-squared	0.1775	0.1043	0.1232	0.1179	0.1327

Standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. *Denotes variables deflated by GDP. Year, quarter and region dummies included but not reported

Figure 1: Confidence Intervals for IV Estimates of the Effect of Banking Crises on External Crises (Emerging Markets)

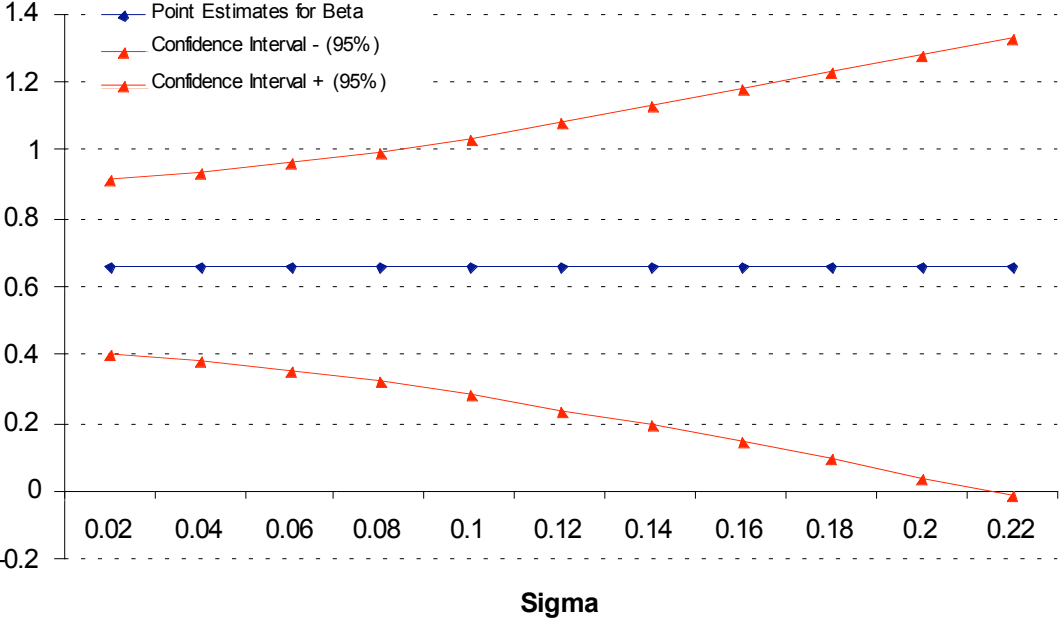
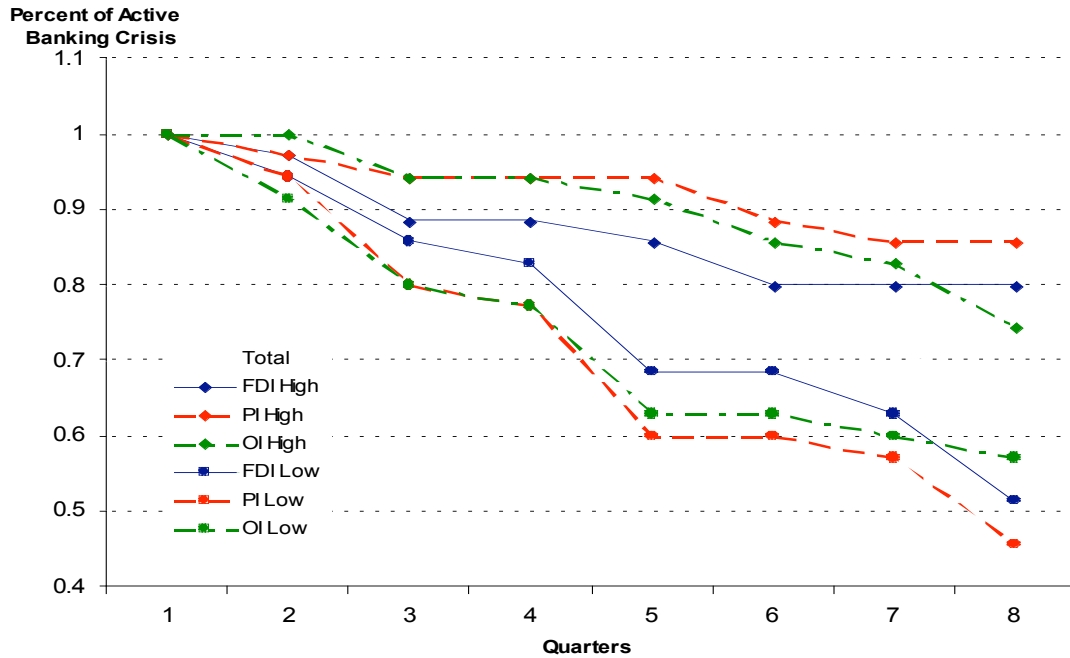


Figure 2: Banking Crisis Persistence and Decomposed GIR



Notes: FDI (PI, OI) High corresponds to Banking Crisis where FDI (PI, OI) reversals preceding the crisis were higher than the median for the series. FDI (PI, OI) Low tracks crises where these reversals were below the median.

Table 11: Persistence of GIR Components

	FDI GIR	PI GIR	OI GIR
FDI GIR (t-1)	0.1323** [0.0501]		
PI GIR (t-1)		0.5176*** [0.0660]	
OI GIR (t-1)			0.2310*** [0.0612]
Observations	5861	5861	5861
Number of country	79	79	79
Overall R-squared	0.1559	0.2746	0.116