Federal Reserve Bank of Dallas
Globalization and Monetary Policy Institute
Working Paper No. 273
http://www.dallasfed.org/assets/documents/institute/wpapers/2016/0273.pdf

Banking Crises, External Crises and Gross Capital Flows*

Thorsten Janus
University of Wyoming

Daniel Riera-Crichton
Bates College

June 2016

Abstract

In this paper, we study the relationship between banking crises, external financial crises and gross international capital flows. First, we confirm that banking and external crises are correlated. Then, as we explore the role of gross capital flows, we find that declines of external liabilities in the balance of payments – a proxy for foreign capital repatriation we call gross foreign investment reversals (GIR) – predict banking as well as external crises. Finally, we estimate the effects of GIR-associated banking crises on the risk of currency and sudden stop crises in an instrumental-variables specification. In developing countries, GIR-associated banking crises increase the onset risk for currency and sudden stop crises by 39-50 and 28-30 percentage points per year respectively. For OECD countries, we show an increase in the currency crisis risk by 33-45 percentage points.

JEL codes: F32, G01, G15, G21

* Thorsten Janus, Department of Economics and Finance, Dept. 3985, 1000 E. University Ave., Laramie, WY 82071. 307-766-3384. tjanus@uwyo.edu. Daniel Riera-Crichton, Department of Economics, Bates College, Pettengill Hall, Room 273, Lewiston, ME 04240. 207-786-6084. drieracr@bates.edu. The views in this paper are those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Dallas or the Federal Reserve System.

1. Introduction

Both domestic financial crises, such as banking crises, stock market crashes, and official defaults, and external financial crises, such as currency, sudden stop, and international debt crises, have been linked to output declines (Prasad et al. 2003, Edwards 2004, Bordo 2006, Reinhart and Rogoff 2008, 2011, De Paoli et al. 2009, Claessens et al. 2010). The fact that domestic and external crises are positively correlated (Kaminsky and Reinhart 1999, Glick and Hutchison 2001, Reinhart and Rogoff 2014) further suggests that they may be causally related. Nonetheless, the magnitudes and directions of the causal effects remain unclear. The identification of these effects is quite important from a policy perspective. For example, if banking crises cause currency crises, then regulations and policies that manage to stabilize the banking sector can also stabilize the external sector.

In order to improve understanding of these issues, this paper studies the relationship between domestic banking crises, external currency and sudden stop crises, and gross international capital flows.[1] Although the relationship between *net* capital inflows and financial crises has been widely studied (Bordo 2006, Edwards 2007), recent research finds that there are large and often asymmetric movements in the underlying gross flows around the crises episodes (Faucette et al. 2005, Broner et al. 2013). In this paper, we document additional asymmetries in the behavior of the gross flows surrounding banking and external crises, pay special attention to the relationship between foreign capital repatriation and banking crises, and use this relationship to estimate the effects of banking crises on external financial turmoil. The paper pursues three goals. First, we confirm the stylized fact in the existing literature that banking and external crises

[1] Following Hutchison and Noy (2006) we define a sudden stop crisis as a current account reversal along with a currency crisis. We explain our crisis and capital flow definitions in detail in Section 3.

are correlated. Second, we characterize the behavior of four different types of gross international capital flows surrounding the onsets of banking, currency, and sudden stop crises. The results show that declines in private external liabilities in the balance of payments – a proxy for foreign capital repatriation we call gross foreign investment reversals (GIR) – predict banking crises as well as external crises. Finally, we use the relationship between GIR and banking crises to estimate the effects of GIR-associated banking crises on currency and sudden stop crises in an instrumental-variables (IV) specification. We estimate that, in the developing country sample, GIR-associated banking crises increase the onset risk for currency and sudden stop crises by 39-50 and 28-30 percentage points per year. In the OECD countries, they increase the currency crisis risk by 33-45 percentage points. However, the fact that the banking crises in the OECD sample are concentrated during the Great Recession period in 2008-9 makes it difficult to estimate the effects precisely. Moreover, we never find sudden stop effects in the OECD sample.

Although we postpone a study of the precise mechanisms linking GIR to banking crises, an important part of the explanation may be that GIR –the value of the negative changes in the country's private external liabilities in the balance of payments – indicate that foreign investors recall their financial claims. The greater repayment burden may force the private financial and non-financial sector to enter a liquidity crisis.[2] If the foreign investors recall their direct loans to the domestic banks, the banks get impacted from the liability side. If they collect their non-financial corporate claims, the corporations may be unable to service their domestic bank debts. FDI sell-offs could decrease productivity and disrupt supply chains and marketing networks.

[2] In principle, the entity that repays the foreign claim can borrow and raise liquidity elsewhere. However, the fact that financial markets tend to be highly imperfect can make it difficult to do so on short notice (Bernanke 1983, Caballero and Krishnamurthy 2001).

Equity sell-offs may undermine consumer and investor confidence, wealth, collateral, and the liquidity role of financial securities (Kiyotaki and Moore 1997, Calvo 2012), thus decreasing aggregate demand and broad liquidity measures. In these cases, even if the foreign investors do not collect their direct bank claims, their actions can undermine the asset side of the banks' balance sheets. The financial crisis literature has previously linked factors such as developed-country interest rates and financial contagion to capital flows and financial crises in developing countries (Calvo et al. 1993, Chuhan, et al. 1998, Eichengreen and Rose 1998, Brana and Lahet 2010, Lim et al. 2014). Moreover, domestic financial fragility may increase the vulnerability to the international shocks. For example, Hahm et al. (2013) argue that banks in emerging markets accumulate external liabilities, which makes them vulnerable to international credit supply shocks, such as increasing interest rates. Empirically, they find that the stock of foreign liabilities in the banking system predicts banking crises. Reinhart and Rogoff (2011) link capital inflow surges, including surges in domestic bank debt, total external debt, and total capital inflows, to impending banking crises. Similarly, Caballero (2014) links net and gross inflow surges, debt surges, and surges in equity inflows to banking crises. Joyce (2011) and Ahrend and Goujard (2012) link debt inflows specifically to banking crises. In contrast to these papers, which link external debt stocks and capital inflows to banking crises, we study the relationship between the collection of outstanding foreign claims – the value of the claims that are actually collected, which may, of course, be a consequence of having a large outstanding debt stock and experiencing large capital inflows in the preceding years - to the onsets of crises. Chang and Velasco (2000, 2001) and the Committee on International Economic Policy and Reform (2012), similarly, link the collection of outstanding international claims on domestic banks to,

respectively, a number of the emerging market financial crises in the 1990s and the spread of the Great Recession in 2008-9 as well as the recent Euro-zone debt crisis.

The paper offers two contributions to the literature on financial crises and international capital flows. First, we characterize the relationships between gross international capital flows and the onsets of banking, currency, and sudden stop crises a four-way decomposition of the net capital inflow based on Janus and Riera-Crichton (2013). In contrast, most of the existing literature on gross capital flows relies on a two-way decomposition of the net inflow. The difference is that the four-way decomposition distinguishes between the positive and the negative changes in the stocks of external liabilities and assets in the balance of payments data in order to distinguish "new" foreign and domestic investment from capital repatriation. When we analyze the relationship between the onsets of financial crises and the four gross flows, we find that the sum of the negative changes in private external liabilities – GIR and our proxy for foreign capital repatriation - stands out for two reasons. First, the GIR value begins to increase over a year before the onset of the banking crises even as the "new" capital in- and outflows stay high until the onset year. Second, when we regress the onsets of banking crises on the four gross flows simultaneously, the GIR coefficient is two times larger than the other three gross flows coefficients and the difference between the coefficients is significant at the 1% level.

Our second contribution is to exploit the correlation between GIR and banking crises to estimate the effects of GIR-associated banking crises on currency and sudden stop crises. Most of the previous literature linking banking crises to external crises either ignores the causality issue or it estimates the Granger-causality linking external crises to lagged banking crises (Kaminsky and Reinhart 1999, Rossi 1999). In order for the Granger-causality to identify the true causality, however, the lagged banking crisis measure must be uncorrelated with the error

term, which is not always the case. For example, anticipated future external crises may generate bank runs since the bank creditors and currency speculators compete for the official reserve stock (Goldstein 2005). Alternatively, omitted variables like unsustainable macroeconomic policies may generate banking crises as well as future external crises. Due to these potential identification problems, we use an IV estimation procedure to identify the effects of GIR-associated banking crises on external currency and sudden stop crises. In order for the method to work, of course, the GIR instrument must satisfy the exclusion restriction, i.e., be uncorrelated with the error term in the external crisis regressions. Although it is impossible to test this assumption directly, we offer two types of indirect evidence to support it.

In the remainder of the paper, Section 2 reviews the potential theoretical mechanisms linking banking and external crises as well as the previous empirical literature. Section 3 defines the four-way decomposition of the net capital inflow and our measures of banking, currency, and sudden stop crises. Section 4 examines the correlations between banking and external crises. Section 5 studies the relationship between the onsets of both banking and external crises, on one hand, and, on the other hand, gross international capital flows. Section 6 estimates the effects of GIR-associated banking crises on external crises. Section 7 presents evidence that supports that the exclusion restriction for the GIR instrument appears to be satisfied, as is required for the IV-estimated effects to be reliable. Section 8 concludes the paper. Most of the variable definitions, data sources, tables and figures can be found in the appendix.

2. Theoretical Mechanisms and the Related Empirical Literature

The paper belongs to the literature on "twin" banking and external crises as well as the recent literature linking financial crises to gross international capital flows.[3] The twin crises literature identifies several reasons why banking crises can lead to external crises. Most intuitively, perhaps, banking sector distress can lead to credit contractions and liquidity crises in the non-financial sector. As the real economy stagnates, the previously optimistic foreign as well as domestic investors may stop investing and move their capital abroad. The falling demand for the domestic currency as well as non-currency financial assets may prompt a currency crisis and a sudden stop in the net capital inflow. In such a scenario, the investors may be particularly footloose if they expect that the country have insufficient reserves to pay their claims (Sachs et al. 1996, Goldstein 2005, Nakata 2010). Additionally, investors may be prone to leave if they expect that the government will bail out the banking system at the cost of exchange rate stability (Miller 1996, Burnside et al. 2001), that the government will increase interest rates to *protect* the currency, which will, in turn, worsen the banking crisis (Stoker 1994, World Bank 2015), or that emergency capital controls will be imposed.

In the other direction, external financial crises can, potentially, generate banking crises. For example, if an international credit crunch or financial contagion causes a sudden stop in international lending, the banking sector may be unable to repay or roll over its short-term

[3] Although this paper does not study the general determinants of banking crises, these crises have been linked to growth declines, inflation, high real interest rates, financial liberalization, deposit insurance, credit booms, spikes in asset prices, and capital inflow surges (Demirgüç-Kunt and Detragiache 1998, Eichengreen and Rose 1998, Reinhart and Rogoff 2008, 2011, Caballero 2014, World Bank 2015). For a summary of the literature, see http://www.worldbank.org/en/publication/gfdr/background/banking-crisis

foreign liabilities (Hahm et al. 2013). Alternatively, the non-financial corporate sector may be unable to repay its international creditors or, at least, to repay its domestic creditors as well (Panizza and Borenzstein 2009, Reinhart and Rogoff 2011, Hahm et al. 2013, Balteanu and Erce 2014). If the government attempts to defend the currency and attract capital by raising interest rates and expending reserves, as mentioned, it may only exacerbate the credit crunch (Stoker 1994, World Bank 2015). If the government *fails* to defend the currency, however, the likely depreciation of the real exchange rate increases the domestic goods cost of repaying foreign-currency liabilities (Mishkin 1996, Calvo 1998, Calvo et al. 2003).

In the empirical literature, Eichengreen and Rose (1998), Kaminsky and Reinhart (1999), Rossi (1999), and Glick and Hutchison (2000) study the relationship between banking and currency crises. We extend their work by studying the relationship, not just between banking and currency crises, but also between banking crises, external currency and sudden stop crises, and gross international capital flows. Moreover, we use the correlation between banking crises and the GIR gross flow to estimate the causal effect of GIR-associated banking crises on external crises. Broner et al. (2013) show that the gross flows of capital between countries are large and volatile compared to the net flows. The gross flows are also pro-cyclical and retrench during crises. Rothenberg and Warnock (2011) show that about half of the sudden stops in net capital inflows in their sample reflect increases in the gross capital outflow or "sudden flight" as opposed to a fall in inflows or "true sudden stop" (Faucette et al. 2005). Cowan et al. (2008) use different definitions to show that outflow surges (inflow declines) explain eighteen (fifty-seven) of the one hundred sudden stops they observe. Forbes and Warnock (2011) study episodes of "surge," "stop," "flight," and "retrenchment" in capital flows, which refer, respectively, to sharply increasing and decreasing inflows and sharply increasing and decreasing outflows. Janus

and Riera-Crichton (2013, 2014) show that GIR predict sudden stop crises and output declines. Adler et al. (2014) show that domestic investors may be able to substitute repatriated capital for the foreign capital that is lost due to capital repatriation in response to global financial shocks.[4] Broner et al. (2006) show that when hedge funds earn low returns in a country, they adjust their portfolios toward the average portfolio, so countries that share over-exposed hedge funds may suffer financial contagion via hedge fund gross flows. We contribute to this literature by linking domestic and external financial crises to four rather than two different gross flows and using one of the gross flows to estimate the effects of banking crises on external crises.

3. Definitions of Gross Capital Flows and Financial Crises

In order to measure gross international capital flows, we use the four-way decomposition of the net capital inflow we introduced in Janus and Riera-Crichton (2013). The four-way decomposition attempts to distinguish between foreign and resident investment as well as between new investment and capital repatriation. In order to do so, it distinguishes between the positive and the negative changes in the external asset and liability stocks in the balance of payments data. The positive changes measure investment, while the negative changes measure capital repatriation. In order to illustrate the difference to the more common two-way decomposition of the net capital inflow, we note that the two-way decomposition can be written

$$NI = \Delta L - \Delta A,$$

[4] Below, we present similar evidence.

where NI is the net capital inflow and ΔL is the sum of the changes in foreign holdings of FDI, portfolio, and other domestic assets, i.e. the sum of the changes in the external liabilities. This sum is usually called the gross capital inflow. Similarly, ΔA is the sum of the changes in domestic holdings of foreign assets. This sum is usually called the gross outflow. The decomposition can be applied separately to the net private and net official capital inflows. In contrast, following Janus and Riera-Crichton (2013), we write the net capital inflow

$$NI = -(CU + \Delta R) = (\Delta L^{+}_{GOV} - \Delta L^{-}_{GOV}) + (\Delta L^{+}_{PRIV} - \Delta L^{-}_{PRIV}) - (\Delta A^{+}_{GOV} - \Delta A^{-}_{GOV}) - (\Delta A^{+}_{PRIV} - \Delta A^{-}_{PRIV}), \qquad (1)$$

where $CU + \Delta R$ are current account plus the change in reserves and the subscripts GOV and PRIV denote official and private gross capital flows. In equation (1), ΔL^{+}_{GOV} is the sum of the *positive* changes in official foreign holdings of domestic assets. ΔL^{-}_{GOV} is the sum of the corresponding *negative* changes in official foreign holdings of domestic assets.[5] The term ΔL^{+}_{PRIV} is, similarly, the sum of the *positive* changes in *private* foreign holdings of domestic assets, while ΔL^{-}_{PRIV} is the sum of all the *negative* changes in private foreign holdings. We henceforth refer to ΔL^{-}_{PRIV}, as GIR. Analogously, ΔA^{+}_{GOV} is the sum of all the positive changes in official domestic holdings of foreign assets, while ΔA^{-}_{GOV} is the sum of the negative changes. Finally, ΔA^{+}_{PRIV} is

[5] To give an example, assume that the private foreign FDI stock increases by \$100 over the year. During the same period, the private foreign stock of portfolio capital and other assets, such as outstanding bank loans, decrease by \$40 and \$50. We, then, record $\Delta L^{+}_{PRIV} = \$100$ and $\Delta L^{-}_{PRIV} = \$90$. In contrast, the standard decomposition of the net capital flow only records the *net* change in official foreign holdings, $\Delta L_{PRIV} = \$100 - \$50 - 40 = \$10$. Thus, it fails to distinguish the foreign investment of \$100 from the disinvestment or capital repatriation value of \$90.

the sum of the positive changes in *private* domestic holdings of foreign assets and ΔA^{-}_{PRIV} represents the sum of the negative changes (Janus and Riera-Crichton 2013). Although equation (1) thus identifies eight different gross capital flows, we follow the argument in Janus and Riera-Crichton (2013, 2014) that the official gross are likely to be less cyclical and less likely to generate financial crises. They are also typically smaller than the private gross flows. Given this, we focus on tracing the private flows surrounding banking, currency, and sudden stop crises.[6]

The data for the gross flows also comes Janus and Riera-Crichton (2013, 2014), who calculate each flow using the IMFs Balance of Payments Statistics (BoPS). For example, GIR for country j in year t is the sum of the declines in external liabilities in the financial and capital accounts of the annual balance of payments, $\Delta L^{-}_{jt} = GIR_{jt} = \sum_{k} Max\{0, -\Delta L_{jkt}\}$, where ΔL_{jkt} is the change in external liabilities of type k deflated by nominal GDP. The BoPS distinguish between k=portfolio [debt and equity], FDI, and other capital flows, where the "other" capital flows include loans, foreign currency, trade credit, and other foreign investments. The GIR data only reflects cross-border transactions and excludes valuation effects (Lane and Milesi-Ferretti 2007, Janus and Riera-Crichton 2013, 2014). We use the same method to compute $\Delta L^{+}_{jt} = \sum_{k} Max\{0, \Delta L_{jkt}\}$, $\Delta A^{+}_{jt} = \sum_{k} Max\{0, \Delta A_{jkt}\}$, and $\Delta A^{-}_{jt} = \sum_{k} Max\{0, -\Delta A_{jkt}\}$. We refer to Janus and Riera-Crichton (2013, 2014) for additional details regarding the methodology.

Next, we define a currency crisis as a drop of two standard deviations or more in a monthly index of exchange market pressure based on Eichengreen et al. (1996),

[6] The main exception is that we use official reserve loses to define a currency crises and we include the stock of official resources a control variable in many of the regressions.

$$EMP_{jt} = \frac{\Delta R_{jt}}{\sigma^2_{j\Delta R}} + \frac{\Delta E_{jt}}{\sigma^2_{j\Delta E}},$$

where ΔR_{jt} is the percent change in official reserves from last period, ΔE_{jt} the percent change in the real exchange rate, and $\sigma^2_{j\Delta R}$ and $\sigma^2_{j\Delta E}$ are the respective country-specific variances of the percent change over the sample years. As in Hutchison and Noy (2006), we focus on the real rather than the nominal exchange rate.[7] We, additionally, follow Hutchison and Noy (2006) in defining a sudden stop crisis as the simultaneous occurrence of a currency crisis and a current account reversal. As a robustness check, we use two measures of current account reversals (CU1 and CU2): a rise in the current account-to-GDP ratio of more than twice the country-specific standard deviation of that ratio; and an increase of three percentage points or more in the current account-to-GDP ratio. We denote the resulting two measures of sudden stop crises ST1 and ST2.

The reason why we do not just define a sudden stop as a current account reversal is that the sudden stop concept refers to a crisis situation where, not only does the country borrow less, but output, asset prices, spending, and the relative of non-tradable goods fall (Hutchison and Noy 2006). In the view of Mendoza and Smith (2002, p.1), for example,

> "A significant fraction of the literature dealing with the waves of economic and financial crises affecting emerging economies since the 1990s focuses on an intriguing phenomenon that Calvo (1998) labeled a "Sudden Stop". This [sudden stop] phenomenon is defined by three key features: sharp reversals in capital inflows and current account deficits, large downward adjustments in domestic production and absorption, and

[7] Eichengreen et al. also include nominal interest rate deviations in the EMP index, but we follow most of the subsequent literature in omitting interest rates due to data limitations.

collapses in asset prices and in the relative prices of nontradable goods relative to tradables."

Consistent with the need to use multiple criteria to define sudden stops (Calvo and Reinhart 1999, Milesi-Ferretti 2000)[8], unreported results in this study show that banking crises rarely predict current account reversals. Similarly, Edwards (2007) finds no relationship between current account reversals and banking crises. These findings suggest that, on the one hand, the sudden stop effects of banking crises we document for the developing countries in the sample may be sensitive to including the currency crisis (i.e., sharp real depreciation) requirement in the sudden stop definition. On the other hand, it seems appropriate to include the requirement.

Finally, the dataset for systemic banking crises comes from Laeven and Valencia (2010), who record a systemic banking crisis when there is a combination of bank runs, losses in the banking system, bank liquidations reflecting systemic distress, or policy interventions responding to bank failures. After we merge our data with theirs, we observe 53 banking crises in 90 countries in the period from 1970 to 2009. We, additionally, check the robustness of our main findings using the alternative data on currency and banking crises in Reinhart and Rogoff (2011).

[8] Kaminski (2003) similarly defines a sudden stop as a currency crises and a capital inflow reversal. Calvo et al. (2006) define sudden stops in emerging markets as large reversals in net capital inflows plus a rising EMBI spread and output decline. Milesi-Ferretti (2000) study the output effects of sustained current account reversals. Edwards (2004, 2007) finds that current account reversals and reversals in the net capital inflow are closely, although imperfectly related, and that it may be only the current account reversals that decrease output. Intuitively, the government should be able to use reserves to stabilize the current account and private spending even after the net capital inflow decrease.

4. The Relationship between Banking and External Crises

In this section, we characterize the empirical relationship between banking and external crises in an annual country panel spanning from 1970 to 2009. The panel is unbalanced with missing data for many emerging economies before the late 1980s and early 1990s. The sample contains a total of 50 countries, 33 developing economies and 17 OECD countries, and is only limited by data availability. Tables 1-2 display the summary statistics and sample countries.

We begin with estimating some simple regression specifications that only control for the lagged current account relative to GDP, along with country and year dummies. Since financial crises are very persistent (see Table 3), and we would like to avoid coding the same crisis onset twice, we recode the onset observations where the same crisis type occurs the previous year to missing. Thus, if the crisis dummy equals one five years in a row, we only record a crisis onset in the first year and code the onset dummy for the other four years to missing. Thus, we estimate the following fixed-effects OLS panel,[9]

[9]Throughout the paper, we estimate linear probability models rather than discrete choice models of crisis onsets. The reason is that, first, the incidental parameters problem makes it difficult to include fixed effects in discrete choice models and even when it is possible to include them (as in the conditional logit and complementary-log-log models), it is impossible to infer the marginal effects of banking crises. The problem is that the interaction between the inconsistent fixed effects estimates and the other crisis determinants in the non-linear probability equation makes the marginal effects estimates inconsistent (Greene 2002). Second, we later extend the OLS estimation to IV estimation and consistent estimation of a non-linear IV model requires that the first stage model is exactly correct (Angrist and Krueger 2001, Angrist and Pischke 2009, Nichols 2011). The paper's qualitative results remain similar when we estimate alternative probit, logit, complementary loglog, dynamic panel complementary log-log model with random effects, and iv-probit specifications.

$$d_{jt}^{E} = \alpha + \beta d_{jt}^{B} + \theta CU_{j(t-1)} + \mu_j + \rho_t + \varepsilon_{jt}, \qquad (2)$$

where $d_{jt}^{E} \in \{0,1\}$ indicates the onset of an external financial (currency or sudden stop) crisis in country j in year t, $d_{jt}^{B} \in \{0,1\}$ is a dummy for an ongoing banking crises, $CU_{j(t-1)}$ is the lagged current-account-to GDP ratio, μ_j is a country effect, ρ_t is a year effect, and ε_{jt} is the error term. We estimate the equation with robust standard errors, which we cluster at the country level in order to control for potential serial correlation within countries.

The results are reported in Table 4. Banking crisis are correlated with currency crises as well as sudden stop crises, although the positive relationship mostly reflects the developing country experience. In the OECD countries, banking crises are only weakly related with currency crises and appear to be unrelated to sudden stop crises.[10] The negative signs on the current account are consistent with the broader literature on currency crises and sudden stops and suggest that high-borrowing economies have greater crisis risk (Kaminsky and Reinhart 1999).

[10]If we lag one of the crisis dummies, we find that lagged banking crises predict currency crises but not the converse. Kaminsky and Reinhart (1996, 1999), Rossi (1999), and Glick and Hutchison (2001), similarly, find that the Granger-causality mainly appears to go from the banking crises to the currency crises. The weaker results for the R&R currency crises compared to the main currency crisis measure may reflect that, in order to maximize data available in their historical dataset R&R only define currency crises based on a high depreciation rate. Eichengreen et al. (1996), however, argue that the definition based on exchange market pressure may be preferable. The reason is that partly currencies can survive speculative attacks and remain stable after the authorities expend reserves or increase interest rates. Partly also currency realignments can occur in tranquil periods, i.e., voluntarily rather than due to a crisis (but potentially intended to avoid a future crisis).

In Table 5, we control for other potential predictors of the external crisis risk, including the lagged values of economic growth, the real effective exchange rate, the stock of reserves, domestic credit growth, de-facto trade openness (the ratio of total merchandise trade to GDP), inflation and squared inflation, the US federal funds rate, institutional quality, de-jure financial openness, and the nation's external debt.[11] The estimates on the banking crisis dummy, however, remain similar to the estimates without the controls in Table 4.

5. The Relationship between Gross Capital Flows and Crises

Having examined the relationship between banking and external crises, our next objective is to study the behavior of the private gross flows of capital in equation (1) surrounding the crises onsets. We start by plotting the average gross flows relative to GDP from three years before to three years after the onsets of banking, currency, and type 1 sudden stop crises in Figure 1. The figure suggests that there may be four important regularities. First, cross-border investments sharply decline in the onset year. Not only do the "new" foreign and domestic investments decline, but both domestic and foreign capital repatriation increase. Broner et al. (2013) have previously documented that gross international capital flows are pro-cyclical and retrench during crises. Second, the decline in the gross flows is larger for the banking crises than for the currency and sudden stop crises. Third, both domestic and foreign capital repatriation begin to increase over a year ahead of the banking crises. In contrast, the "new" capital in- and outflows increase

[11]Although the literature has tested many determinants of external crises, it is unclear that it has reached a consensus. Nonetheless, we believe that the controls we include are reasonably representative (Frankel and Rose 1996, Edwards 2004, Cavallo and Frankel 2008).

until the onset year. Fourth, we do not observe increases in capital repatriation before currency crises and, at most, a minor increase in the run-up to sudden stops.

Since the evidence in Figure 1 only characterizes the bivariate relationship between crisis onsets and capital flows, we further estimate the following equation for each of the crisis onsets,

$$d_{jt}^{C} = \alpha + \beta GF_{j(t)} + \theta X_{j(t-1)} + \mu_j + \rho_t + \varepsilon_{jt}, \quad (3)$$

where $d_{jt}^{C} \in \{0,1\}$ indicates the onset of a banking, currency, or sudden stop type 1 crisis (depending on the specification) in country j in year t. GF_{jt} is the vector of the four private gross capital flows in equation (1) and Figure 1, and $X_{j(t-1)}$ contains the control variables from Table 5. Again, μ_j, ρ_t, and ε_{jt} are the country and year effects along with the error term. Finally, we estimate the equations with both the contemporary and the one-year lagged gross flows.

Tables 6-7 report the results for the contemporary and the lagged gross flows respectively. Since the results for the lagged flows are less statistically significant but broadly similar, Table 6 focuses on the contemporary flow estimates. Consistent with Figure 1, foreign capital repatriation (or outflows from liabilities) remains positively related to the crisis onsets. On the other hand, after we control for the levels of foreign investment and foreign capital repatriation (the in- and outflows from liabilities), the correlations between the crisis onsets and the *resident* capital flows change sign. This finding suggests that, when the domestic residents move or retain more capital at home during crises, as depicted in Figure 1, they may replace the

foreign capital that exits. However, if we hold the foreign investment loss or external liability changes constant, we observe that residents actually export their capital.[12]

If we compare the magnitude and statistical significance of the gross flows estimates in Table 6-7, we find that the GIR or outflows-from-liabilities coefficient is larger and it tends to be more significant than the other three gross-flows coefficients. The GIR coefficient in the banking-crisis regressions, particularly, is twice as large as the coefficient on resident capital repatriation or inflows from assets. It is also substantially larger than the coefficients on the "new" foreign and domestic investments (inflows from liabilities and outflows from assets). The differences between the GIR coefficient and the other three gross flows coefficients are significant at the 1% level.

6. Do Banking Crises Cause External Crises?

As we noted in the introduction, the correlation between GIR and banking crises that we find may reflect that, when the foreign investors recall their claims, they potentially force the banking sector to enter a liquidity crisis. If the investors recall their direct loans to the banks, they impact the banks from the liability side, but even if they do not recall direct bank loans, they may impact the banks from the asset side. From an econometric perspective, as long as GIR (1) predict banking crises, but (2) are uncorrelated with the external crisis onsets except, potentially, via a banking crises, we can potentially use them as an instrumental variable for banking crises. In particular, we can identify the causal effects of having a new or ongoing GIR-associated banking

[12] The sign changes for the resident flows are independent of whether we include the full set of controls or just control for the foreign gross flows.

crisis on the risk of a currency crisis or sudden stop onset by estimating the following IV-2SLS equation system.[13]

$$d_{jt}^{B} = \chi + \lambda GIR_{jt} + \xi CU_{j(t-1)} + \varphi_j + \psi_t + \nu_{jt}, \tag{4}$$

$$d_{jt}^{E} = \alpha + \beta \hat{d}_{jt}^{B} + \theta CU_{j(t-1)} + \mu_j + \rho_t + \varepsilon_{jt}, \tag{5}$$

where $\hat{d}_{jt}^{B}$ is the predicted probability of having an ongoing banking crises, GIR_{jt} is the GIR-to-GDP ratio, ϕ_j, ψ_t, and ν_{jt} are the first stage country effects, year effects, and error term. As long as the GIR instrument predicts banking crises and it is uncorrelated with the error term in the external crisis regression, $E\left(GIR_{jt}\varepsilon_{jt}\right)=0$, the estimated value of β, denoted $\hat{\beta}$, ought to indicate the effect of GIR-associated banking crises on the risk of a currency crisis or sudden stop onset. We can test the first assumption directly via the under- and weak-identification statistics when we estimate the system. While it is impossible to test the second assumption directly, Section 7 below offers two pieces of evidence that suggest that it is quite unlikely that the potential failure of the exclusion restriction, such that $E\left(GIR_{jt}\varepsilon_{jt}\right)\neq 0$, explains the results we find below. On this basis, we proceed to estimate the model with the same robust and clustered error structure we used earlier. Due to the reasons we will explain momentarily, we also present the estimation results with both a common time trend and the full set of year effects.

[13]In principle, even if GIR are merely a reaction to banking crises, they can still be a valid instrumental variable. They must just be uncorrelated with the error term in equation (5), such that

In Table 8, the first-stage estimates in the bottom two panels show that, except in the OECD equations with year effects, the GIR instrument is significantly related to the incidence of banking crises (and not just to the onsets of banking crises we studied in Tables 6-7). The weak-identification statistics, which we report in the upper three panels, imply that – again, with the exception of the OECD equations with year effects – we can reject the null hypothesis that the GIR instrument is weak. More precisely, the weak-identification statistics allows us to reject that the size of the five percent significance tests for the endogenous banking crisis dummy actually exceeds ten percent due to weak instrumentation (Stock and Yogo 2005). Finally, the first-stage estimates show that GIR increases are linked to much larger increases in banking crisis incidence in developing countries than in OECD countries. In the year-effects specifications, every percentage-point increase in the GIR-to-GDP ratio is associated with 1.8 percentage-point increase in banking crisis incidence in OECD countries but 5.8 percentage points increase in banking crisis incidence in the developing countries. The reason may be that the banking systems in developing countries are more vulnerable to foreign loan withdrawals due to borrowing in external currency, a lack of foreign currency reserves, and exposition to depreciation risk, i.e., currency-mismatch problems (Mishkin 1996, Calvo 1998).[14]

The second stage estimates in the three upper panels in Table 8 also turn out to depend on the sample. In the developing country year-effects specifications in columns (4)-(8), ongoing GIR-associated banking crises increase the onset risk for currency and sudden stop crises by, respectively, 39-50 and 28-30 percentage points per year. In the OECD countries, they increase

[14] Alternatively, if GIR are more a symptom than a cause of banking crises, the larger GIR coefficient in the developing country regressions may reflect that foreign investors react more strongly to banking crises in these countries relative to OECD economies.

the currency crisis risk by 33-45 percentage points, but the standard errors and statistical significance of the estimates depend on including the year effects: moving from columns (1) and (4) in the OECD panel to columns (5) and (8) doubles to triples the standard errors. In order to explain this puzzle, Figure 2 depicts the incidence of banking crisis in the OECD and developing country samples over time. The OECD crises turn out to be heavily concentrated during the Great Recession in 2008-9. Therefore, the addition of the year dummies control for the spikes in banking crises and GIR during the Great Recession period, which decreases the remaining variation in the data. The fact that the point estimates remain largely unchanged when we add the year effects suggests that the OECD results are unlikely to be explained by the Great Recession years, but the time-clustered banking crisis data still makes it difficult to identify the coefficients. We postpone a more through identification attempt for the OECD countries to the future.

If we compare the IV estimates in Tables 8-9 with the OLS estimates in Tables 4-5, we find that the IV estimates tend to be similar or larger than the OLS estimates. If the OLS estimates reflected reverse causality from external crises to banking crises or that omitted variables cause external as well as banking crises, all else constant, they should have been upward biased. The comparison therefore suggests that, subject to the assumption that the GIR instrument is valid, the reverse causality and omitted variables problems in the OLS estimation may be limited (Kaufmann and Kraay 2002). Alternatively, however, the large IV estimates may reflect that GIR-associated banking crises increase the external crisis risk more than the average banking crisis. For example, if GIR-associated banking crises reflect that foreign investors run on the domestic banks, the foreign investors may also run on the currency and stop lending to the country as a whole, thereby, causing a sudden stop crisis (Sachs et al. 1996, Goldstein 2005, Nakata 2010). In contrast, some of the non-GIR associated banking crises in the dataset may be

associated with domestic investor runs and defaults, which can occur even in non-financially integrated economies and economies with credible currency pegs. In these cases, the banking crises may be unlikely to trigger currency runs and current account reversals.

In Table 10, we show that the IV estimates remain similar when we add the control variables from Tables 5-6. In Figure 3 and Table 10, we briefly decompose the aggregate GIR into FDI, portfolio, and other GIR in order to examine whether one of the three GIR categories may be more important and shed light on the potential causal mechanism linking GIR to banking crises.[15] Figure 3 is constructed like Figure 1, so it depicts the average values of FDI, portfolio, and other GIR in the six-year windows surrounding the onsets of banking, currency, and type 1 sudden stop crises. Both the bivariate graphical analysis and the fixed effects regressions in Table 10 suggest that the "Other" GIR component is the most important one. Given that a large portion of the "other-capital-flows" category consists of international loans to domestic banks (in the underlying BoPS/IFS dataset, the bank-loan GIR is, on average, around 65% of the total other-GIR and the correlation between the bank loan-loan GIR and total other-GIR is 0.97), the correlation between GIR and banking crises we find may capture the recall of foreign loans to the banking sector. In that case, the GIR impact the banks from the liability side. Caballero (2014) and the Committee on International Economic Policy and Reform (2012) also link international loans and the recall of international inter-bank loans to banking crises respectively. Nonetheless, the first-stage estimates in Table 10 are also consistent with Caballero's (2014) results linking surges in portfolio equity inflows (and, in our case, reversals in those inflows in the crisis year) to banking crises. The reason may be that foreign equity selloffs lead to declining asset prices, wealth, and aggregate spending, and ultimately domestic loan defaults that impact

[15] We are very grateful to a referee for suggesting this decomposition approach.

the banks from the asset rather than the liability side. Alternatively, the falling asset prices may decrease the economy-wide liquidity supply and raise banks' liquidity costs (Calvo 2012). Interestingly, however, and in contrast to the results for other-GIR-associated banking crises, we find no evidence linking portfolio-GIR-associated banking crises to external crises. In other words, the repatriation of foreign portfolio capital is associated with banking crises, but somehow these banking crises do not cause external crises. We leave the study to explain these differences to future research.

7. The GIR Instrument's Exclusion Restriction: Indirect Evidence

In order for the IV estimates to identify the effects of the banking crises on the external crises in Tables 7-9, the exclusion restriction for the instrument, $E\left(GIR_{jt}\varepsilon_{jt}\right)=0$, must hold, i.e., GIR must be uncorrelated with the error term in the external crisis regressions. If there is a positive correlation between the GIR instrument and the error term, such that $E\left(GIR_{jt}\varepsilon_{jt}\right)>0$, we will tend to overestimate the effects of the banking crises. The simplest way to get a positive correlation and upward coefficient bias may be if GIR or the ΔL^{-}_{PRIV} component in equation (1) increases the current account deficit. In this case, our GIR instrument may affect the external crisis risk via the current account deficit rather than via the banking crisis mechanism. Nonetheless, GIR are only one of the eight gross flows that, along with the change in reserves, determine the current account in equation (1). Table 11 shows that the correlation between GIR

changes and current account changes in the three-year windows surrounding the sudden stop onsets is at most 0.08.[16]

In order to address the potential endogeneity problem more generally, we use a modified version of the instrument falsification test that Iyer (2010) proposes. The idea is that, under the null hypothesis that the GIR instrument is valid, it must only be correlated with external crisis onsets via the banking crisis mechanism. In order to examine that idea, we regress the external crisis onsets on the GIR instrument after dropping the observations where the external crisis onset is accompanied by a banking crisis. In the restricted sample, we only observe external crisis onsets in the absence of banking crises, so the banking crises can only be negatively or insignificantly related to the external crisis onsets. Therefore, if the exclusion restriction holds and GIR only affect the external crisis risk via the banking crisis mechanism, we should find a negative or insignificant relationship between the GIR instrument and the external crisis onsets.[17] Table 12 shows that this is precisely what we find. In addition, the last column shows that GIR

[16]Controlling for the contemporary rather than the lagged current account in the regressions also does not change the paper's qualitative results. We further estimated a series of fixed effects regressions linking either the lagged or the contemporary GIR to the two dummies for current account reversals we defined in Section 3. The results were largely never significant.

[17] To the best of our knowledge, our instrument falsification test differs from the test Iyer (2010) uses due to the fact that we drop the observations that allow the endogenous variable to have the hypothesized effect on the dependent variable. Thus, the data elimination should not affect the first-stage IV relationship (GIR should still be positively related to banking crises), but it disrupts the second-stage relationship by forcing the banking-external crisis correlation to become non-positive. Iyer (2010), instead, restricts attention to the set of observations where the author knows a-priori that the instrument cannot predict the endogenous variable. This restriction disrupts the first-stage rather than the second-stage IV relationship. Either way, however, if the instrument is valid, it should not retain the relationship to the dependent variable it has in the full-sample estimation.

continue to predict banking crises even after eliminating the observations where we also observe an external crisis. The latter finding suggests that GIR explain banking crises directly and not because GIR causes external crises that then cause banking crises. In fact, the GIR coefficients in Column (4) are almost identical to the first-stage GIR coefficients in Table 8, despite the elimination of the twin crises.

Finally, we also address the potential endogenity of GIR by (a) regressing the full set of dummies for banking and external crisis onsets on the GIR instrument, but (b) adding a first-stage equation where we "instrument the instrument". The instrument for GIR is the bilateral bank-loan weighted GIR from developed countries whose banks hold claims on the sample country. If for example, France and Germany each own 50% of the bank loans to Argentina in the bilateral bank-loan dataset, then, we instrument GIR from Argentina with 50% times GIR from Germany plus 50% times GIR from France.[18] The idea is that capital withdrawals from the lender countries may indicate that these countries experience financial distress. In turn, they may want to recall their international claims, causing GIR from the sample country. In order to account for the possibility that the lenders also recall loans from neighboring countries (e.g., Germany recalls loans from both Argentina and Brazil), we also control for the trade-weighted growth rate of countries' large trade partners.[19]

[18] The underlying Bank of International Settlements (BIS) dataset only includes developed country bank lenders, so, the bilateral-bank loan weighted GIR instrument only uses bank loans from developed countries Ahrend and Goujard (2012) construct a similar measure to study financial contagion.

[19] Due to tractability concerns, we only included the trade partners that individually represented at least 5% of the country's total international trade. These trade partners typically represented 40-50% of the country's total trade. We also used the trade-weighted GIR from the trade partners instead of the bank-loan weighted GIR from developed country lenders as an alternative instrument for the original GIR measure. The results were broadly similar.

The results in Table 13 show that the instrumented GIR continues to predict crises. Nonetheless, the first-stage weak identification statistics in Table 13 are somewhat small and therefore the banking crisis coefficients may not be identified. Moreover, the conventional Wald significance tests may be biased. Thus, we also report the p-values for the banking crisis coefficients using the size-correct Anderson-Rubin significance test. The Anderson-Rubin test is robust to using weak instruments and does not require the coefficient on the endogenous variable to be identified (Stock and Yogo 2002, Finlay and Magnusson 2009). Since five of the six p-values are close to zero, we can mostly reject that GIR have zero effect on the financial crisis risks. [20]

8. Conclusion

In this paper, we have studied the relationship between domestic and external financial turmoil and the role played by private gross capital flows in that relationship. We first show that there is a positive correlation between domestic banking crises and external currency and sudden stop crises. Next, we decompose the net private inflow into four gross flow components and study the behavior of the gross flows surrounding episodes of domestic and external financial turmoil. We find evidence of declines in de-facto capital market integration in the onset year for all three crises types with the decline being particularly large for banking crises. Moreover, foreign capital repatriation, which we also refer to as gross investment reversals (GIR), predicts oncoming banking crisis. Finally, we use GIR to predict the incidence of banking crises and estimate the effects of GIR-associated banking crises on currency and sudden stop crises. In the

[20] Guggenberger (2012), however, show that any small violations of the exclusion restriction will make the Anderson-Rubin test oversized (Riquelme et al. 2013).

developing country sample, GIR-associated banking crises increase the onset risk for currency and sudden stop crises by 39-50 and 28-30 percentage points per year. In the OECD countries, they appear to increase the currency crisis risk by 33-45 percentage points per year. However, the fact that the banking crises in the OECD sample are concentrated during the Great Recession in 2008-9 makes it difficult to estimate the effects precisely. Moreover, we never find sudden stop effects in the OECD sample. To the extent that GIR may play a role in causing banking crises, it seems advisable to use policies that decrease their magnitude or mitigate their effects on the banking system. This could potentially stabilize the domestic banking sector and, as an added benefit, help to avoid currency crises in all countries and sudden stop crises in developing countries.

References

Adler, G., Djigbenou, M.L., and S. Sosa 2014. Global Financial Shocks and Foreign Asset Repatriation: Do Local Investors Play a Stabilising Role? IMF Working Paper No. 14/60

Ahrend, R. and Goujard, A. 2012. International capital mobility and financial fragility – Part 1. Drivers of Systemic Banking Crises: the role of bank-balance-sheet contagion and financial account structure. OECD Economics Department Working Papers No. 902, OECD Publications, http://dx.doi.org/10.1787/5kg3k8ksgglw-en

Angrist, J. and A. Krueger 2001.Instrumental Variables and the Search for Identification: From Supply and Demand to Natural Experiments. *Journal of Economic Perspectives* 15, 69-85

Angrist, Joshua D and Jorn-Steffen Pischke 2009. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton NJ: Princeton University Press 642-65

Balteanu, Irina, and Aitor Erce 2014. *Bank Crises and Sovereign Defaults in Emerging Markets: Exploring the Links*. Bank of Spain Documentos de Tabajo No. 1414

Bernanke, Ben S 1983. Nonmonetary Effects of the Financial Crisis in Propagation of the Great Depression. *American Economic Review* 73, 3, 257-76

Bordo, Michael 2006. Sudden Stops, Financial Crises, and Original Sin in Emerging Countries: Déjà Vu?" NBER Working Paper No. 12393

Calvo, Guillermo 2012. Financial crises and liquidity shocks a bank-run perspective. *European Economic Review* 56, 3, 317-326.

Brana, Sophie & Delphine Lahet (2010). Determinants of Capital Flows into Asia: The Relevance of Contagion Effects as Push Factors. Emerging Markets Review 11, 3, 273-84

Broner, Fernando A., R. Gaston Gelos, and Carmen M. Reinhart 2006. When in peril, retrench: Testing the portfolio channel of contagion. *Journal of International Economics* 69, 1, 203-230.

Broner, Fernando A, Tatiana Didier, Aitor Erce and Sergio L Schmukler 2013. Gross capital flows: Dynamics and crises. *Journal of Monetary Economics* 60, 1, 113-133.

Caballero, R. J & Krishnamurthy, A. 2001. International and Domestic Collateral Constraints in a Model of Emerging Market Crises. *Journal of Monetary Economics*, 48(3), 513-48.

Caballero, Julián A 2014. Do Surges in International Capital Inflows Influence the Likelihood of Banking Crises? *Economic Journal* 126, 591, 281-316.

Calvo, Guillermo A 1998. Capital Flows and Capital-Market Crises: The simple economics of Sudden Stops. *Journal of Applied Economics* 1, 1, 35-54

Calvo, Guillermo A., and Carmen M. Reinhart 1999. When capital inflows come to a sudden stop: consequences and policy options. Working Paper, University of Maryland, College Park

Calvo, G. A, Izquierdo, A., and Talvi, E. 2003. Sudden stops, the real exchange rate, and fiscal sustainability: Argentina's lessons. NBER Working Paper No. 9828, Cambridge, MA.

Cavallo, Eduardo A., and Jeffrey A. Frankel 2008. Does openness to trade make countries more vulnerable to sudden stops, or less? Using gravity to establish causality. *Journal of International Money and Finance* 27, 8, 1430-1452.

Chinn, M. and Ito, H. 2006. What matters for financial development? Capital controls, institutions, and interactions, *Journal of Development Economics*, 61, 1, 163-192.

Chuhan, Punam, Stijn Claessens, and Nlandu Mamingi 1998. Equity and Bond Flows to Latin America and Asia: The Role of Global and Country Factors. *Journal of Development Economics* 55, 2, 439-463.

Claessens, Stijn, M. Ayhan Kose, and Marco E. Terrones 2010. Recessions and Financial Disruptions in Emerging Markets: A Bird's Eye View. *Central Bank of Chile Working Paper* 585.

Calvo, Guillermo A, Leonardo Leiderman and Carmen M Reinhart 1996. Inflows of Capital to Developing Countries in the 1990s. *Journal of Economic Perspectives* 10, 2, 123-39

Calvo, Guillermo, Leonardo Leiderman, and Carmen Reinhart 1993. Capital Inflows and the Real Exchange Rate Appreciation in Latin America: The Role of External Factors. *IMF Staff Papers* 40, 1, 108-51

Chang, Roberto, and Andres Velasco 2000. Liquidity Crises in Emerging Markets: Theory and Policy. *NBER Macroeconomics Annual 1999, Volume 14*. 11-78.

Chang, Roberto, and Andres Velasco 2001. A model of financial crises in emerging markets. *Quarterly Journal of Economics* 116, 2, 489-517.

Committee on International Economic Policy and Reform 2012. *Banks and Cross-Border Capital Flows: Policy Challenges and Regulatory Responses*. By Markus Brunnermeier, José De Gregorio, Barry Eichengreen, Mohamed El-Erian, Arminio Fraga, Takatoshi Ito, Philip R. Lane, Jean Pisani-Ferry, Eswar Prasad, Raghuram Rajan, Maria Ramos, Hélène Rey, Dani Rodrik, Kenneth Rogoff, Hyun Song Shin, Andrés Velasco & Beatrice Weder. Brookings Institution: Washington, DC

Cowan, K., J. De Gregorio, A. Micco, and C. Neilson, 2008. Financial Diversification, Sudden Stops, and Sudden Starts. In *Current Account and External Finance,* eds. K. Cowan, S. Edwards, R. Valdés, and N. Loayza, 159-194. Central Bank of Chile

Demirgüç-Kunt, A and Enrica Detragiache 1998. The Determinants of Banking Crises in Developed and Developing Countries. *IMF Staff Papers* 45, 1, 81-109

Edwards, Sebastian 2004. Financial Openness, Sudden Stops, and Current-Account Reversals. *American Economic Review* 94, 2, 59-64

Edwards, Sebastian 2007: Capital Controls, Sudden Stops, and Current Account Reversals. In S. Edwards (ed.), *Capital Controls and Capital Flows in Emerging Economies: Policies, Practices and Consequences*. University of Chicago Press,bron 73-120

Eichengreen, Barry, Andrew Rose, and Charles Wyplosz 1996. Contagious Currency Crises. NBER Working Paper No. 5681

Eichengreen, Barry and Andrew Rose 1998. Staying Afloat When the Wind Shifts: External Factors and Emerging-Market Banking Crises, NBER Working Paper 6370

Eichengreen, B. and Bordo, M. 2002. Crises Now and Then: What Lessons from the Last era of Financial Globalisation? NBER Working Paper 8716.

Faucette, J., A. Rothenberg, and F. Warnock 2005. Outflows-Induced Sudden Stops, *Journal of Policy Reform* 8, 119-29

Finlay, Keith, and Leandro M. Magnusson 2009. Implementing Weak-instrument Robust Tests for a General Class of Instrumental-variables Models. *Stata Journal* 9, 3, 398-421.

Forbes, Kristin J., and Francis E. Warnock 2012. Capital flow waves: Surges, stops, flight, and retrenchment. *Journal of International Economics* 88, 2, 235-251

Frankel, Jeffrey A. and Andrew K. Rose 1996. Currency crashes in emerging markets: An empirical treatment. *Journal of International Economics* 41, 3-4,351-66

Glick, Reuven and Michael M Hutchison 2001. Banking and Currency Crises: How Common Are Twins? In Financial Crises in Emerging Markets (eds. Reuven Glick, Ramon Moreno, Mark M. Spiegel). Cambridge: Cambridge University Press, 35-69

Goldstein, Itay. 2005. Strategic Complementarities and the Twin Crises. *Economic Journal* 115, 368-90

Greene, William H. 2002. *Econometric Analysis*. New Jersey: Prentice-Hall.

Guggenberger, Patrik 2012. On The Asymptotic Size Distortion of Tests When Instruments Locally Violate the Exogeneity Assumption. *Econometric Theory* 28, 2, 387-421.

Hahm, Joon-ho, Hyun Song Shin, and Kwanho Shin. Non-core Liabilities and Financial Vulnerability. *Journal of Money, Credit and Banking* 45, 1, 3-36

Hutchison, Michael M and Ilan Noy 2006. Sudden Stops and the Mexican Wave: Currency Crises, Capital Flow Reversals and Output Loss in Emerging Markets. *Journal of Development Economics* 79, 1, 225-48

Iyer, Lakshmi 2010. Direct versus indirect colonial rule in India: Long-term consequences. *Review of Economics and Statistics* 92, 4, 693-713.

Janus, T. and D. Riera-Crichton 2013, International gross capital flows: New Uses of Balance of Payments Data and Application to Financial Crises. *Journal of Policy Modeling* 35, 1, 16-28

Janus, T. and D. Riera-Crichton 2015. The Output Effect of Gross Foreign Investment Reversals *Oxford Economic Papers* 67, 2, 356-79.

Joyce, J. 2011. Financial Globalization and Banking Crises in Emerging Markets. Open Economies Review 22, 5, 875–95.

Kaminsky, Graciela, and Carmen Reinhart 1999. The Twin Crises: The Causes of Banking and Balance-of-Payments Problems. *American Economic Review* 89, 473–500

Kaufmann, Daniel and Aart Kraay 2002. Growth without Governance. Economia 3, 1, 169-229

Kiyotaki, Nobuhiro, and John Moore, 1997. Credit Cycles. *Journal of Political Economy*, 105, 2, 211-248.

Laeven, Luc and Fabian Valencia 2010, Resolution of Banking Crises: The Good, the Bad, and the Ugly, IMF working paper 10/146.

Lane, Philip R. and Gian Maria Milesi-Ferretti 2007. The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970–2004. *Journal of International Economics* 73, 2, 223-250.

Lim, Jamus, Sanket Mohapatra, and Marc Stocker 2014. Tinker, Taper, QE, Bye? The Effect of Quantitative Easing on Financial Flows to Developing Countries. World Bank Policy Research Paper 6820

Milesi-Ferretti, Gian Maria, and Assaf Razin 2000. Current account reversals and currency crises: empirical regularities. *Currency crises*. University of Chicago Press, 285-323.

Miller, Victoria 1996. Speculative Currency Attacks with Endogenously Induced Commercial Bank Crises. *Journal of International Money and Finance*, 15, June, 385-403

Mishkin, Frederic S. 1996. Understanding Financial Crises: A Developing Country Perspective. In Michael Bruno and Boris Pleskovic, eds., Annual World Bank conference on development Economics. Washington DC: World Bank, 29–62

Nakata, Takeshi. Interdependent Bank Runs under a Collapsing Fixed Exchange Rate Regime. *Journal of the Japanese and International Economies* 24, 4, 603-23

Nichols, Austin 2011. Causal inference for binary regression with observational data CHI11 Stata Conference 6, Stata Users Group

De Paoli, Bianca, Glenn Hoggarth, and Victoria Saporta 2009. Output Costs of Sovereign Crises: Some Empirical Estimates. Bank of England Working Paper No. 362

Prasad, Eswar S, Kenneth Rogoff, Shang-Jin Wei and M Ayhan Kose 2003. Effects of Financial Globalization on Developing Countries: Some Empirical Evidence. IMF Occasional Paper 220

Reinhart, Carmen M and Kenneth S Rogoff 2008. Banking Crisis: an Equal Opportunity Menace. Working Paper, Harvard University

Reinhart, Carmen M and Kenneth S Rogoff 2011. From Financial Crash to Debt Crisis. *American Economic Review* 101, 5, 1676-1706

Reinhart, Carmen M., and Kenneth S. Rogoff 2014. This time is different: A Panoramic View of Eight Centuries of Financial Crises. *Annals of Economics and Finance* 15, 2, 1065-1188.

Riquelme, Andrés, Daniel Berkowitz, and Mehmet Caner 2013. Valid tests when instrumental variables do not perfectly satisfy the exclusion restriction. *Stata Journal* 13, 528-546.

Rossi, Marco 1999. Financial Fragility and Economic Performance in Developing Countries. IMF Working Paper No. 99/66

Rothenberg, A., and Warnock, F. 2011 Sudden flight and true sudden stops. *Review of International Economics* 19, 3, 509-24

Sachs, Jeffrey, Aarón Tornell and Andrés Velasco 1996. The Mexican Peso Crisis: Sudden Death or Death Foretold? *Journal of International Economics* 41, 3-4, 265-83

Stock, James H. and Motohiro Yogo 2005. Testing for Weak Instruments in Linear IV Regression, in (eds. D. W. K. Andrews and J. H. Stock) *Identification and inference for econometric models: Essays in honor of Thomas Rothenberg*. Cambridge: Cambridge University Press.

Stoker, James 1994. Intermediation and the Business Cycle under a Specie Standard: The Role of the Gold Standard in English Financial Crises, 1790–1850. Mimeo, University of Chicago

World Bank 2015. Global Financial Development Report 2015/16: Long-term Finance. World Bank, Washington, DC.

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 Output Growth: the yearly percentage change of real $US GDP (Y) for each country, Ln(Y(t))-lnY(t-1)). The main source is the IMF's International Financial Statistics (IFS) dataset,

where we use the deflator provided by the IMF to deflate the nominal domestic currency GDP for each country. We, then, transform this value into US$ using the nominal exchange rate provided in IFS. Other sources for real GDP are OECD Source, Economic Intelligence Unit (EIU), DataStream (DS) and CEIC.

Gross Flows

- **Total Gross Capital 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.
- **Private Outflows from Liabilities (GIR):** Defined as the absolute value of all decreases in foreign liabilities from private domestic residents in the BoPS financial and capital accounts.
- **Private Inflows from Liabilities:** Defined as the absolute value of all increases in foreign liabilities from private domestic residents in the BoPS financial and capital accounts.
- **Private Outflows from Assets:** Defined as the absolute value of all increases in foreign assets from private domestic residents in the BoPS financial and capital accounts.
- **Private Inflows from Assets:** Defined as the absolute value of all decreases in foreign assets from private domestic residents in the BoPS financial and capital accounts.

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

Domestic Credit: The 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), scaled by nominal GDP in US$. The main source is IFS, but we also use data from EIU, DS and CEIC.

Stock of Reserves: The total stock of international reserves minus gold, scaled by nominal GDP in US$. 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 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.

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); ei: Exchange rates of currency i against the US dollar (US dollars per currency i in index form); wi: Weights attached to the country/ currency i in the index; P: Consumer Price Index (CPI) of Subject country and Pi 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.

US Federal Funds Rate: From Global Financial Data

Institutional Quality: The weighted average of the indexes for Corruption, Bureaucracy Quality, Law and Order and Investment Profile from the International Country Risk Group.

De-Jure Capital Account Openness: From Chinn and Ito (2006).

External Debt/GDP: From Lane and Milesi-Ferretti (2007)

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Outflows from Liabilities (GIR)	1202	0.02	0.05	0	0.7
Inflows from Assets	1202	0.02	0.05	0	0.76
Outflows from Assets	1202	0.09	0.18	0	1.85
Inflows from Liabilities	1202	0.11	0.18	0	2.08
Current Account Balance*	1217	-0.01	0.06	-0.27	0.27
Change in Domestic Credit*	1233	0.08	0.28	-1.99	3.29
Trade Openness	1262	0.29	0.24	0	1.83
Real Output Growth	1196	0	0.05	-0.45	0.09
Stock of International Reserves*	1270	0.4	0.51	0	4.44
Change in Reserves*	1217	-0.01	0.03	-0.34	0.08
Inflation	1189	0.15	0.94	-0.1	20.76
Real Effective Exchange Rate	1258	103.31	17.73	51.58	199.17
Institutional Quality	1049	4.95	1.16	1.41	7
De-jure Capital Openness	1265	0.66	0.33	0	1
External Debt*	1251	0.74	0.78	0.05	7.87
Fed. Funds Rate	1273	5.01	4.16	0.05	22
Currency Crisis Incidence	1273	0.15	0.36	0	1
Banking Crisis Incidence	1025	0.11	0.31	0	1
R&R Banking Crisis Incidence	1012	0.18	0.39	0	1
R&R Currency Crisis Incidence	1011	0.15	0.35	0	1
Currency Crisis Onset	1085	0.13	0.34	0	1
Banking Crisis Onset	955	0.05	0.21	0	1
R&R Banking Crisis Onset	882	0.06	0.25	0	1
R&R Currency Crisis Onset	948	0.09	0.29	0	1
Sudden Stop 1 Incidence	1273	0.05	0.22	0	1
Sudden Stop 2 Incidence	1273	0.1	0.3	0	1
Sudden Stop 1 Onset	1214	0.03	0.17	0	1
Sudden Stop 2 Onset	1161	0.06	0.23	0	1

* Variables are deflated by nominal GDP. Sudden Stop 1 is a dummy for sudden stops defined as a currency crisis plus a rise in the current account-to-GDP ratio of more than twice the country-specific standard deviation of that ratio. Sudden Stop 2 is a dummy for sudden stops defined as a currency crisis plus an increase of three percentage points or more in the current account-to-GDP ratio. A currency crisis is a drop of two standard deviations or more in exchange market pressure (Eichengreen et al. 1996), formulated as follows for country i and period t: $EMP_{it} = \frac{\%\Delta R_{it}}{\sigma^2_{i\%\Delta R}} + \frac{\%\Delta E_{it}}{\sigma^2_{i\%\Delta E}}$; where $\%\Delta R_{it}$ is the percent change in official reserves from last period, $\%\Delta E_{it}$ the percent change in the real exchange rate, and $\sigma^2_{i\%\Delta R}$ and $\sigma^2_{i\%\Delta E}$ are the respective country-specific variances of the percent change over the sample years.

Table 2: Sample Countries

All Countries (68)

Algeria	France	Latvia	Singapore
Argentina	Georgia	Lithuania	Slovak Rep.
Australia	Germany	Malaysia	Slovenia
Austria	Greece	Mexico	South Africa
Bolivia	Guatemala	Morocco	Spain
Brazil	Honduras	Netherlands	Sri Lanka
Bulgaria	Hungary	New Zealand	Sweden
Canada	Iceland	Nicaragua	Switzerland
Chile	India	Norway	Thailand
China	Indonesia	Panama	Tunisia
Colombia	Ireland	Paraguay	Turkey
Costa Rica	Israel	Peru	Ukraine
Croatia	Italy	Philippines	United Kingdom
Denmark	Japan	Poland	United States
Dominican Rep.	Kenya	Portugal	Uruguay
Egypt	South Korea	Romania	Venezuela
Finland	Kyrgyz Rep.	Russia	Zambia

Table 3: Transition Probability Matrices for the Crisis Dummies

	Banking Crises			Currency Crises		
	0	1	Total	0	1	Total
0	2,236	87	2,323	1,418	247	1,665
	96.25%	3.75%	100%	85.17%	14.83%	100%
1	68	144	212	253	114	367
	32.08%	67.92%	100%	68.94%	31.06%	100%
Total	2,304	231	2,535	1,671	361	2,032
	90.89%	9.11%	100%	82.23%	17.77%	100%
	Sudden Stop 1			**Sudden Stop 2**		
	0	1	Total	0	1	Total
0	1,120	37	1,157	1,045	57	1,102
	96.8%	3.2%	100%	94.83%	5.17%	100%
1	32	27	59	52	62	114
	54.24%	45.76%	100%	45.61%	54.39%	100%
Total	1,152	64	1,216	1,097	119	1,216
	94.74%	5.26%	100%	90.21%	9.79%	100%
	R&R Currency Crises			**R&R Banking Crises**		
	0	1	Total	0	1	Total
0	1,932	113	2,045	1,671	227	1,898
	94.47%	5.53%	100%	88.04%	11.96%	100%
1	98	275	373	230	287	517
	26.27%	73.73%	100%	44.49%	55.51%	100%
Total	2,030	388	2,418	1,901	514	2,415
	83.95%	16.05%	100%	78.72%	21.28%	100%

The first row shows the frequency and the second the transition probability. R&R refers to data taken from Reinhart and Rogoff (2011).

Table 4: OLS Estimates for Banking and External Crises

FULL SAMPLE

Dependent Variable	**CC**	**ST1**	**ST2**	**R&R CC**
Banking Crisis (t)	0.21	0.16	0.12	0.03
	[0.058]***	[0.042]***	[0.045]***	[0.030]
Current Account (t-1)	0.04	-0.35	-0.39	-0.33
	[0.357]	[0.188]*	[0.328]	[0.232]
Observations	839	922	882	938
Number of countries	49	49	49	45
Adjusted R-squared	0.133	0.123	0.0571	0.105

DEVELOPING COUNTRIES

Dependent Variable	**CC**	**ST1**	**ST2**	**R&R CC**
Banking Crisis (t)	0.28	0.25	0.20	0.10
	[0.082]***	[0.059]***	[0.069]***	[0.072]
Current Account (t-1)	-0.59	-0.37	-0.63	-0.78
	[0.394]	[0.259]	[0.459]	[0.368]**
Observations	382	431	420	568
Number of countries	16	16	16	20
Adjusted R-squared	0.175	0.0215	0.0572	0.166

OECD COUNTRIES

Dependent Variable	**CC**	**ST1**	**ST2**	**R&R CC**
Banking Crisis (t)	0.12	0.02	0.02	-0.02
	[0.073]	[0.041]	[0.059]	[0.027]
Current Account (t-1)	0.76	-0.41	-0.21	-0.02
	[0.908]	[0.337]	[0.632]	[0.251]
Observations	457	491	462	370
Number of countries	33	33	33	25
Adjusted R-squared	0.134	0.224	0.106	0.151

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include country and year fixed effects. R&R refers to data taken from Reinhart and Rogoff (2011). CC and ST refer to Currency Crisis and Sudden Stops, respectively.

Table 5: Full-sample OLS Estimates for Banking and External Crises with Controls

Dependent Variable	CC	ST1	ST2	R&R CC
Banking Crisis (t)	0.25	0.17	0.17	0.05
	[0.056]***	[0.044]***	[0.046]***	[0.038]
Current Account (t-1)	0.43	-0.15	-0.38	-0.17
	[0.371]	[0.158]	[0.213]*	[0.321]
Real Output Growth (t-1)	-0.82	-0.37	-0.76	0.72
	[0.458]*	[0.174]**	[0.345]**	[0.493]
Log REER (t-1)	0.20	0.11	0.21	0.35
	[0.130]	[0.078]	[0.091]**	[0.135]**
ΔDomestic Credit (t-1)	0.00	-0.03	0.00	0.01
	[0.048]	[0.024]	[0.024]	[0.035]
Stock of Reserves (t-1)	-0.14	-0.08	-0.03	-0.04
	[0.093]	[0.048]	[0.064]	[0.071]
Trade Openness (t-1)	-0.53	-0.14	-0.32	-0.31
	[0.321]	[0.164]	[0.325]	[0.216]
Inflation (t-1)	-0.14	-0.03	-0.09	0.38
	[0.047]***	[0.026]	[0.038]**	[0.421]
Inflation^2 (t-1)	0.01	0.00	0.00	-0.01
	[0.002]***	[0.001]	[0.002]**	[0.287]
Fed. Funds Rate (t-1)	0.01	-0.00	0.00	-0.01
	[0.012]	[0.005]	[0.003]	[0.007]*
Institutional Quality (t-1)	0.05	0.03	0.02	0.03
	[0.033]	[0.019]*	[0.029]	[0.026]
Total Gross Flows/GDP (t-1)	0.04	-0.02	0.07	0.08
	[0.087]	[0.039]	[0.074]	[0.056]
De-jure Cap. Open. (t-1)	-0.07	-0.07	-0.15	-0.13
	[0.077]	[0.057]	[0.064]**	[0.092]
External Debt/GDP (t-1)	-0.12	-0.06	-0.09	-0.04
	[0.047]**	[0.023]**	[0.038]**	[0.032]
Observations	648	696	672	726
Number of countries	45	45	45	44
Adjusted R2	0.150	0.163	0.113	0.157

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include country and year fixed effects. R&R refers to data taken from Reinhart and Rogoff (2011). CC and ST refer to Currency Crisis and Sudden Stops, respectively.

Table 6: Gross International Capital Flows and Financial Crisis Onsets

	(1)	(2)	(3)	(4)	(5)	(6)
Type of Crises	**BC**	**R&R BC**	**CC**	**R&R CC**	**ST1**	**ST2**
Outflow from Liabilities (t)	3.04	2.95	2.43	1.76	0.87	1.74
	[0.88]***	[0.97]***	[0.76]***	[0.69]**	[0.49]*	[0.57]***
Inflow from Assets (t)	-1.53	-1.67	-1.88	-1.37	-0.90	-1.50
	[0.80]*	[0.67]**	[0.69]***	[0.76]*	[0.36]**	[0.50]***
Outflow from Assets (t)	0.05	0.41	0.84	0.86	0.45	1.00
	[0.35]	[0.36]	[0.24]***	[0.39]**	[0.22]*	[0.23]***
Inflow from Liabilities (t)	-0.34	-0.60	-0.65	-0.40	-0.46	-0.56
	[0.25]	[0.28]**	[0.23]***	[0.35]	[0.19]**	[0.19]***
Real Output Growth (t-1)	-1.13	-0.22	-0.63	-0.27	-0.62	-0.86
	[0.64]*	[0.85]	[0.43]	[0.58]	[0.31]*	[0.41]**
Log REER (t-1)	0.13	0.20	0.26	0.30	0.05	0.01
	[0.22]	[0.28]	[0.13]**	[0.16]*	[0.11]	[0.15]
ΔDomestic Credit (t-1)	0.06	0.08	0.04	0.02	0.06	0.09
	[0.05]	[0.06]	[0.05]	[0.04]	[0.03]	[0.05]*
Reserves (t-1)	-0.11	-0.17	-0.17	-0.16	-0.16	-0.15
	[0.13]	[0.15]	[0.07]**	[0.08]*	[0.07]**	[0.08]*
Trade Openness (t-1)	0.10	0.87	-0.40	-0.33	0.06	-0.02
	[0.64]	[0.51]*	[0.39]	[0.32]	[0.23]	[0.49]
Inflation (t-1)	-0.04	-0.13	-0.12	0.32	-0.07	-0.11
	[0.08]	[0.07]*	[0.04]***	[0.06]***	[0.03]***	[0.04]***
$Inflation^2$ (t-1)	0.00	0.01	0.01	-0.01	0.00	0.00
	[0.00]	[0.00]***	[0.00]***	[0.00]***	[0.00]**	[0.00]***
Fed. Funds Rate (t-1)	-0.02	0.01	-0.00	0.00	-0.01	-0.01
	[0.01]**	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Institutional Quality (t-1)	0.01	0.02	0.04	0.04	0.05	0.03
	[0.05]	[0.05]	[0.03]	[0.03]	[0.02]***	[0.03]
De-jure Cap Open (t-1)	-0.14	-0.01	-0.17	-0.13	-0.17	-0.22
	[0.09]	[0.15]	[0.07]**	[0.10]	[0.07]**	[0.07]***
External Debt/GDP (t-1)	0.12	0.21	-0.14	-0.08	-0.04	-0.08
	[0.10]	[0.08]***	[0.07]**	[0.03]**	[0.04]	[0.05]
P-values						
Outflow L= -Inflow A	0.00	0.01	0.29	0.44	0.89	0.30
Outflow L= Outflow A	0.00	0.01	0.03	0.14	0.31	0.16
Outflow L= -Inflow L	0.00	0.01	0.01	0.02	0.34	0.04
Constant	Y	Y	Y	Y	Y	Y
Year Effects	Y	Y	Y	Y	Y	Y
Observations	717	752	879	751	879	879
Countries	45	44	54	44	54	54
Adjusted R2	0.297	0.236	0.151	0.206	0.114	0.116

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include country and year fixed effects. R&R refers to data taken from Reinhart and Rogoff (2011). BC, CC, and ST refer to Banking Crises, Currency Crisis and Sudden Stops, respectively.

Table 7: One-year-lagged Gross International Capital Flows and Financial Crisis Onsets

	(1)	(2)	(3)	(4)	(5)	(6)
Type of Crises	**BC**	**R&R BC**	**CC**	**R&R CC**	**ST1**	**ST2**
Outflow from Liabilities (t-1)	2.00	1.84	0.98	0.64	-0.20	0.41
	[0.84]**	[1.04]*	[0.56]*	[0.43]	[0.40]	[0.63]
Inflow from Assets (t-1)	-0.70	-0.50	-0.76	-0.33	0.14	-0.44
	[0.68]	[0.80]	[0.48]	[0.40]	[0.33]	[0.55]
Outflow from Assets (t-1)	0.41	0.24	0.15	0.09	-0.22	0.34
	[0.48]	[0.47]	[0.34]	[0.40]	[0.23]	[0.31]
Inflow from Liabilities (t-1)	-0.57	-0.12	-0.08	-0.16	-0.02	-0.07
	[0.29]*	[0.40]	[0.25]	[0.37]	[0.18]	[0.28]
Real Output Growth (t-1)	-0.97	-0.28	-0.75	-0.40	-0.77	-1.15
	[0.72]	[0.84]	[0.43]*	[0.59]	[0.29]***	[0.41]***
Log REER (t-1)	0.21	0.22	0.30	0.36	0.06	0.05
	[0.23]	[0.29]	[0.14]**	[0.16]**	[0.11]	[0.15]
ΔDomestic Credit (t-1)	0.05	0.08	0.02	0.02	0.04	0.08
	[0.04]	[0.06]	[0.05]	[0.04]	[0.03]	[0.05]
Reserves (t-1)	-0.02	-0.14	-0.16	-0.17	-0.16	-0.15
	[0.12]	[0.15]	[0.07]**	[0.08]**	[0.06]**	[0.08]*
Trade Openness (t-1)	0.07	0.81	-0.48	-0.27	0.03	-0.01
	[0.65]	[0.50]	[0.39]	[0.29]	[0.24]	[0.49]
Inflation (t-1)	-0.06	-0.15	-0.13	0.31	-0.08	-0.13
	[0.09]	[0.08]*	[0.04]***	[0.06]***	[0.02]***	[0.04]***
Inflation^2 (t-1)	0.00	0.01	0.01	-0.01	0.00	0.01
	[0.00]	[0.00]***	[0.00]***	[0.00]***	[0.00]***	[0.00]***
Fed. Funds Rate (t-1)	-0.02	0.02	-0.00	0.00	-0.01	-0.01
	[0.01]*	[0.01]	[0.01]	[0.01]	[0.01]	[0.01]
Institutional Quality (t-1)	0.03	0.04	0.05	0.04	0.05	0.03
	[0.05]	[0.06]	[0.03]	[0.03]	[0.02]***	[0.03]
De-jure Cap. Open. (t-1)	-0.14	-0.03	-0.18	-0.14	-0.17	-0.23
	[0.10]	[0.15]	[0.08]**	[0.10]	[0.07]**	[0.08]***
External Debt/GDP (t-1)	0.25	0.25	-0.09	-0.02	0.00	-0.04
	[0.09]***	[0.10]**	[0.05]*	[0.03]	[0.02]	[0.03]
P-Value						
Outflow L= -Inflow A	0.00	0.00	0.30	0.10	0.72	0.91
Outflow L= Outflow A	0.08	0.17	0.14	0.40	0.95	0.90
Outflow L= -Inflow L	0.10	0.14	0.10	0.45	0.55	0.55
Constant	Y	Y	Y	Y	Y	Y
Year Effects	Y	Y	Y	Y	Y	Y
Observations	716	751	878	750	878	878
Countries	45	44	54	44	54	54
Adjusted R2	0.257	0.219	0.119	0.185	0.0988	0.0795

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include country and year fixed effects. R&R refers to data taken from Reinhart and Rogoff (2011). BC, CC, and ST refer to Banking Crises, Currency Crisis and Sudden Stops, respectively.

Table 8: IV Estimates for Banking and External Crises

FULL SAMPLE	**CC**	**ST1**	**ST2**	**R&R CC**	**CC**	**ST1**	**ST2**	**R&R CC**
Banking Crisis (t)	0.47	0.04	0.10	0.26	0.35	0.04	0.05	0.17
	[0.123]***	[0.036]	[0.054]*	[0.132]**	[0.154]**	[0.049]	[0.085]	[0.125]
Current Account (t-1)	-0.05	-0.51	-0.61	-0.15	-0.01	-0.41	-0.56	-0.27
	[0.337]	[0.192]***	[0.281]**	[0.325]	[0.319]	[0.175]**	[0.282]**	[0.304]
Observations	841	926	885	935	841	926	885	938
Number of countries	50	50	50	46	50	50	50	46
Underidentification test,	18.83	23.65	20.93	24.17	22.92	29.28	25.05	30.90
Chi-sq P-val	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000
Weak identification test:	46.10	16.02	43.52	14.64	37.30	13.56	35.12	12.31
DEVELOPING COUNTRIES	**CC**	**ST1**	**ST2**	**R&R CC**	**CC**	**ST1**	**ST2**	**R&R CC**
Banking Crisis (t)	0.55	0.24	0.29	0.35	0.50	0.30	0.28	0.39
	[0.227]**	[0.113]**	[0.160]*	[0.157]**	[0.215]**	[0.115]***	[0.163]*	[0.220]*
Current Account (t-1)	-0.45	-0.41	-0.57	-1.06	-0.48	-0.34	-0.59	-1.16
	[0.345]	[0.247]*	[0.351]	[0.454]**	[0.364]	[0.229]	[0.382]	[0.563]**
Observations	456	490	462	365	456	490	462	368
Number of countries	33	33	33	25	33	33	33	25
Underidentification test:	12.58	15.55	13.21	21.60	15.92	18.29	15.46	11.60
Chi-sq P-val	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.001
Weak identification test:	22.01	28.61	23.66	30.91	25.46	30.80	26.56	14.87
OECD COUNTRIES	**CC**	**ST1**	**ST2**	**R&R CC**	**CC**	**ST1**	**ST2**	**R&R CC**
Banking Crisis (t)	0.51	-0.01	0.05	0.32	0.45	-0.22	-0.10	0.33
	[0.162]***	[0.026]	[0.046]	[0.168]*	[0.475]	[0.179]	[0.190]	[0.323]
Current Account (t-1)	0.61	-0.50	-0.57	0.68	0.61	-0.62	-0.58	0.51
	[0.699]	[0.270]*	[0.491]	[0.515]	[0.682]	[0.352]*	[0.414]	[0.609]
Observations	385	436	423	570	385	436	423	570
Number of countries	17	17	17	21	17	17	17	21
Underidentification test:	12.75	17.12	13.04	17.45	8.676	10.34	9.194	13.42
Chi-sq P-val	0.00	0.00	0.00	0.00	0.003	0.001	0.002	0.000
Weak identification test:	52.19	16.34	45.38	12.92	7.869	4.292	8.868	4.918
Year effects	N	N	N	N	Y	Y	Y	Y
Maximal IV Size	10%	15%	20%	25%				
Stock-Yogo weak ID test cr.val	16.38	8.96	6.66	5.53				

Table 8 (cont.): IV Estimates for Banking and External Crises

First Stage LSDV	Full Sample BC	Developing BC	OECD BC	Full Sample R&R BC	Developing R&R BC	OECD R&R BC
WITHOUT YEAR EFFECTS						
GIR (t)	1.9986	5.7259	1.4399	1.7413	4.9966	1.3471
	[0.619]***	[0.881]***	[0.408]***	[0.554]***	[1.470]***	[0.431]***
Observations	971	516	455	994	416	578
Number of countries	50	33	17	46	25	21
Adjusted R-squared	0.162	0.227	0.258	0.0891	0.135	0.103
WITH YEAR EFFECTS						
GIR (t)	1.7535	5.5775	0.4709	1.5621	3.8205	0.6642
	[0.596]***	[0.733]***	[0.326]	[0.551]***	[1.414]**	[0.371]*
Observations	971	516	455	994	416	578
Number of countries	50	33	17	46	25	21
Adjusted R-squared	0.205	0.292	0.448	0.127	0.206	0.211

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include country fixed effects. R&R refers to data taken from Reinhart and Rogoff (2011). BC, CC, and ST refer to Banking Crises, Currency Crisis and Sudden Stops, respectively. Underidentification test: Kleibergen-Paap rk LM statistic. Weak Identification test: Kleibergen-Paap rk Wald F statistic.

Table 9: IV Estimates for Banking and External Crises with Control Variables

FULL SAMPLE	**CC**	**ST1**	**ST2**	**R&R CC**
Banking Crisis	0.50	0.17	0.12	0.12
	[0.255]*	[0.075]**	[0.116]	[0.217]
Observations	642	690	667	717
Number of countries	45	45	45	44
Underidentification test	16.69	22.72	16.80	25.24
Chi-sq P-val	0.00	0.00	0.00	0.00
Weak identification test	18.34	19.20	19.56	14
DEVELOPING COUNTRIES	**CC**	**ST1**	**ST2**	**R&R CC**
Banking Crisis	0.61	0.40	0.36	0.20
	[0.250]**	[0.148]***	[0.216]*	[0.280]
Observations	368	388	368	320
Number of countries	29	29	29	24
Underidentification test	14.18	16.93	12.36	12.17
Chi-sq P-val	0.00	0.00	0.00	0.00
Weak identification test	21.33	23.46	19.13	11.94
OECD COUNTRIES	**CC**	**ST1**	**ST2**	**R&R CC**
Banking Crisis	0.52	-0.20	0.16	0.75
	[0.734]	[0.223]	[0.157]	[1.238]
Observations	274	302	299	397
Number of countries	16	16	16	20
Underidentification test	4.389	4.912	4.293	1.214
Chi-sq P-val	0.04	0.03	0.04	0.27
Weak identification test	4.011	4.368	4.163	1.137
Maximal IV Size	10%	15%	20%	25%
Stock-Yogo weak ID test critical values	16.38	8.96	6.66	5.53

First Stage LSDV	**Full Sample BC**	**Developing** BC	**OECD BC**	**Full Sample R&R BC**	**Developing R&R BC**	**OECD R&R BC**
GIR (t)	2.1254	4.5012	0.6466	1.7436	3.8693	0.3792
	[0.547]***	[0.693]***	[0.398]	[0.573]***	[1.035]***	[0.424]
Observations	717	409	308	752	354	398
Number of countries	45	29	16	44	24	20
Adjusted R-squared	0.292	0.326	0.561	0.233	0.278	0.383

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include country and year fixed effects. R&R refers to data taken from Reinhart and Rogoff (2011). BC, CC, and ST refer to Banking Crises, Currency Crisis and Sudden Stops, respectively. Underidentification test: Kleibergen-Paap rk LM statistic. Weak Identification test: Kleibergen-Paap rk Wald F statistic. Although we omit the estimates, the control variables are the same as in Tables 5-7.

Table 10: IV Estimates for Banking and External Crises for Different Types of GIR

FULL SAMPLE	**CC (ALL GIR)**	**CC (FDI GIR)**	**CC (PI GIR)**	**CC (OI GIR)**
Banking Crisis (t)	0.26	-0.08	-0.20	0.32
	[0.153]*	[0.557]	[0.253]	[0.174]*
Current Account (t-1)	0.05	-0.18	-0.28	0.09
	[0.311]	[0.494]	[0.375]	[0.318]
Observations	831	839	839	831
Number of countries	49	49	49	49
Underidentification test	22.82	9.251	3.817	17.83
Chi-sq P-val	0.00	0.00	0.05	0.00
Weak identification test	30.80	3.449	14.60	13.03
FULL SAMPLE	**ST1 (ALL GIR)**	**ST1 (FDI GIR)**	**ST1 (PI GIR)**	**ST1 (OI GIR)**
Banking Crisis (t)	0.08	0.09	0.02	0.09
	[0.054]	[0.127]	[0.076]	[0.058]*
Current Account (t-1)	-0.40	-0.41	-0.47	-0.39
	[0.176]**	[0.205]**	[0.192]**	[0.175]**
Observations	914	922	922	914
Number of countries	49	49	49	49
Underidentification test	30.87	11.13	5.389	24.23
Chi-sq P-val	0.00	0.00	0.02	0.00
Weak identification test	33.12	4.161	10.24	14.50
FULL SAMPLE	**ST2 (ALL GIR)**	**ST2 (FDI GIR)**	**ST2 (PI GIR)**	**ST2 (OI GIR)**
Banking Crisis (t)	0.03	0.25	0.09	0.00
	[0.082]	[0.216]	[0.178]	[0.083]
Current Account (t-1)	-0.45	-0.29	-0.41	-0.48
	[0.270]*	[0.313]	[0.300]	[0.271]*
Observations	875	882	882	875
Number of countries	875	882	882	875
Underidentification test	49	49	49	49
Chi-sq P-val	0.00	0.00	0.04	0.00
Weak identification test	25.17	9.190	4.421	20.15
Maximal IV Size	10%	15%	20%	25%
Stock-Yogo weak ID test critical values	16.38	8.96	6.66	5.53
First Stage LSDV	**BC (ALL GIR)**	**BC (FDI GIR)**	**BC (PI GIR)**	**BC (OI GIR)**
GIR (t)	2.8721	2.4793	3.3743	3.3113
	[0.688]***	[1.681]	[1.313]**	[1.017]***
Observations	959	969	969	959
Number of countries	49	49	49	49
Adjusted R-squared	0.232	0.109	0.124	0.215

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include country and year fixed effects. R&R refers to data taken from Reinhart and Rogoff (2011). BC, CC, and ST refer to Banking Crises, Currency Crisis and Sudden Stops, respectively. Underidentification test: Kleibergen-Paap rk LM statistic. Weak Identification test: Kleibergen-Paap rk Wald F statistic.

Table 11: Correlations between Changes in GIR and Changes in the Current Account Surrounding Sudden Stops

Simple Correlation	During ST ΔCU	During ST1 ΔCU	During ST2 ΔCU
ΔGIR (t-1)	0.013	0.056	0.047
ΔGIR (t)	0.041	0.071	0.083
ΔGIR (t+1)	-0.009	0.011	-0.006

Variable Stats	Obs	Mean	Std. Dev.	Min	Max
ΔCU Type 1 Reversal	170	0.086	0.077	0.005	0.543
ΔCU Type 2 Reversal	741	0.068	0.046	0.030	0.543

ΔGIR and ΔCU represent the change from the previous year in the GIR-to-GDP and current account-to-GDP ratios. ST refers to sudden stop crises.

Table 12: Estimates for GIR on Single Crises

FULL SAMPLE	**CC_NO_BC**	**ST1 NO_BC**	**ST2 NO_BC**	**BC_NO_CC**
GIR (t-1)	-0.3794	0.0297	-0.1575	1.9392
	[0.254]	[0.124]	[0.327]	[0.557]***
Current Account (t-1)	-0.2294	-0.4672	-0.4589	-0.2092
	[0.336]	[0.219]**	[0.382]	[0.298]
Year Effects	Y	Y	Y	Y
Observations	1,110	1,110	1,110	836
Number of countries	61	61	61	49
Adjusted R-squared	0.07	0.06	0.06	0.16
DEVELOPING COUNTRIES	**CC_NO_BC**	**ST1 NO_BC**	**ST2 NO_BC**	**BC_NO_CC**
GIR (t-1)	-0.3502	0.0427	-0.2202	4.3676
	[0.327]	[0.176]	[0.481]	[1.030]***
Current Account (t-1)	-0.3948	-0.4496	-0.5822	0.0445
	[0.312]	[0.257]*	[0.407]	[0.339]
Year Effects	Y	Y	Y	Y
Observations	577	577	577	456
Number of countries	41	41	41	33
Adjusted R-squared	0.08	0.05	0.07	0.15
OECD COUNTRIES	**CC_NO_BC**	**ST1 NO_BC**	**ST2 NO_BC**	**BC_NO_CC**
GIR (t-1)	-1.2014	-0.1841	-0.5328	0.6129
	[0.462]**	[0.244]	[0.357]	[0.415]
Current Account (t-1)	0.0298	-0.6380	-0.2432	-1.0081
	[0.758]	[0.511]	[0.911]	[0.366]**
Year Effects	Y	Y	Y	Y
Observations	533	533	533	380
Number of countries	20	20	20	16
Adjusted R-squared	0.103	0.0614	0.0708	0.442

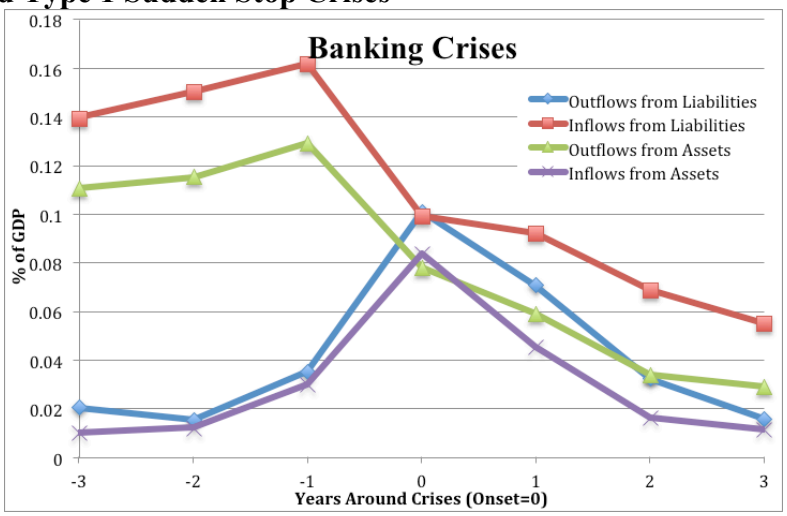
Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include country and year fixed effects. R&R refers to data taken from Reinhart and Rogoff (2011). BC, CC, and ST refer to Banking Crises, Currency Crisis and Sudden Stops, respectively. CC_NO_BC refer to currency a crisis onset without a banking crises etc.

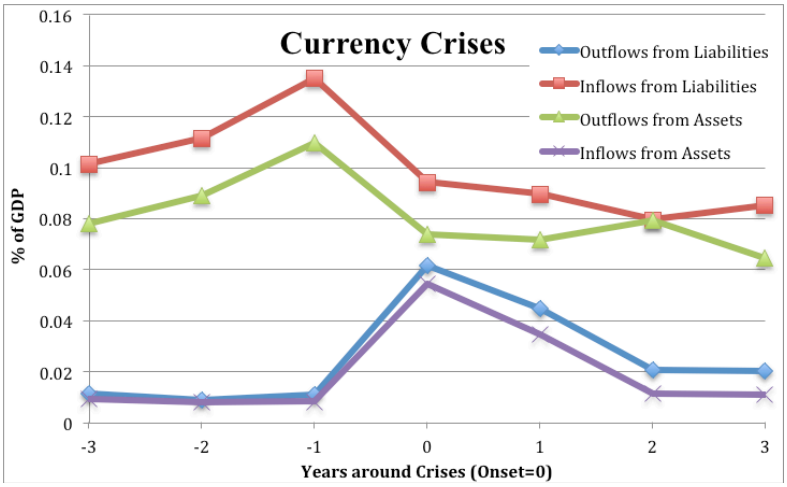
Table 13: The Effects of Instrumenting the GIR Instrument with GIR from Bank Partners

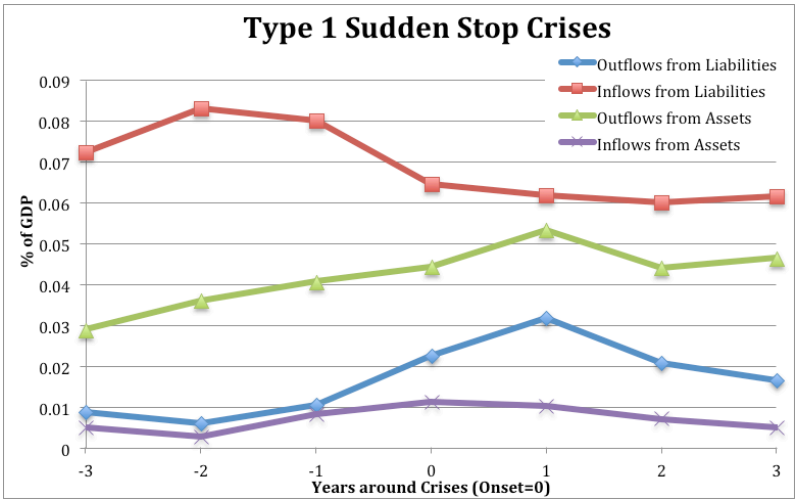
FULL SAMPLE	**BC**	**CC**	**ST1**	**ST2**	**R&R BC**	**R&R CC**
GIR (t)	5.20	3.54	1.85	2.98	6.69	0.72
	[1.81]***	[2.13]*	[1.31]	[1.71]*	[2.16]***	[1.89]
Trade Partner Growth (t)	-0.03	-4.08	-0.43	-1.51	1.05	-0.88
	[1.07]	[1.74]**	[0.70]	[1.22]	[1.61]	[1.10]
Current Account (t-1)	-0.67	-0.09	-0.34	-0.31	-1.19	-0.31
	[0.24]***	[0.35]	[0.17]**	[0.28]	[0.31]***	[0.26]
Observations	792	887	1,007	964	844	912
Number of countries	40	49	49	49	44	44
Underidentification test	5.348	6.887	6.808	6.398	6.771	5.937
Chi-sq P-val	0.021	0.009	0.009	0.011	0.009	0.015
Weak identification test	7.860	6.499	6.794	6.337	4.889	5.046
Anderson-Rubin p-value	0.00	0.042	0.069	0.05	0.02	0.687
Maximal IV Size	10%	15%	20%	25%		
Stock-Yogo weak ID test critical values	16.38	8.96	6.66	5.53		
FIRST STAGE LSDV/	**GIR**					
GIR Instrument (t)	0.3152					
	[0.118]**					
Observations	1,054					
Number of countries	49					
Adjusted R-squared	0.176					

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include country and year fixed effects. R&R refers to data taken from Reinhart and Rogoff (2011). BC, CC, and ST refer to Banking Crises, Currency Crisis and Sudden Stops, respectively. Underidentification test: Kleibergen-Paap rk LM statistic. Weak Identification test: Kleibergen-Paap rk Wald F statistic. The GIR instrument is the bilateral loan-weighted GIR from developed countries whose banks hold claims on the sample country. The Anderson-Rubin p-value is the p-value for the null hypothesis that the GIR coefficient is zero using the size-correct Anderson-Rubin test rather than the Wald test.

Figure 1: Average Private Gross Capital Flows Surrounding the Onsets of Banking Crises, Currency Crises, and Type 1 Sudden Stop Crises

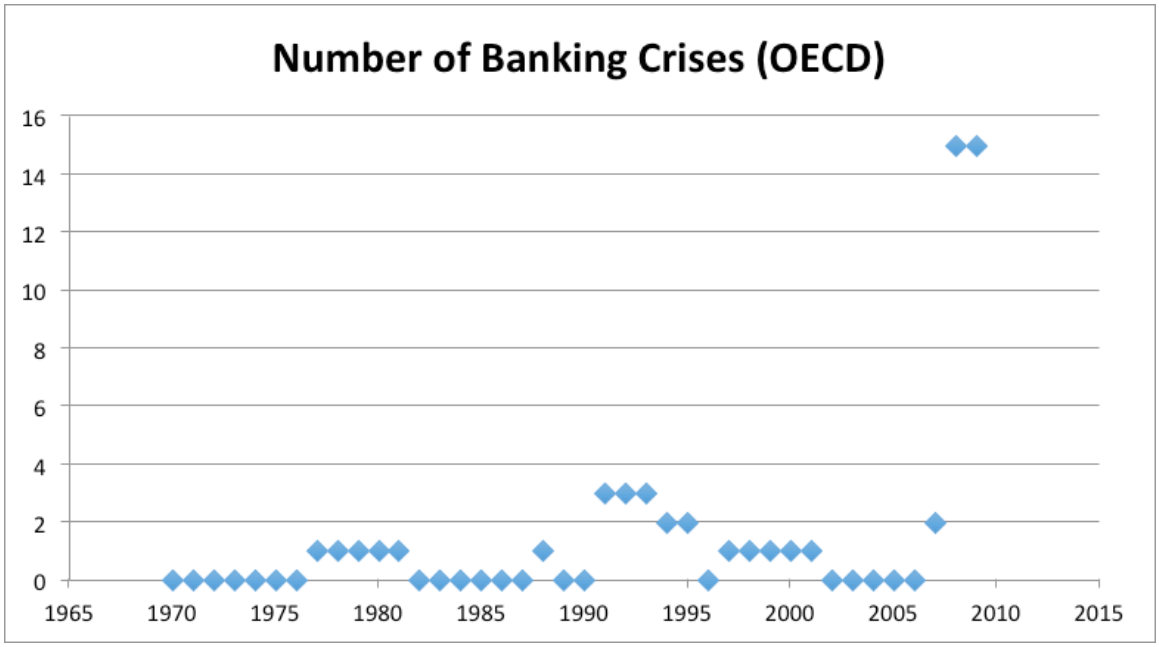


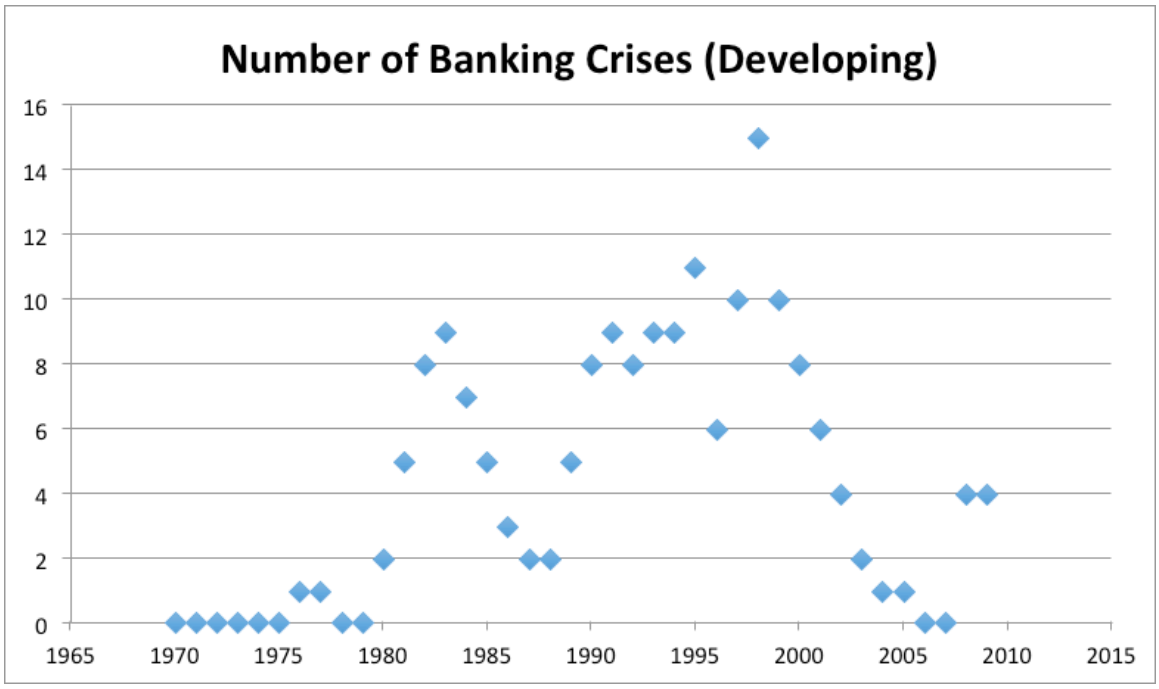




The figure depicts the average values of the private gross capital flows in equation (1) relative to GDP in the six-year windows surrounding the onsets of banking, currency, and type 1 sudden stop crises, including the outflows from negative liability changes or foreign capital repatriation (ΔL^{-}_{PRIV} or GIR); inflows from positive liability changes or foreign investment (ΔL^{+}_{PRIV}); outflows from positive asset changes or outgoing resident investment (ΔA^{+}_{PRIV}); and inflows from negative asset changes or resident capital repatriation (ΔA^{-}_{PRIV}).

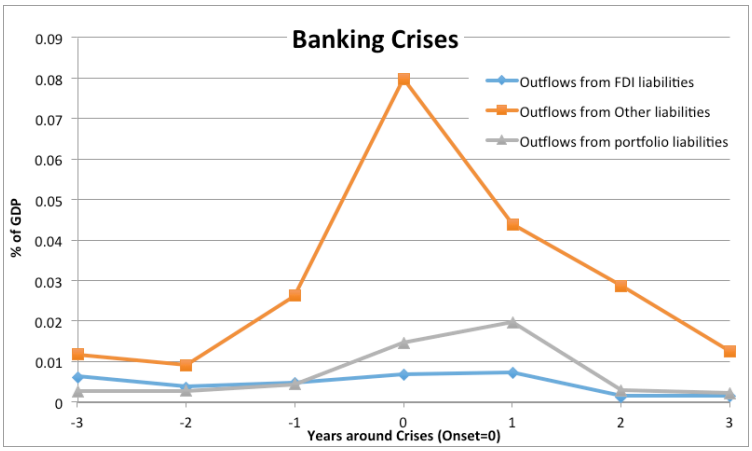
Figure 2: The Incidence of Banking Crises by Year in OECD and Developing Countries



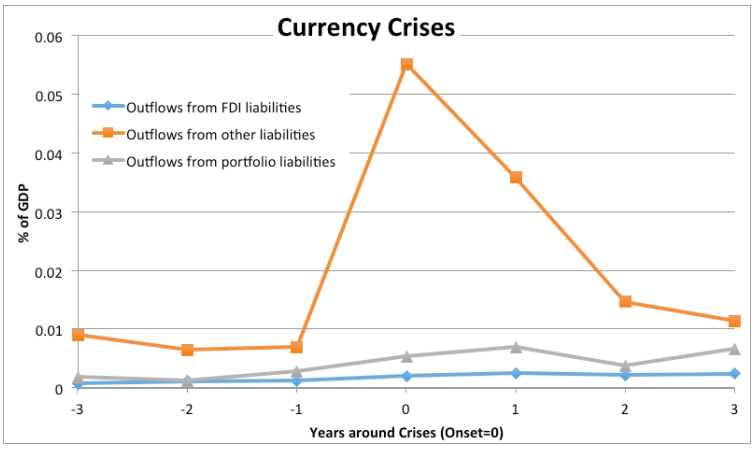


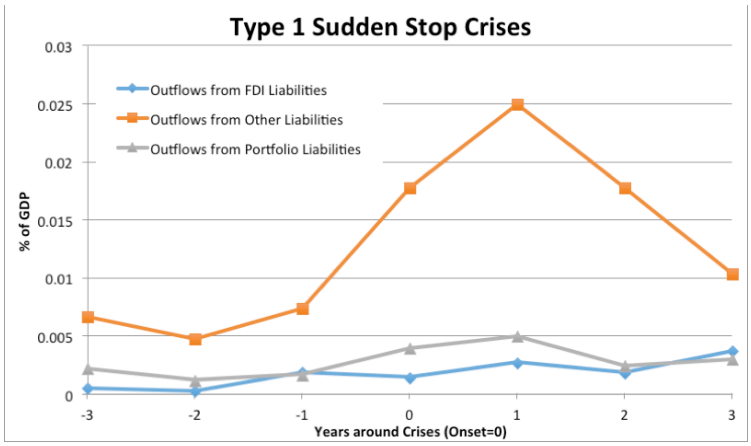
The figure shows the total number of banking crises in each year in the OECD and developing countries in the sample. The banking crisis data comes from Laeven and Valencia (2010).

Figure 3: Average Gross Foreign Investment Reversals (GIR) Surrounding the Onsets of Banking Crises, Currency Crises, and Type 1 Sudden Stop Crises, Decomposed by GIR Category



.





The figure depicts the average values of the FDI, portfolio, and other components of the private gross capital outflow from negative liability changes or foreign capital repatriation in equation (1) (ΔL^{-}_{PRIV} or GIR) in the six-year windows surrounding the onsets of banking, currency, and type 1 sudden stop crises.