External Liabilities, Domestic Institutions and Banking Crises in Developing Economies

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Abstract

We investigate the impact of foreign equity and debt on the occurrence of banking crises in 61

lower-income and middle-income economies during the 1984-2010 period. We also focus on the

effects of domestic institutions on banking crises and whether they mitigate or exacerbate the

impact of the external liabilities. We find that FDI liabilities lower the probability of a crisis, while

debt liabilities increase their incidence. However, institutions that lower financial or political risk

partially offset the impact of debt liabilities, as does government stability. A decrease in

investment risk directly reduces the incidence of banking crises.

JEL: F32, F34, G15, G21

Key words: banking crises, FDI, portfolio, debt, institutions

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1. Introduction

Banking crises, which were almost non-existent during the Bretton Woods era, became

more frequent during the subsequent period when the regulation of domestic and foreign financial

flows and institutions was eased (Bordo *et al.* 2001). International financial integration can yield

benefits for an economy that is removing barriers to foreign capital, such as access to more

sources of finance and a lower cost of capital. But capital flows can also be disruptive and

contribute to the incidence of financial crises.

Banks that rely on foreign funds are particularly susceptible to such volatility. Maturity

transformation can leave these institutions with long-term domestic assets and short-term

liabilities held by foreigners who withdraw their funds if they fear the outbreak of a crisis.

Liabilities denominated in foreign currencies add to the fragility of the domestic banks when

exchange rates are devalued. In their study of financial crises, Reinhart and Rogoff (2009: 155)

noted that "Periods of high international capital mobility have repeatedly produced international

banking crises, not only famously, as they did in the 1990s, but historically."

However, not all forms of foreign capital are likely to lead to banking and other financial

crises. Debt represents a contractual commitment on which payment is expected regardless of the

borrower's circumstances, and debt financing may in some cases be withdrawn on short notice. In

contrast, the return on equity, particularly foreign direct investment (FDI), depends on the

profitability of the partner in the host country and is less prone to sudden withdrawals. Moreover,

the host country firm may be able to draw upon the financial resources of its foreign partner in the

event of a domestic crisis, which lessens the strain on the local financial system.

Consequently, some empirical analyses of banking crises have distinguished among the

different forms of capital. These studies have shown that debt held by foreigners increases the

probability of a banking crisis, while equity, and in particular FDI, contributes to a smaller occurrence of such crises. Furceri, Guichard and Rusticelli (2012), for example, reported that large capital inflows driven by debt increase the probability of banking as well as currency and balance-of-payment crises, while inflows that are driven by FDI or portfolio equity have a negligible effect. Powell and Tavella (2015) also found that banking and portfolio debt inflows are linked to a higher probability of a bank crisis, but portfolio equity is not.

Forbes and Warnock (2012) have shown the importance of distinguishing between gross inflows and gross outflows. They point out that a change in net flows can be due to the actions of foreign or domestic investors, who respond differently to various policies and shocks. An increase in net inflows, for example, can be due to an increase in gross inflows by foreign investors or a decrease in gross outflows by domestic residents. The proper response to the net flow will depend on its source.

Similarly, changes in the stocks of assets or liabilities can affect the probability of a bank crisis. A country may have a neutral position on its external balance position, but its assets—and in particular the foreign exchange assets held by a central bank—are not necessarily available to the residents who issued foreign-currency denominated liabilities. Therefore, a number of studies have looked at the disaggregated stocks of foreign liabilities. Joyce (2011) and Hamdi and Boukef Jlassi (2014) found that the stocks of FDI liabilities were associated with fewer bank crises, while external debt led to more crises. Ahrend and Goujard (2014) confirmed that increases in debt liabilities, particularly short-term debt, increase the occurrence of systemic banking crises.

Moreover, financial flows take place within a set of institutions. These can include a legal code that specifies property rights, a judicial system for adjudicating disputes, and a government that protects civil and other liberties. Good institutions are necessary to enforce contracts and allow the payout of returns. Those who lend, for example, assume that they will be able to

maintain ownership of their investments and receive profits from them, and not suffer theft or confiscation.

Banks link borrowers and lenders, and their ability to maintain these relationships depends on the institutional environment in which they operate. Banking crises may be less likely to occur if there are good domestic institutions. Klomp (2010) reported that banking crises in emerging markets and developing countries were significantly linked to low institutional quality.

Demirgüç-Kunt and Detragiache (1998) included a measure of law enforcement in their pioneering study of the determinants of banking crises. They found that lower values on a "law and order" index were associated with the increased likelihood of a crisis. They attributed this linkage to a higher probability of fraud and/or a lesser ability to enforce prudential supervision.

Demirgüç-Kunt and Detragiache built upon these results in their 2001 study of the impact of financial liberalization on banking crises. They used several institutional variables, such as law and order and corruption, which they interacted with a financial liberalization measure in order to analyze whether the quality of institutions affects the incidence of banking crises following financial liberalization. They reported that a stronger institutional environment lowers the probability of a banking crisis following the liberalization of financial markets. They inferred from this finding that institutional development should be a part of the process of financial liberalization.

Claessens, Klingebiel and Laeven (2004) in a study of the role of institutions in resolving banking crises also investigated their impact on the likelihood of such a crisis. They reported that better quality institutions, less corruption and greater judicial efficiency all contributed to a decrease in the occurrence of banking crisis. They point to several likely channels, including the ability of a well-functioning legal system to restructure corporations in crisis, and the ability of supervisory authorities to enforce regulations and intervene in incipient crisis situations.

This paper makes two contributions to the literature on banking crises. First, we include in our analysis the gross stocks of foreign assets and liabilities rather than net flows, and distinguish among them to determine how debt and the components of equity differ in their impact on the incidence of banking crises. Second, we also examine whether domestic institutions affect the occurrence of banking crises, and either mitigate or exacerbate the impact of a country's external financial liabilities. Our paper is the first to examine the interaction of domestic institutions with external liabilities.

In our empirical analysis, we investigate the determinants of bank crises in 61 lower-income and middle-income economies over the years 1984-2010. We concentrate on these countries because, as Eichengreen and Rose (2001) pointed out in an early analysis of banking crises in these countries, "…their problems are distinctive..." Similarly, Claessens, Klingebiel and Laeven (2004) claimed that financial crises are different in emerging markets than those in industrial countries, in part because the former have weaker institutions.[1]

Our results indicate that the stocks of FDI and debt liabilities have very different impacts on bank crises. The former reduce their occurrence, while the latter increase the likelihood of such crises. Portfolio equity seems to have little or no effect. In addition, lowering overall financial or political risk partially offsets the impact of debt liabilities on the incidence of the crises. Institutions that enforce contracts directly reduce the incidence of a crisis. Other political factors, such as the stability of the government, can partially offset the impact of debt liabilities.

The next section of the paper provides a brief review of the relevant literature. Section 2 explains the methodology and data used in this study. Section 3 contains the results of the analysis. The last section offers our conclusions.

2. Data and Methodology

Our sample consists of a panel of 61 developing nations that have experienced banking crises and foreign capital volatility. We used the World Bank's income classification criteria to distinguish among the countries.[2] They include 27 upper middle-income economies, which are often called emerging market economies, and 34 lower middle-income and low-income countries, which are the developing economies in our sample. The list of countries appears in the Data Appendix in Table A1. The annual time series data covers the period from 1984-2010. This period includes several episodes of financial turbulence, including the Gulf War in 1991, the Mexican crisis in 1994, the East Asian crisis in 1997-98 and the subsequent Russian crisis, the Argentine crisis of 2000-2001 and the global financial crisis of 2008-09.

Our indicator of a banking crisis is a binary variable that takes the value of 1 when there was a crisis and zero otherwise. In the empirical analysis, therefore, we used a logit estimation. We chose a random effects specification that allows the inclusion of time-invariant determinants.[3]

A crisis takes place when $y^*_{i,t}$ is positive:

$$\text{Bk Cr}_{i,t} = \begin{cases} 1 \text{ if } y^*_{i,t} > 0 \\ 0 \text{ otherwise} \end{cases} \tag{1}$$

where $y_{i,t}$ is a linear function that is expressed as follows:

$$y^*_{i,t} = \beta \text{FAL}_{i,t} + \theta X_{i,t} + \varepsilon_{i,t} \tag{2}$$

where $\text{FAL}_{i,t}$ is a measure of foreign assets or liabilities,

$X_{i,t}$ is a vector of other explanatory variables

and $\varepsilon_{i,t} = \mu_i + \vartheta_{i,t}$ is a composite error term with μ_i country effects, and $\vartheta_{i,t}$ is the independent error term identically distributed with mean zero and variance σ^2.

The dates of the banking crises were obtained from the database of systemic banking crises of Laeven and Valencia (2013). The data on external assets and liabilities were taken from the

"External Wealth of Nations" dataset, which was constructed by Lane and Milesi-Ferretti (2007).[4] We used several components of the external balance sheet. These include a country's equity assets and its components, FDI and portfolio equity, and also debt assets, each scaled by total foreign assets (Eq Ast/Ast, FDI Ast/Ast, Prt Ast/Ast, Dbt Ast/Ast). Similarly, we obtained equity, FDI, portfolio equity and debt liabilities, which were scaled by total liabilities (Eq Lbt/Lbt, FDI Lbt/Lbt, Prt Lbt/Lbt, Dbt Lbt/Lbt).

Data on the quality of institutions were obtained from the *International Country Risk Guide* (ICRG*)* database. The ICRG ratings are based on 22 variables in three categories: economic risk (ECON), financial risk (FIN), and political risk (POL). We also use three components of the political risk rating: the country's investment riskiness profile (INVEST), governmental stability (GOV), and democratic accountability (DEM).[5]

We drew upon the existing literature for control variables. These consist of macroeconomic and financial variables. The macroeconomic variables include the annual growth rate of GDP (GDP Gr); real gross domestic product per capita (GDP PC), a measure of economic development; inflation (Inf), as measured by the percentage change in the Consumer Price Index; and trade openness (Trade), which is measured by the sum of exports plus imports scaled by Gross Domestic Product. We have an index of exchange rate regimes (Ex Rte Reg) as rated in the Reinhart-Rogoff (2004) classification scheme. Their system assigns ratings between 1 and 15, where higher values are associated with more flexible regimes.[6]

The financial variables include the ratio of bank credit to the private sector scaled by GDP (DC/GDP), a widely-used indicator of the development of the financial sector; the real interest rate (Real Int Rate), as measured by the lending interest rate minus the rate of inflation; and the ratio of broad money to the foreign exchange reserves of the central bank (M2/Res), which the IMF (2000) interprets as a "measure of the potential impact of a loss of confidence in the domestic currency."

We also have a measure of capital account openness (Cap Open), the *de jure* index of capital controls introduced by Chinn and Ito (2006). This index is based on data reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)* regarding the existence of multiple exchange rates, restrictions on current and capital account transactions, and requirements of export proceeds. Chinn and Ito calculated the first principal component of the data reported for each country to construct an index where higher values denote fewer regulations and more financial openness.[7]

In order to deal with the possibility of reverse causality, all the explanatory variables of the model are lagged one year. Duttagupta and Cashin (2011) studied the dynamics of bank crises, and found that they follow periods of slower growth and increased credit growth. Examples of other studies that have used this methodology include the empirical studies cited in note #1, as well as those of Boyd, De Nicoló and Loukoianova (2009), Angkinand, Sawangngoenyuang and Wihlborg (2010) Angkinand and Willett (2011), and Ahrend and Goujard (2014).

The definitions and sources of all these variables are listed in Table A2 in the Appendix. Summary statistics of the variables are in Table A3 in the Appendix. A matrix of correlation coefficients is available from the authors.

3.   Results

Foreign Assets and Liabilities

Our initial results appear in Table 1. The results for the lagged control variables are consistent with those reported in previous studies. Banking crises are more likely to occur when there is slower economic growth, higher inflation, and more private credit preceding the crisis. There is some evidence that an increase in trade openness lowers the incidence of crises. The

exchange rate regime has a positive coefficient while the capital account openness measure of Chinn and Ito has a negative sign, but neither is significant.

In equation 1 we introduce lagged equity assets scaled by total assets and lagged equity liabilities scaled by total liabilities. The assets variable is not significant, but the coefficient of equity liabilities is negative and significant at the 1% level. In equation 2, we include only lagged FDI assets and liabilities as proportions of total assets and liabilities. The assets variable is not significant but FDI liabilities have a negative coefficient that is highly significant. When we replace FDI with lagged portfolio equity assets and liabilities in equation 3, neither variable is significant. The result for equity liabilities in equation 1, therefore, is driven by the FDI liabilities. In the last equation, we include lagged debt assets and liabilities scaled by total assets and liabilities, respectively. Debt assets are not significant, but debt liabilities increase the probability of the occurrence of a bank crisis and the coefficient is highly significant.

To ascertain the economic significance of the results, we used the marginal effects of the variables evaluated at their mean values.[8] A rise in the share of FDI liabilities of all liabilities of 1% would lower the probability of a bank crisis by approximately .25%, i.e., a quarter of a percentage point. The standard deviation of this variable is .173, so a one-deviation rise would lower the chances of a bank crisis by 4.3%. However, a rise in the share of debt liabilities of all liabilities of 1% would increase the probability of a bank crisis by approximately .14%, while a one standard deviation rise of .192 would increase the probability of a debt crisis by 2.8%.

These results confirm that the composition of the external balance sheet has consequences for a country's vulnerability to banking crises, and are consistent with the earlier studies cited in Section 1 above. Rodrik and Velasco (2000) pointed out that banks that borrow from foreign lenders are vulnerable to domestic or foreign shocks that increase the burden of continuing payments on these liabilities. If the liabilities are denominated in a foreign currency and there is a

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depreciation of the domestic currency, this burden is heightened. Non-bank borrowers that directly borrowed from foreign lenders will also have difficulty in making payments, which can affect their obligations to the domestic banks and contributes to a worsening of the conditions of those banks. FDI liabilities, in contrast, allow the transfer of risk during downturns, which alleviates some of the strain on the domestic financial sector.[9]

In Table 2, we again examine the impact of FDI, portfolio equity and debt assets and liabilities on the probability of a banking crisis, but include the variables separately. In this specification, GDP per capita appears in this table with a negative coefficient that is significant in several cases. The results confirm the negative and significant effect of FDI liabilities on the incidence of banking crises, and the positive and significant effect of debt liabilities. Moreover, when we include debt assets by itself, it appears with a positive and significant coefficient. This result may be due to the correlation of debt assets and liabilities. Broner *et al.* (2013) have shown that gross capital flows have been highly correlated, and this linkage may skew our results. The correlation coefficient of debt assets and liabilities is 0.49, which is higher than the corresponding correlations of FDI assets and liabilities (0.21) or portfolio equity (0.31).

We extended out benchmark results by reestimating the equations in Table 2 for the upper-middle income countries, which correspond with many of the emerging market economies, and then the lower- and lower-middle income countries. These results are reported in Tables 3 and 4, and there are several interesting differences between the two sets of results. We omit the results for all equity assets and liabilities to conserve space.

First, several variables are significant for the upper-middle income countries but not the lower- and lower-middle income group. GDP growth, for example, has a highly significant negative impact on banking crises for the former group but not the latter. Similarly, inflation is significant and positive in several estimations for the upper middle-income countries, but not in

the second group. The exchange rate regime has a positive and significant coefficient in several of the estimations for the upper middle-income countries, as does the ratio of M2 to reserves. Upper-middle income economies with lower economic growth, higher inflation rates, more flexible exchange rate regimes and larger monetary expansion relative to reserves are more likely to experience a banking crisis.

Second, the capital account openness measure appears with negative and highly significant coefficient in the case of the low-income and lower-middle income countries. Opening up the capital account in these countries can destabilize an undeveloped financial sector. The upper-income economies, in contrast, are likely to have more developed financial systems that can handle foreign capital flows.

Third, the coefficients of FDI liabilities and debt liabilities carry negative and positive signs, respectively, for both groups of countries. In the case of the upper-income countries, however, they are significant at the 1% or 5% levels, while the level of significance for the lower- and lower-middle income nations is 10%. Moreover, the coefficient of portfolio assets in the case of the upper-income countries is negative and significant, while this coefficient has a positive and significant sign in the low-income and lower-income group. Debt assets also have a positive and significant coefficient for the upper-income group. Asset holdings play a different role for this group, which again may reflect their own more extensive financial markets.

Debt and Institutions

In this section we examine whether institutions have an effect on banking crises, either directly and/or through their interaction with the debt liabilities that raise the probability of such events. As explained above, we use several *ICRG* ratings. We begin with a composite institutional rating (INSTIT) based on the three summary ratings of economic risk (ECON), financial risk

(FIN) and political risk (POL). We then include each of the three components of overall risk. In each case points are awarded based on assessments of a country on various criteria related to the type of risk; more points indicate lower risk.

These results are reported in Table 5. Almost all the control variables appear with their usual signs and levels of significance, while the debt liabilities variable has a positive coefficient that is highly significant in all the estimations.

We begin with the composite institutional measure, which appears in equation 1. This measure by itself does not affect the incidence of banking crises. However, when it is interacted with the debt liabilities measure, its coefficient is negative and significant at the 10% level. The impact of better institutions offsets in part the effect of debt liabilities.

We then introduce each of the three main risk component measures in equations 2, 3 and 4. None of these *ICRG* indicators themselves have significant coefficients. However, when financial and political risks are interacted with debt liabilities in equations 3 and 4, the interacted variables have negative coefficients that are significant at the 5% level. The impact of debt liabilities on the incidence of bank crises is lower when there is less political or financial risk. The lack of significance of the interaction with the economic measure may reflect the inclusion in the model of many of the variables that are also included in the *ICRG* economic risk measure, including GDP growth, GDP per capita, and inflation.

We examined the marginal effects of the financial and political variables evaluated at their mean values to determine if these offsetting effects were economically significant. A rise in the share of debt liabilities of all liabilities of 1% would increase the probability of a bank crisis by approximately 0.20%. An increase of one unit in the financial risk index, which is measured on a scale of 1-50, lowers that increased risk by only 0.012%; since financial risk is measured on scale of 1-50, a 1% rise leads to a 0.006% decline in the impact of the debt liabilities variable. A one-

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unit rise in the political risk index, scaled by 1-100, lowers the impact of the debt variable on banking crises by 0.009%. These are relatively small impacts, so a country would have to rise far up the respective scales for improvements to have a large effect. However, decreases in financial or political risk may affect some of the other variables that have an impact on bank crises.

To look further at the impact of political risk on the incidence of banking crises, we use three of the subcomponents of the political risk rating: investment profile, governmental stability and democratic accountability. Again, more points reflect higher ratings and lower risk. The results are reported in Table 6.

Of the three, only one—investment security—has a negative coefficient that is significant at the 1% level. The marginal coefficient reveals that a one-unit rise in the index, which is measured on a scale of 1-12, lowers the probability of a banking crisis by 0.0183, so the impact of a 1% increase in the index lowers the probability by 0.225%. The *ICRG* guide explains that this variable is based on an assessment of several factors: contract viability, the repatriation of profits and payments delays. A country that does not rate highly on these criteria is more likely to experience unstable business conditions that affect financial institutions and flows, and lead to crises. Levine (1998) showed that countries with legal systems that emphasize creditor rights and enforce contracts have better-developed banks than countries that do not.

In addition, the interaction of one of the other subcomponents—government stability—has a negative coefficient that is negative and significant at the 5% level. The marginal effect of a 1% rise in this index, also measured on a twelve-point scale, is 0.52%, half a percentage point, the largest marginal effect of any of the *ICRG* variables. The democracy variable, by comparison, has neither a direct or indirect effect on banking crises. The former result shows that the occurrence of bank crises due to debt liabilities is less when a country has a stable and competent government,

and this result is not negligible. However, the political system of a country does not affect the incidence of bank crises.

In general, then, the impact of debt liabilities on financial stability may be lessened through the establishment of good institutions. Moreover, studies such that of Bénassy-Quéré, Coupet and Mayer (2007) have shown that institutional quality is positively linked to FDI. Government policies that can improve the institutional environment may have a double payoff: equity inflows rise while the impact of debt liabilities during a contraction is lessened.

Our results are consistent with those of Demirgüç-Kunt and Detragiache (2001), Claessens, Klingebiel and Laeven (2004) and Klomp (2010), cited above. They also looked at measures of institutional quality and found that they affected the chances and costs of banking crises. They urged the development of better institutions, although they admitted that this process takes time. However, some of the aspects of the riskiness of investments could be addressed with changes in a country's legal code.

How are good institutions acquired? There is no simple organizational framework that is applicable in all circumstances. Rodrik, Subramanian and Trebbi (2004: 157) point out that "…there is growing evidence that desirable institutional arrangements have a large element of context specificity, arising from differences in historical trajectories, geography, political economy, or other initial conditions." They claim that economic principles such as property rights and incentives have a common basis, but their institutional embodiment depends on domestic conditions.

4. Extensions

We undertook several extensions of our results.[10] First, we interacted the different types of liabilities with the Chinn-Ito *de jure* measure of capital account openness. In these specifications,

FDI liabilities again lower the incidence of banking crises as in the previous tables and its coefficient is significant at the 1% level. Moreover, its interaction with the capital account variable also has a negative coefficient, which is significant at the 5% level. The probability of a crisis with FDI liabilities is even lower when there are fewer government restrictions on the capital account. The ability of partner firms to reallocate capital may reinforce financial stability and reduce fragility.

In the case of portfolio equity liabilities, the coefficients of both the liability itself and its interaction are not significant. In the case of debt, its interaction with the capital account regime is not significant, but debt liabilities again has a positive and significant coefficient. Moreover, capital account openness itself has a negative coefficient that is significant at the 10% level. Deregulation of the capital account, therefore, reinforces the negative effect of FDI liabilities on the incidence of banking crises, is neutral with respect to portfolio equity, and may lower the incidence of bank crises when there are debt liabilities.

We then interacted the external balance sheet liabilities with the Reinhart-Rogoff indicator of exchange rate regimes, with higher values indicating more flexible systems. The exchange rate regime variable itself has positive coefficients, but none are significant and none of the interactive variables were significant. The nature of the exchange rate regime, therefore, does not affect the impact of external liabilities on bank crises.

However, exchange rates may matter in a different context. We sought to determine whether the existence of a currency crisis had an impact on the effects of the liabilities on banking crisis. We introduced a currency crisis dummy variable, which is based on Laeven and Valencia's (2013) chronology, into our estimations. It takes the value of one if a currency crisis occurs either before a banking crisis or in the same year.

The currency crisis variable itself appears with a positive and significant coefficient whenever the interactive term is not included. However, this does not imply causality, as the phenomenon of simultaneous or "twin crises" of currency and banking crises occurring is well known (Kaminsky and Reinhart 1999). But none of the interactions of the crisis dummy with the external liabilities are significant, and the coefficient of the currency crisis itself is not significant in any of these equations. In our sample, currency crises are directly linked to bank crises, as previous studies have indicated, but do not change the effect of external liabilities on these crises.

5. Conclusions

Our results illuminate several aspects of banking crises in lower- and middle-income countries. As in the advanced economies, the crises follow periods of credit "booms," as measured by the amount of domestic credit extended to the private sector. In the upper-middle income countries, they also follow periods of low economic growth and high inflation, and are associated with larger monetary sectors.

Moreover, the composition of the external balance sheet is important. Debt owed to foreign lenders can worsen a deteriorating domestic economy and contribute to a banking crisis. FDI, however, allows domestic firms to share risks with foreign partners, thus mitigating the impact of a domestic shock and lowering the probability of a banking crisis. This effect increases when there is liberalization of capital controls.

Institutions can contribute to lowering the incidence of bank crises. Lower financial and political risk can offset to some degree the effect of debt liabilities, as can government stability. Moreover, an increase in the security of investments lowers the occurrence of banking crises. A stable and efficient government may ease the financial stress that debt owed to foreign lenders can

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cause. These results reinforce the IMF's (2002) advice that capital account liberalization be undertaken as part of a wider process of institutional reform.

The issuance of external liabilities, therefore, should be undertaken with several considerations in mind. First, banking crises respond to many of the same features—low growth, increased credit—in developing economies that occur in advanced countries. Second, equity may be more expensive to service than debt, but it has several properties that favor its use. FDI contributes to financial stability whereas debt raises the incidence of banking crises. Third, financial flows take place in an institutional context, and these institutions also affect the stability of the financial environment. Capital account liberalization, therefore, should only be undertaken when institutions have been made sufficiently strong to deal with any financial volatility.

Data Appendix

Table A1

Countries

Albania	M	Ghana	L	Niger	L
Algeria	M	Guinea	L	Nigeria	L
Argentina	M	Guinea-Bissau	L	Panama	M
Armenia	L	Guyana	L	Paraguay	M
Azerbaijan	M	Haiti	L	Peru	M
Bangladesh	L	Indonesia	L	Philippines	L
Belarus	M	Jamaica	M	Romania	M
Bolivia	L	Jordan	M	Russia	M
Brazil	M	Kenya	L	Senegal	L
Bulgaria	M	Latvia	M	Sri Lanka	L
Burkina Faso	L	Lebanon	M	Tanzania	L
Cameroon	L	Liberia	L	Thailand	M
Chile	M	Lithuania	M	Togo	L
China	M	Madagascar	L	Tunisia	M
Colombia	M	Malaysia	M	Uganda	L
Congo, Republic of	L	Mali	L	Ukraine	L
Dominican Republic	M	Mexico	M	Venezuela	M
Ecuador	M	Morocco	L	Vietnam	L
Egypt	L	Mozambique	L	Yemen	L
El Salvador	L	Nicaragua	L	Zambia	L
				Zimbabwe	L

Note: L: Lower-Income and Lower Middle-Income. M: Upper Middle-Income

Table A2

Definitions and Sources of Variables

Variables	Definitions	Source
Cap Open	Capital account openness	Chinn and Ito (2006)
DC/GDP	Domestic credit to private sector (% of GDP)	*WDI*
Debt Ast/Ast, Debt Lbt/ Lbt	Debt Assets/Assets, Debt Liabilities /Liabilities	*EWN*
DEM	Democracy (higher numbers less risk)	*ICRG*
ECON	Economic Risk (higher numbers less risk)	*ICRG*
Eq Ast/Ast, Eq Lbt/Lbt	Equity Assets/Assets, Equity Liabilities/Liabilities	*EWN*
Ex Rte Reg	Exchange Rate Regime (higher numbers more flexible)	Reinhart and Rogoff (2004)
FDI Ast/Ast, FDI Lbt/ Lbt	FDI Assets/Assets FDI Liabilities /Liabilities	*EWN*
FIN	Financial Risk(higher numbers indicate less risk)	*ICRG*
GDP Gr	GDP growth (%)	*WDI*
GDP PC	GDP per capita (constant 2000 US$)	*WDI*
GOV	Government Stability (higher numbers indicate less risk)	*ICRG*
Inf	Change in Consumer Price Index (%)	*WDI*
INSTIT	Composite of economic, financial and political risk (higher numbers less risk)	*ICRG*
INVEST	Investment Risk (higher numbers less risk)	*ICRG*
M2/Res	Money and quasi money /Total reserves (%)	*WDI*
POL	Political Risk (higher numbers less risk)	*ICRG*
Prt Eq Ast/Ast, Prt Eq Lbt/Lbt	Portfolio Equity Assets/Assets, Portfolio Equity Liabilities/Liabilities	*EWN*
Real Int Rate	Nominal interest rate minus the rate of inflation	*WDI*
Trade	Exports plus imports/GDP (%)	*WDI*

Notes: EWN = *External Wealth of Nations*; ICRG = *International Country Risk Guide*; WDI = *World Development Indicators*

Table A3

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
DC/GDP	1520	29.772	27.134	0.198	165.719
Debt Ast/Ast	1671	0.565	0.204	0.038	1.1483
Debt Lbt/Lbt	1673	0.730	0.192	0.086	1.000
DEM	1523	3.313	1.372	0.000	6.000
ECON	1519	30.480	6.780	1.500	45.166
Eq Ast/Ast					
Eq Lbt/Lbt					
Ex Rate Reg	1591	8.048	4.422	1.000	15.000
FDI Ast/Ast	1671	0.055	0.082	0.010	0.499
FDI Lbt/Lbt	1673	0.241	0.173	0.000	0.499
FIN	1519	30.312	8.138	6.333	49.166
Fin Lib					
GDP Gr	1660	3.289	6.828	-51.030	106.279
GDP PC	1687	6.946	1.078	4.171	9.646
GOV	1561	7.332	2.314	1.000	12.000
Inf	1656	3.177	1.051	-1.736	10.195
INSTIT	1519	59.030	11.389	13.500	82.466
INVEST	1523	6.417	2.137	0.000	11.500
M2/Res	1552	11.977	101.907	-37.292	3691.140
POL	1519	57.230	11.520	10.000	81.833
Prt Eq Ast/Ast	1649	0.014	0.036	0.000	0.399
Prt Eq Lbt/Lbt	1663	0.027	0.058	0.000	0.462
Real Int Rate	1174	7.445	20.883	-97.812	252.115
Trade	1584	68.754	36.888	11.544	280.361

NOTES

[1] Other studies of banking crises in emerging markets and developing economies include those of
Chang and Velasco (2001), Eichengreen and Arteta (2002), Noy (2004), Daniel and Jones (2007),

Duttagupta and Cashin (2010), Joyce (2011) and Hamdi and Boukef Jlassi (2014).

[2] An explanation of the World Bank's classification criteria is provided at:

https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

[3] Boyd, De Nicolò and Loukoianova (2009) also used random effect models in their study of

banking crises.

[4] The dataset is available at: http://www.philiplane.org/EWN.html

[5] More information on the construction of the ratings is available in the *International Country Risk*

Methodology:

http://www.prsgroup.com/wp-content/uploads/2012/11/icrgmethodology.pdf

[6] The data can be found at: http://www.carmenreinhart.com/data/browse-by-topic/topics/11/

[7] The data are available at: http://web.pdx.edu/~ito/Chinn-Ito_website.htm

[8] The results with the marginal effects of the variables are available from the authors.

[9] Alfaro and Chen (2012) found that multinational subsidiaries fared better than domestic firms

during the global financial crisis, and attributed the difference in part to financial linkages with the

parent firm.

[10] All results are available from authors.

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Table 1

Banking Crises and Foreign Assets and Liabilities

Variables	1.1	1.2	1.3	1.4
GDP Gr	-0.080***	-0.080***	-0.079***	-0.071***
	(0.021)	(0.0213)	(0.021)	(0.021)
GDP PC	-0.096	-0.172	-0.366	-0.128
	(0.213)	(0.214)	(0.243)	(0.230)
Inf	0.369**	0.314*	0.431**	0.288*
	(0.171)	(0.164)	(0.177)	(0.167)
DC/GDP	0.031***	0.0310***	0.036***	0.035***
	(0.007)	(0.008)	(0.008)	(0.007)
Ex Rte Reg	0.024	0.027	0.052	0.038
	(0.036)	(0.037)	(0.038)	(0.037)
Real Int Rate	0.002	0.003	0.001	0.002
	(0.005)	(0.005)	(0.005)	(0.005)
M2/Res	0.003	0.002	0.008	0.003
	(0.007)	(0.008)	(0.007)	(0.007)
Trade	-0.009*	-0.008	-0.0123**	-0.009
	(0.005)	(0.005)	(0.006)	(0.006)
Cap Open	-0.116	-0.091	-0.160	-0.121
	(0.114)	(0.119)	(0.120)	(0.119)
Eq Ast/Ast	2.324			
	(1.618)			
Eq Lbt/Lbt	-3.661***			
	(1.114)			
FDI Ast/Ast		2.830		
		(1.824)		
FDI Lbt/Lbt		-4.107***		
		(1.240)		
Prt Ast/Ast			-6.747	
			(6.389)	
Prt Lbt/Lbt			-0.369	
			(3.108)	
Dbt Ast/Ast				1.307
				(0.882)
Dbt Lbt/Lbt				2.407**
				(1.129)
Constant	-2.377	-1.830	-1.633	-5.624***
	(1.447)	(1.458)	(1.690)	(2.161)
Observations	1,026	1,042	1,026	1,042
Pseudo R^2	0.499	0.497	0.496	0.497
Log Likelihood	-331.2	-332.6	-335.7	-333.4

Note: The dependent variable is a dummy for banking crises. The lagged independent variables are the growth rate of real GDP, GDP per capita, inflation, domestic credit extended to the private sector/GDP, the exchange rate regime, the real interest rate, M2/Reserves, trade openness, capital account openness, FDI assets/assets, FDI liabilities/liabilities, portfolio equity assets/assets, portfolio liabilities/liabilities, debt assets/assets and debt liabilities/liabilities. Standard errors are reported in parentheses. The symbols *, ** and *** denote significance levels of 10%, 5% and 1%.

Table 2

Banking Crises and Foreign Assets and Liabilities:
Alternative Specification

Variables	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8
GDP Gr	-0.074***	-0.079***	-0.074***	-0.078***	-0.076***	-0.077***	-0.068***	-0.076***
	(0.021)	(0.022)	(0.021)	(0.021)	(0.021)	(0.022)	(0.021)	(0.021)
GDP PC	-0.503**	-0.097	-0.527**	-0.149	-0.398*	-0.460*	-0.378*	-0.124
	(0.229)	(0.226)	(0.226)	(0.222)	(0.229)	(0.241)	(0.217)	(0.232)
Inf	0.368**	0.382**	0.378**	0.312*	0.372**	0.434**	0.312*	0.315*
	(0.169)	(0.174)	(0.170)	(0.166)	(0.170)	(0.178)	(0.170)	(0.166)
DC/GDP	0.038***	0.033***	0.038***	0.033***	0.037***	0.038***	0.038***	0.034***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ex Rte Reg	0.056	.034	0.056	0.035	0.056	0.054	0.050	.040
	(0.038)	(0.037)	(0.038)	(0.037)	(0.038)	(0.038)	(0.037)	(0.037)
Real Int Rate	0.002	0.002	0.002	0.003	0.002	0.001	0.002	.003
	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)
M2/Res	0.008	0.006	0.007	0.006	0.008	0.008	0.004	0.006
	(0.008)	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)
Trade	-0.012**	-0.009*	0.012**	-0.008	-0.012**	-0.012**	-0.011*	-0.008
	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(-0.006)
Cap Open	-0.164	-0.126	-0.155	-0.116	-0.161	-0.162	-0.148	-0.127
	(0.122)	(0.117)	(0.122)	(0.120)	(0.122)	(-0.121)	(0.121)	(0.119)
Eq Ast/Ast	0.316							
	(1.65)							
Eq Lbt/Lbt		-3.003***						
		(1.057)						
FDI Ast/Ast			1.205					
			(1.864)					
FDI Lbt/Lbt				-3.620***				
				(1.208)				
Prt Ast/Ast					-7.286			
					(6.687)			
Prt Lbt/Lbt						-0.435		
						(3.18)		
Dbt Ast/Ast							1.938**	
							(0.856)	
Dbt Lbt/Lbt								2.956***
								(1.071)
Constant	-0.781	-2.638*	-0.708	-2.103	-1.382	-1.183	-2.604	-5.387**
	(1.613)	(1.526)	(1.600)	(1.507)	(1.612)	(1.691)	(1.73)	(2.154)
Observations	1,030	1,038	1,042	1,042	1,030	1,038	1,042	1,042
Pseudo R^2	0,490	0 .496	0.489	0.495	0.491	0.490	0.493	0.494
Log Likelihood	-337.4	-333.2	-338	-333.7	-336.7	-337.1	-335.6	-334.5

Note: The dependent variable is a dummy for banking crises. The lagged independent variables are the growth rate of real GDP, GDP per capita, inflation, domestic credit extended to the private sector/GDP, the exchange rate regime, the real interest rate, M2/Reserves, trade openness, capital account openness, FDI assets/assets, FDI liabilities/liabilities, portfolio equity assets/assets, portfolio liabilities/liabilities, debt assets/assets and debt liabilities/liabilities. Standard errors are reported in parentheses. The symbols *, ** and *** denote significance levels of 10%, 5% and 1%.

Table 3

Banking Crises and Foreign Assets and Liabilities:
Upper-Income Countries

Variables	3.1	3.2	3.3	3.4	3.5	3.6
GDP Gr	-0.090***	-0.087***	-0.101***	-0.103***	-0.082***	-0.082***
	(0.029)	(0.029)	(0.030)	(0.031)	(0.028)	(0.029)
GDP PC	0.071	0.516	0.460	0.0390	0.301	0.553
	(0.385)	(0.359)	(0.358)	(0.368)	(0.319)	(0.375)
Inf	0.647**	0.411	0.646**	0.999***	0.384	0.439
	(0.291)	(0.296)	(0.289)	(0.346)	(0.278)	(0.293)
DC/GDP	0.029***	0.023***	0.028***	0.029***	0.030***	0.025***
	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)
Ex Rte Reg	0.0969*	0.075	0.114**	0.0811	0.0994**	0.083*
	(0.051)	(0.050)	(0.051)	(0.051)	(0.049)	(0.0495)
Real Int Rate	0.0136	0.010	0.0100	0.00709	0.013	0.0101
	(0.012)	(0.011)	(0.011)	(0.012)	(0.011)	(0.011)
M2/Res	0.105**	0.091**	0.098**	0.086**	0.063	0.0903**
	(0.044)	(0.037)	(0.042)	(0.041)	(0.040)	(0.038)
Trade	-0.001	-0.009	-0.014**	-0.011*	-0.011*	-0.009
	(0.007)	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)
Cap Open	0.197	0.132	0.225	0.220	0.0977	0.125
	(0.175)	(0.179)	(0.174)	(0.171)	(0.171)	(0.177)
FDI Ast/Ast	-1.880					
	(2.478)					
FDI Lbt/ Lbt		-4.130***				
		(1.56)				
Prt Ast/Ast			-27.00**			
			(12.07)			
Prt Lbt/Lbt				-0.854		
				(3.203)		
Dbt Ast/Ast					3.214***	
					(1.125)	
Dbt Lbt/Lbt						3.196**
						(1.282)
Constant	-6.585**	-7.847***	-8.892***	-7.006**	-9.144***	-11.68***
	(3.281)	(2.865)	(3.119)	(3.196)	(3.024)	(3.626)
Observations	488	488	488	484	488	488
Pseudo R^2	0.788	0.792	0.796	0.791	0.793	0.792
Log Likelihood	-140.4	-137.3	-135.2	-138.3	-137.2	-137.9

Note: The dependent variable is a dummy for banking crises. The lagged independent variables are the growth rate of real GDP, GDP per capita, inflation, domestic credit extended to the private sector/GDP, the exchange rate regime, the real interest rate, M2/Reserves, trade openness, capital account openness, FDI assets/assets, FDI liabilities/liabilities, portfolio equity assets/assets, portfolio liabilities/liabilities, debt assets/assets and debt liabilities/liabilities. Standard errors are reported in parentheses. The symbols *, ** and *** denote significance levels of 10%, 5% and 1%.

Table 4

Banking Crises and Foreign Assets and Liabilities:
Lower- and Lower-Middle Income Countries

Variables	4.1	4.2	4.3	4.4	4.5	4.6
GDP Gr	-0.040	-0.039	-0.039	-0.038	-0.035	-0.039
	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
GDP PC	-0.749*	-0.431	-0.977**	-0.781*	-0.705	-0.393
	(0.414)	(0.453)	(0.443)	(0.468)	(0.430)	(0.468)
Inf	0.139	0.098	0.063	0.12	0.112	0.101
	(0.228)	(0.227)	(0.231)	(0.229)	(0.230)	(0.227)
DC/GDP	0.051***	0.052***	0.055***	0.051***	0.050***	0.052***
	(0.015)	(0.015)	(0.016)	(0.015)	(0.015)	(0.015)
Ex Rte Reg	0.062	0.065	0.084	0.069	0.068	0.067
	(0.063)	(0.063)	-0.065	(0.064)	-0.064	-0.063
Real Int Rate	0.001	0.003	07.34e-05	0.001	0.001	0.002
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
M2/Res	0.001	0.001	0.005	0.005	0.004	0.002
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Trade	-0.015	-0.007	-0.0183*	-0.013	-0.011	-0.007
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Cap Open	-0.562***	-0.495**	-0.594***	-0.578***	-0.561***	-0.507**
	(0.198)	(0.202)	(0.201)	(0.201)	(0.203)	(0.202)
FDI Ast/Ast	3.376					
	(2.866)					
FDI Lbt/ Lbt		-3.884*				
		(2.155)				
Prt Ast/Ast			23.14**			
			(11.17)			
Prt Lbt/Lbt				0.813		
				(6.542)		
Dbt Ast/Ast					0.67	
					(1.213)	
Dbt Lbt/Lbt						3.303*
						(1.989)
Constant	0.828	-0.716	2.457	0.948	0.027	-4.366
	(2.65)	(2.860)	(2.82)	(3.024)	(3.063)	(4.093)
Observations	554	554	542	554	554	554
Pseudo R^2	0.719	0.720	0.722	0.718	0.718	0.720
Log Likelihood	-186.1	-185.1	-184.1	-186.8	-186.7	-185.4

Note: The dependent variable is a dummy for banking crises. The lagged independent variables are the growth rate of real GDP, GDP per capita, inflation, domestic credit extended to the private sector/GDP, the exchange rate regime, the real interest rate, M2/Reserves, trade openness, capital account openness, FDI assets/assets, FDI liabilities/liabilities, portfolio equity assets/assets, portfolio liabilities/liabilities, debt assets/assets and debt liabilities/liabilities. Standard errors are reported in parentheses. The symbols *, ** and *** denote significance levels of 10%, 5% and 1%.

Table 5

Banking Crises, Foreign Assets and Liabilities and Risk

Variables	5.1	5.2	5.3	5.4
GDP Gr	-0.066***	-0.072***	-0.065***	-0.068***
	(0.023)	(0.023)	(0.022)	(0.022)
GDP PC	-.063	-.116	-.021	-.070
	(0.256)	-(0.245)	(0.247)	(0.249)
Inf	0.316*	0.373**	0.324*	0.334**
	(0.170)	(0.173)	(0.167)	-(0.170)
DC/GDP	0.036***	0.035***	0.035***	0.036***
	(0.008)	(0.008)	(0.008)	(0.008)
Ex Rte Reg	0.040	0.045	0.0370	0.040
	(0.038)	(0.038)	(0.037)	(0.038)
Real Int Rate	(0.006)	(0.003)	(0.006)	(0.005)
	(0.005)	(0.006)	(0.005)	(0.005)
M2/Res	0.005	0.006	0.005	0.005
	(0.008)	(0.007)	(0.007)	(0.008)
Trade	-0.007	-0.008	-0.007	-0.008
	(0.006)	(0.006	(0.006)	(0.006)
Cap Open	-0.087	-0.137	-0.060	-0.127
	(0.124)	-(0.124)	(0.122)	(0.124)
Dbt Lbt/Lbt	3.714***	3.002**	3.465***	3.542***
	(1.246)	(1.187)	(1.286)	(1.159)
INSTIT	-0.006			
	(-0.020)			
Dbt Lbt/Lbt X INSTIT	-0.147*			
	(0.083)			
ECON		0.012		
		(0.031)		
Dbt Lbt/Lbt X ECON		0.037		
		(0.143)		
FIN			-0.028	
			(0.025)	
Dbt Lbt/Lbt X FIN			-0.210**	
			(0.103)	
POL				-0.0003
				(0.017)
Dbt Lbt/Lbt X POL				-0.159**
				(0.078)
Constant	-4.044**	-3.554**	-4.352**	-4.016**
	-1.846	-1.747	-1.789	-1.837
Observations	1030	1030	1030	1030
Pseudo R^2	0.505	0.501	0.508	0.505
Log Likelihood	-327.7	-329.9	-325.8	-327.5

Note: The dependent variable is a dummy for banking crises. The lagged independent variables are the growth rate of real GDP, GDP per capita, inflation, domestic credit extended to the private sector/GDP, the exchange rate regime, the real interest rate, M2/Reserves, trade openness, capital account openness, debt liabilities/liabilities, institutional risk, economic risk, financial risk and political risk. Standard errors are reported in parentheses. The symbols *, ** and *** denote significance levels of 10%, 5% and 1%.

Table 6

Banking Crises, Foreign Assets and Liabilities and Components of Political Risk

Variables	6.1	6.2	6.3
GDP Gr	-0.061***	-0.067***	-0.066***
	(0.021)	(0.022)	(0.021)
GDP PC	0.031	-0.057	0.006
	(0.245)	(0.240)	(0.248)
Inf	0.283*	0.305*	0.340**
	(0.168)	(0.168)	-0.167
DC/GDP	0.039***	0.035***	0.037***
	(0.009)	-0.008	-0.008
Ex Rte Reg	0.044	0.043	0.047
	(0.038)	(0.038)	(0.038)
Real Int Rate	0.002	0.006	0.004
	(0.005)	(0.005)	(0.005)
M2/Res	0.003	0.006	0.005
	(0.008)	(0.008)	(0.007)
Trade	-0.009	-0.007	-0.009
	(0.006)	(0.006)	(0.006)
Cap Open	-0.005	-0.062	-0.124
	(0.125)	(0.123)	(0.123)
Dbt Lbt/Lbt	1.768	2.830**	3.349***
	(1.141)	(1.159)	(1.107)
INVEST	-0.336***		
	(0.081)		
Dbt Lbt/Lbt X INVEST	-0.230		
	(0.395)		
GOV		-0.101	
		(0.067)	
Dbt Lbt/Lbt X GOV		-0.723**	
		(0.357)	
DEM			-0.153
			(0.128)
Dbt Lbt/Lbt X DEM			-0.876
			(0.638)
Constant		-4.076**	-4.449**
		(1.753)	(1.818)
Observations	1030	1030	1030
Pseudo R^2	0.516	0.508	0.504
Log Likelihood	-320.4	-325.7	-328.3

Note: The dependent variable is a dummy for banking crises. The lagged independent variables are the growth rate of real GDP, GDP per capita, inflation, domestic credit extended to the private sector/GDP, the exchange rate regime, the real interest rate, M2/Reserves, trade openness, capital account openness, debt liabilities/liabilities, investment risk, government stability and democratic accountability. Standard errors are reported in parentheses. The symbols *, ** and *** denote significance levels of 10%, 5% and 1%.