

Financial Globalization and Banking Crises In Emerging Markets

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ABSTRACT

The incidence of bank crises increased in the post-Bretton Woods era, and these events have been particularly costly in emerging economies. This paper investigates the impact of financial integration on the incidence, duration and output costs of systemic bank crises in 20 emerging markets over the years 1976-2002 using measures of *de facto* and *de jure* financial openness. An increase in foreign direct investment within a country contributes to a decrease in the number of crises, while foreign debt liabilities have the opposite effect. A more liberal *de jure* capital regime lowers the incidence of banking crises. FDI also lowers the duration of banking crises, but a less regulated capital regime is associated with crises of greater duration. Financial globalization does not seem to be directly associated with the costs of the crises, but currency crises are linked to higher costs.

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Key words: financial integration; banking crises; emerging markets

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1. Introduction

Bank crises have become a more frequent occurrence in the post-Bretton Woods era, particularly in emerging markets. Bordo et al. (2001) report that the incidence of bank crises and “twin crises,” i.e., combined banking and currency crises, was higher in the 1973-1997 period than in the previous era or during the Gold Standard.¹ They also find that such crises have been primarily an emerging market phenomenon. Similarly, Husain, Mody and Rogoff (2005) present evidence which demonstrates that emerging markets experience more banking and twin crises than do upper-income or developing economies. They point out that such economies are more exposed to capital flows than developing economies, but have more fragile financial sectors than the advanced economies.

Moreover, these events are costly. Honohan and Laeven (2005) place the fiscal cost of banking crises in developing countries over the preceding 25 year period at over \$1 trillion. Dobson and Hufbauer (2001) estimate an average output loss of 2 percent of GDP during each year of these crises.² Cerra and Saxena (2008) report that the output losses of banking and twin crises persist over extended periods of time, and may never be totally recuperated.

One area of the research devoted to improving our understanding of banking crises has sought to identify their determinants. Demirgüç-Kunt and Detragiache (1998), for example, in a seminal paper found that macroeconomic factors, such as low GDP growth and high inflation rates, increased the probability of a crisis taking place. They also found that financial variables, such as the growth of credit to the private sector, were significant in the determination of banking crises. Subsequent papers which extended this work include those of Demirgüç-Kunt

and Detragiache (2001), Domaç and Martinez Peria (2003), Eichengreen and Rose (2001), Glick and Hutchison (2001), Honig (2006), Mendis (2002), Noy (2004), Rossi (1999) and von Hagen and Ho (2007).³

In addition to domestic variables, the external sector, and in particular international financial flows, may also play a role in the occurrence of banking crises. However, empirical analyses which have examined the effect of capital controls on banking crises generally find no evidence of any linkage. Bordo et al. (2001), for example, reported a negative and significant relationship between capital controls and bank crises for 21 countries during the period of 1880-1997; however, when the empirical analysis was done for the post-1973 period alone, the coefficient on the capital controls variable was not statistically significant. Eichengreen and Arteta (2002) found that a dummy variable for capital account liberalization had no influence in their study of banking crises in 75 developing countries over the period of 1975-1997. Similarly, Edwards (2007) in a study of 163 countries during the years 1970-2000 concluded that banking crises occurred irrespective of the degree of capital mobility.

This paper extends the previous work in several directions. First, we concentrate on the experience of emerging markets, since they have been most vulnerable to banking crises, and expand the sample period to 2002 to include the record of the post-1997 crises. Second, we examine the impact of both *de facto* and *de jure* financial globalization. Third, we also investigate the impact of financial openness on the duration of these crises and their output losses.⁴

The next section of the paper discusses how financial globalization could contribute to banking crises in emerging markets. Section 3 describes the data utilized in the empirical analysis. The fourth section reports the results for the panel analysis of the determinants of bank

crises. Section 5 investigates the duration of these crises, and the following section examines their output losses. The final section summarizes the results and derives some policy implications.

2. Analysis

Banks are well-suited as intermediaries to deal with the problems associated with asymmetric information in the financial sector. Since banks do not need to share information, they have an incentive to spend resources on obtaining information which they can use in making loans and setting rates, which allows firms to obtain finance at terms they deem reasonable. Banks can also monitor compliance with the conditions of a loan agreement.

These bank activities are particularly important in emerging markets which do not have well-established financial markets or other external sources of finance for firms. In the absence of securities markets, firms rely on domestic banks for external credit. Foreign capital may provide an alternative supply of funds, but investment has been shown to be tied to domestic savings.⁵ Gathering information is more difficult and costly in these countries, which reinforces the domestic banks' advantage in these activities.

Bank crises, therefore, have particularly severe consequences in emerging markets, since they interrupt the flow of savings to those sectors dependent on the banks. Firms which can not obtain short-term credit or face high borrowing costs may fail and economic activity declines. The decline in investment expenditures which follows bank crises contributes to the persistence of their impact.⁶ In the most serious cases, such as Mexico in 1994-95, East Asia in 1997-98 and Argentina in 2001-02, the banking crises are accompanied by currency crises which exacerbate the situation and result in twin crises.⁷

Mishkin (2006) describes the circumstances which lead to a banking crisis in an emerging market. Some of these features are shared with upper-income countries, while others are unique to the emerging markets. A deterioration in the banks' balance sheets usually antedates a crisis, as the banks make speculative loans, often in response to government pressure. A rapid rise in domestic credit to the private sector may be a sign of a lending "boom" and "overborrowing" that follows financial deregulation and capital inflows.⁸

A rise in domestic interest rates then raises the cost of borrowing, which affects the cash flow and profits of private sector borrowers.⁹ If adverse selection exists, credit-worthy firms withdraw from the credit markets, leaving behind the more risky firms which are willing to pay the higher rates. The banks may respond by rationing credit.¹⁰ If there is also an increase in uncertainty, possibly due to political events, it becomes more difficult to assess the relative riskiness of investment projects. A number of political assassinations in Mexico in 1994, for example, raised fears regarding the country's political stability.

Another factor which can contribute to a financial crisis is a decline in asset prices, such as stock prices. Such a fall lowers the market valuation of the net worth of firms, which makes banks more reluctant to lend to them. Moreover, all these circumstances—the increase in borrowing costs and uncertainty, and a decline in asset prices—increase the incentive for moral hazard to occur, as some firms engage in risky activities in order to restore their profitability.

Bank crises can also reflect fiscal imbalances. In many emerging markets, banks have been pressured by governments to purchase bonds which finance their budget deficits. If subsequent concerns about repayment lead to declines in bond prices, the banks' balance sheets and their ability to supply credit weaken, which aggravates adverse selection and moral hazard problems. The situation of the banks is particularly worsened in the case of sovereign default.

Financial globalization can affect the likelihood of a banking crisis or its severity through several channels.¹¹ On the one hand, the entry of foreign banks in the domestic markets can contribute to more efficiency through their introduction of financial innovations and increased competition.¹² Integration with global financial markets may also induce the domestic authorities to implement regulatory and economic policies and institutional reforms which contribute to financial stability. The ability to withdraw their funds gives domestic savers an incentive to monitor the activities of the local banks, and induces the banks to avoid risky lending which could cause the depositors to pull out. Moreover, both savers and lenders are able to diversify risk.

On the other hand, a currency crisis in an emerging market would exacerbate a weak financial situation.¹³ Domestic borrowers, including banks, which obtain funds from abroad usually borrow in a foreign currency such as the dollar to give foreign investors some reassurance about the value of their investments. If a speculative attack against the domestic currency is successful, however, the cost of repaying debt denominated in a foreign currency rises. Domestic firms unable to repay their obligations may be forced to shut down, which brings about a slowdown in economic activity.

A domestic banking crisis is also intensified if it is accompanied by a “sudden stop,” i.e., an outflow of capital. Calvo and Reinhart (2000) point out that the incidence of nonperforming loans after an outflow as real interest rates rise due to higher country risk premiums. Banks subsequently cut back on their lending activity, which contributes to a protracted downturn. In an international crisis such as the Asian crisis, contagion may lead to the transmission of these shocks across borders.¹⁴

3. Data

We investigated the incidence of bank failures in a sample of 20 emerging markets over the period of 1976-2002. In choosing the countries to be included in the analysis, we used the Standard & Poor's Emerging Market Index, the Morgan Stanley Capital International Emerging Market Index and the IMF's International Capital Markets Department's list of emerging markets. The countries in our sample appeared on at least two of those three lists.¹⁵ The countries are Argentina, Brazil, Chile, Colombia, Egypt, Hungary, Indonesia, Israel, Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Sri Lanka, Thailand, Turkey, Venezuela and Zimbabwe.

Our data for bank crises comes from the data base first compiled by Caprio and Klingebiel (1996). The most recent versions of the data appear in Caprio, Klingebiel, Laeven and Noguera (2005) and Laeven and Valencia (2008). The latter authors also report the dates of the currency crises in our sample. For sudden stops we use the dates reported by Calvo, Izquierdo and Mejia (2004) and Frankel and Cavallo (2002).

Table 1 lists the years of systemic banking crises for each country in our sample. There are a total of 29 separate crises. Several countries had more than one crisis episode, with Argentina accounting for four. Figure 1 shows the number of countries with crises over each year of the sample period. It exhibits a rise during the debt crisis of the 1980s, and a subsequent decline towards the end of the decade. The number of crises rose again at the time of the Mexican crisis and then again during the Asian crisis.

For the panel analysis of the determinants of bank crises we relied on the past literature on banking crises, and in particular Demirgüç-Kunt and Detragiache's (2005) survey, for our choice of control variables.¹⁶ We include the rate of real GDP growth (YGR), which is expected

to lower the incidence of financial crises. The inflation rate (INF) is calculated as the natural log of one plus the change in the Consumer Price Index, which reflects macroeconomic volatility and should have the opposite effect. We lagged these domestic variables in order to minimize feedback from the crisis to the control variables.¹⁷ The data in the sample begin with observations in 1975. Our use of fixed effects in the estimation should account for institutional variables, such as the nature of the legal code, which change slowly (if at all) over time.

We also utilize the lagged values of several financial variables, including the ratio of broad money to the foreign exchange reserves of the central bank (M2/RES), which is an indicator of a country's vulnerability to a foreign sector crisis and could increase the probability of a banking crisis. We include bank credit to the private sector scaled by GDP (BCPS/Y) and the growth of bank credit to the private sector (BCPSGR), both of which reflect increased lending in the economy and could lead to banking crises. We also enter real GDP per capita (Y/POP) which has been negatively linked to banking crises in studies with data from both developed and developing economies.

We used measures of each country's actual trade or financial openness. We measure the former with the traditional measure of exports and imports scaled by GDP (XM/Y), and the latter by foreign assets and liabilities also scaled by GDP (FAL/Y). The latter measurement is based on the data of Lane and Milesi-Ferretti (2007), who assembled a dataset for the stocks of gross foreign assets and liabilities for 145 nations during the period of 1970-2004. We also used their data on foreign assets (FA/Y) and liabilities (FL/Y), and the components of the latter, foreign direct investment (FDIL/Y), portfolio equity (FPEL/Y) and debt investments (FDL/Y).

There is a difference between the two indicators of openness: the trade variable measures flows while the financial variables are stock measurements. Since asset totals reflect capital

flows over time, it is a better measurement of an economy's long-term financial integration. There is no corresponding stock of goods and services, since these are largely consumed in the year of purchase.

For a measure of *de jure* capital openness, we use the Chinn-Ito (2008a, 2008b) measure of capital controls (CAP). The Lane and Milesi-Ferretti data measure *de facto* financial integration, while the Chinn-Ito measure is based on the *de jure* regulatory environment in 182 countries over the period of 1970-2006. The index is based on data reported in the IMF's *Annual Report on Exchange Arrangements and Restrictions* on the existence of multiple exchange rates, restrictions on the current and capital accounts and requirements to surrender export proceeds. The Chinn-Ito index is the first principal component of these four indicators, and ranges from -1.8 in the case of full control to 2.6 in the case of complete liberalization.

In addition, we utilize the exchange rate regime classification developed by Reinhart and Rogoff (2004) to develop an indicator of fixed exchange rate regimes. Their classification system, which is based on market data rather than official statements, ranges from 1 for countries without a separate legal tender through various arrangements of pegs and crawling bands to freely floating rates, denoted by 13. There are separate categories for freely falling rates and dual markets with missing data. We defined FIX as an indicator for fixed exchange rates which takes the value of one if the Reinhart and Rogoff system indicates a pegged or crawling peg or band less than or equal to 2%.¹⁸ The most recent available data covers 165 countries from 1946-2007.

We also defined a contagion variable, CONTAG, which takes the value of unity when another country in the area of one with a banking crisis also has a crisis. The country groups used to calculate this variable, and the sources of the other data series, are reported in the Appendix. Table 2 reports the mean values of the variable and their standard deviations.

4. Determination of Banking Crises

In the panel estimations we were interested in the determinants of the onset of a banking crisis. Therefore, as the dependent variable we used a binary variable which took the value of one in the first year of a crisis. We deleted the following years of the crisis from the data, as well as the first year following the crisis, to minimize the impact of the crisis on the right-hand variables.

Studies of discrete events such as banking crises use logit or probit estimation models. If fixed effects are included and the number of countries is large relative to the number of total observations, then the estimation of the incidental parameters (the fixed effect coefficients) render the estimates of the coefficients of interest inconsistent.¹⁹ Therefore, we used a conditional logit model for the estimations. We include time dummies to account for year-specific shocks.

Table 3 reports the results of the estimation of the determinants of bank crises.²⁰ Equation 3.1 reports the results for the lagged control variables. The coefficient of real economic growth is negative, as expected, and significant at the 1% level. Bank crises are more likely to occur when the economy is slowing down. In addition, the amount of bank credit to the private sector has a positive effect on banking crises which is significant at the 5% level, consistent with the hypothesis that crises follow lending “booms.”²¹ The other lagged domestic coefficients, on the other hand, are not significant, which may in part reflect collinearity among the domestic variables.

The two indicators of trade and financial openness are added in equation 3.2. Neither is significant, and there is virtually no change in the pseudo R-squared. In equation 3.3 we replace lagged foreign assets and liabilities with lagged foreign assets scaled by GDP and foreign

liabilities scaled by GDP, since the two variables may have different impacts. The results are virtually the same as those in the previous equation.

However, the domestic credit variable is not significant in these equations or the following. This may be due to the presence of the financial globalization variables, since capital flows can finance part of the domestic credit growth. Mendoza and Terrones (2008) in their study of credit booms report: "...in emerging economies we find that over 50 percent of credit booms were preceded by large capital inflows."²²

In equation 3.4, we replace foreign liabilities with its three components each scaled by GDP: foreign direct investment, portfolio equity and debt (portfolio debt and other investments). The pseudo R-squared rises from 0.517 in the previous equation to 0.590. Foreign direct investment has a negative coefficient which is significant at the 5% level, while foreign debt liabilities has a positive coefficient also significant at the 5% level.

The type of foreign liability that a country incurs, therefore, has an impact on whether financial integration hinders or advances the incidence of banking crises. Foreign debt liabilities raise the probability of such a crisis, while foreign direct investment lessens its likelihood. The former result is consistent with other findings that link external debt to financial crises, such as those reported by Calvo (2007) and Rodrik and Velasco (2000). Our result for foreign direct investment suggests that it may promote short-run stability as well as long-term growth.

In Table 4, we extend our analysis to include the *de jure* capital openness regime. We include the two financial variables which were significant in the former table, foreign direct investment and foreign debt, with the control variables.

First, we add the Chinn-Ito measure of capital regulatory openness on a lagged basis. The coefficient in equation 4.1 is negative and significant at the 5% level, which implies that

countries with more open capital regimes are less likely to have bank crises. This may indicate that capital mobility induces governments to enact policies to forestall bank crises. The two *de facto* variables retain their significance.

This result differs from some of the papers reported in the Introduction of this paper. On the other hand, Figure 1 demonstrates that the largest number of crises occurred in the early 1980s, before the wave of capital deregulation that occurred in many of these countries. Moreover, this result is consistent with studies that find that countries with less restrictive capital controls are less prone to speculative currency attacks.²³

In the following equations we examined the interaction of the two types of financial openness. In equation 4.2 we added an interactive variable for foreign direct investment liabilities and regulatory openness, while we add a similar variable for foreign debt liabilities and regulatory openness in equation 4.3. In the first case, the interactive variable has a positive coefficient which is slightly above the 5% level of significance. This suggests that regulatory openness may give foreign firms flexibility to move their assets in the host country in ways that contribute to financial stability. On the other hand, the second interactive variable is not significant.

In equation 4.4 we added our indicator of fixed exchange rates based on the Reinhart-Rogoff measure of exchange rate flexibility. The coefficient of that variable is positive and significant at the 5% level, while the regulatory capital account variable is still negative and significant. Fixed exchange rate regimes are more likely to lead to bank crises.

Eichengreen and Arteta (2002) also studied the influence of exchange rate regime on banking crises, and reported that there was no stable association. Domaç and Martinez Peria (2003), on the other hand, found that adopting a fixed exchange rate lowered the probability of a

banking crisis in developing countries, and Honig (2006) reported a similar result. On the other hand, our result is consistent with the experience of Mexico in 1994-95 and East Asia in 1997-98.

In equation 4.5 we added the lagged contagion variable. This variable had a positive but insignificant coefficient. The capital account regulation variable remains negative and significant in these estimations, while the fixed exchange rate indicator falls in significance to 10%.²⁴

In three equations (4.1, 4.2 and 4.4), the coefficient on the trade openness variable is positive and significant at the 5% level, and is significant at the 10% level in the remaining two equations. This result differs from Frankel and Cavallo's (2004) finding that trade openness is associated with fewer currency crises and sudden stops. On the other hand, Easterly, Islam and Stiglitz (2000) find that trade openness contributes significantly to output volatility, while Bekaert, Harvey and Lundblad (2006) report evidence of a similar effect on consumption volatility.

The results for the determination of bank crises, therefore, indicate that a slowdown in economic growth precedes the outbreak of a banking crisis. There is also some evidence that an expansion of bank credit contributes to these crises. The evidence regarding financial openness is more mixed. Financial integration can lead to a higher probability of a crisis if the integration takes the form of debt liabilities, but foreign direct investment has the opposite effect. A more open capital account regulatory regime is associated with a lower likelihood of a banking crisis, while maintaining a fixed exchange rate has the opposite effect.

Bonfiglioli (2008) also investigated the linkages of *de jure* and *de facto* financial integration on the probability of a banking crisis. She found that *de jure* openness was not a significant determinant of systemic banking crises, although it was of borderline crises. *De facto*

integration as measured by the Lane and Milesi-Ferretti data had no impact on the incidence of these crises, although it affected currency crises.

Our results have an interesting similarity to those reported by Kose, Prasad and Terrones (2008) in their study of the impact of financial openness on total factor productivity (TFP) growth. They also used the Lane and Milesi-Ferretti data on foreign assets and liabilities, and they disaggregated foreign liabilities between FDI with portfolio equity as one variable and foreign debt liabilities as another. In their results they found that FDI and equity liabilities raised TFP growth while debt liabilities reduced it. They also investigated the impact of *de jure* openness, and when they used the Chinn-Ito measure found some evidence that it had a positive impact on TFP growth. Our results may provide an explanation for these findings, as we would expect bank crises to hinder productivity growth.

5. Duration of Crises

In addition to the likelihood of occurrence of bank crises, the external sector may also affect their duration. Figure 2 uses the data from Table 1 to show the distribution of the duration of the banking crises in our sample. Most crises lasted for more than one year, and the crisis with the longest duration—Mexico’s—continued for eleven years.

Duration models are used to analyze events with time horizons, such as spells of unemployment. In order to estimate duration models, a distribution of the data must be selected which determines the shape of the hazard function. Baseline exponential, Weibull, and log-logistic hazard functions were estimated, and ranked by the Akaike Information Criterion (AIC), where the preferred model is the one with lowest AIC value.²⁵ The Weibull has a lower AIC value than the exponential and log-logistic distributions, and this distribution was used in

estimating the hazard functions. Domaç and Martinez Peria (2003) also used the Weibull distribution in their duration models.

Table 5 reports the results of the estimation of the coefficients of the hazard function with *de facto* financial openness. A positive (negative) coefficient indicates that the hazard ratio rises (falls) and therefore the duration of a crisis falls (rises) as the variable increases in value. The control variables include lagged real growth, inflation, bank credit to the private sector relative to GDP, government consumption expenditures relative to GDP and trade openness. There was little evidence that any of these variables were significant, which may be due to the use of lagged values in this context. We also averaged these variables over two and three year periods before the crises took place and had similar results.

In equation 5.1, the coefficient of global financial integration is positive and highly significant. The positive sign indicates that banking crises end more quickly when a country has foreign assets and liabilities. The chi-squared statistic is below the 10% level of significance, however. When foreign assets and liabilities appear as separate variables in equation 5.2, both coefficients are positive at the 10% level. In equation 5.3, the three foreign liability variables are entered with foreign assets. The latter is insignificant, but foreign direct investment is significant at the 1% level, and the chi-squared statistic rises to the 5% level of significance. A country which has a larger stock of foreign direct investment liabilities will emerge from a banking crisis more quickly. The firms with foreign ownership may be able to resume operations more quickly than domestically-owned firms due to access to other financing opportunities, such as a foreign parent company.

In the following table, equation 6.1 introduces *de jure* capital openness, while retaining the foreign direct investment variable. The former has a negative coefficient, which increases the

duration of the crisis, and is significant at the 1% level. The more open regulatory regime may contribute to a slower resolution of the crisis by allowing residents to transfer their financial assets outside the country—capital flight—as happened in Asia during the 1997-98 crisis.²⁶

We tested the robustness of this result in the following estimations by introducing additional variables in the following equations. The exchange rate regime indicator is not significant in equations 6.2. In equation 6.3 we tested whether a banking crisis would have a shorter or longer duration if there was also a currency crisis. The currency crisis variable (CURCR) in equation 6.3 takes the value of one if there was such a crisis either the year before or during a banking crisis. There is no indication that a currency crisis has a systemic impact on the duration of a banking crisis. In equation 6.4 we undertake a similar test for the impact of sudden stops, using a variable (SUDST) constructed in the same fashion as the currency crisis variable. We obtain a comparable result, i.e., the sudden stop variable is not significant.

Finally, in equation 6.5 we tested whether a banking crisis which occurred after another crisis in the same region would affect the duration of the domestic crisis. We also introduced a variable (IMF) that indicated whether or not a country entered an IMF program during the bank crisis.²⁷ We found no evidence in support of these hypotheses. However, the coefficient on the *de jure* capital account is negative and significant in all these estimations.

To further test the robustness of our results, the model was also estimated using the partial likelihood estimation method of Cox (1972). This approach is often used to examine the effects of variables on a hazard rate without assuming a particular distribution. The estimates of the coefficients from this semiparametric estimation and their impact on the hazard ratios are consistent with the previous results, although in some cases at a lower level of significance.²⁸ The financial openness variable in equation 5.1, for example, is negative and significant at the

5% level, while the separate foreign asset and liability variables in equation 5.2 are no longer significant at the 10% level. However, foreign direct investment and the capital account regime indicator are always significant at the 5% or higher level of significance (with one exception for the *de jure* capital indicator).

The impact of financial globalization, therefore, on the duration of banking crises depends on the nature of the integration. Foreign direct investment in a country leads to a shorter crisis, but a more open regulatory regime has the opposite effect. The latter may reflect financial outflows once a crisis begins which exacerbate it. The occurrence of a currency crisis, a sudden stop or a crisis in another country, however, does not affect the length of time of a banking crisis.

6. Output Costs of Crises

The external sector may have an impact on the output costs of banking crises as well as their incidence and duration. There has been less research devoted to this aspect of crises. However, Demirgüç-Kunt and Detragiache (1998), Domaç and Martinez Peria (2003) and Hoggarth, Reis, and Saporta (2002) have investigated the determinants of the output losses.²⁹

The most recent estimates of the output losses of the banking crises are reported in Laeven and Valencia (2008). The authors compared trend GDP growth rate before the crisis with the actual growth rates during the crisis and computed the differences between the two rates over the first four years of the crisis as a percentage of trend GDP.³⁰ However, output losses were not reported for those crises where the trend growth rates were affected by other crises. There were output losses for 27 crises in our sample, which ranged from zero in five cases (Brazil 1994-1999, Chile 1976, Israel 1977-1983, Philippines 1997-2002, Turkey 1982-1985) to 92% in the case of Chile (1981-1983). Figure 3 shows the distribution of the losses.

Since there could not be an output loss lower than zero, Tobit models were used in the empirical analysis. Several domestic variables were included as controls, including output growth, inflation, the amount of bank credit to the private sector within the economy relative to GDP, government consumption scaled by GDP and the existence of deposit insurance.³¹ The right-hand macroeconomic variables were again lagged by one year to avoid endogeneity issues.

Table 7 presents the results of our analysis of the determinants of the output losses.³² The coefficient on inflation is negative and highly significant. This result reflects the impact of the data from Brazil, which had inflation rates of 1,431% and 1,928% in the years before its two banks crises but output costs of only 12.2% and 0%. If the two Brazilian observations are excluded from the data and the equation re-estimated, the coefficient is still negative but not significant.

The coefficient of the provision of bank credit to the private sector before a crisis is positive and is significant here and in subsequent equations. A lending boom by banks before the crisis imposes costs on the economy in the post-crisis period. This indicates that a larger increase in credit expansion contributes to an expansion in economic activity which contracts in the wake of the boom. Similarly, the IMF (2008) reported that the cumulative loss of output during an economic downturn is linked to the amount of corporate and household lending that preceded it.

Conversely, government consumption has a negative effect on the size of the output loss, which is significant at the 5% level. This result can be interpreted in several ways. More government spending implies that the government has more resources available to address the financial crisis. Government expenditures also affect the economy in the recovery phase by continuing to provide services while firms in the private sector are shrinking or shutting down.

Also, a larger government sector implies a smaller private sector, which limits the amount of economic distortion that the bank crisis can inflict.

In equation 7.2, financial openness is included. The trade variable, which had been insignificant, is negative and significant at the 10% level, which suggests that open economies suffer lower costs from a crisis. The financial sector as measured by foreign assets and liabilities scaled by GDP, however, is not significant.

When foreign assets and liabilities are included separately in equation 7.3, there is no change in the significance of the financial sector. The three components of foreign liabilities are used in equation 7.4. None of these variables is significant.

In Table 8, the indicators of *de jure* capital openness and the exchange rate regime are added. In equation 8.1 the capital account regime is not significant, nor is the exchange rate regime indicator in equation 8.2. The inflation, bank credit and government consumption variables, on the other hand, continue to be significant in all the equations, indicating that these domestic factors play an important role in determining the output loss of a banking crisis. The trade variable has a negative coefficient which is significant at the 10% level.

The currency crisis and sudden stop variables appear in equations 8.3 and 8.4, respectively. The currency crisis is highly significant in the first equation, while the trade variable rises in significance to the 5% level and the deposit insurance to the 1% level with a negative coefficient. But the sudden stop variable does not have a significant coefficient, and the deposit insurance variable fall in levels of significance in equation 8.4.³³ Finally, the currency crisis variable is again significant in equation 8.5, and the IMF program variable is positive and significant at the 10% level.

The costs of banking crises seem to depend largely on domestic conditions, and financial globalization does not play a direct role. These results are consistent with those reported in the recent IMF (2008) study on financial stress and economic downturns, as well as Laeven and Valencia's (2008) study of government policies to resolve banking crises. But there is evidence that costs rise when there is a currency crisis in addition to the banking crisis, and some evidence that trade openness lowers the cost.

7. Summary

Bank crises take place in emerging markets when there is a slowdown in output and when there has been a recent boom in bank lending to the private sector. But our results demonstrate these crises are not a purely domestic phenomenon, and the type of foreign liability a country incurs before a crisis also has an impact. Foreign direct investment within a country contributes to a smaller incidence of these crises, while bank crises are more likely to occur when a country has debt liabilities. A more open capital account regime lowers the likelihood of a bank crisis occurring.

The duration of a banking crisis is also affected by financial openness. While *de jure* capital account openness is linked to longer crises, foreign direct investment has the opposite effect. The output cost of a crisis, on the other hand, does not seem to respond to financial integration *per se*. The prior growth of domestic credit and the size of government expenditures do have an impact on the costs of these crises.

The effect of financial globalization, therefore, on domestic financial fragility is not a simple phenomenon. Opening the capital account confers benefits in terms of fewer banking crises. But an increase in debt which follows the opening of the capital account would have

adverse consequences, particularly if there is a fixed exchange rate. Foreign direct investment, on the other hand, both lowers the incidence of banking crises and shortens their duration.

The results of this research largely confirm the recommendations of recent studies of the optimal sequencing of capital account liberalization, such as those of Ishii and Habermeier (2002) and Prasad and Rajan (2008). These studies acknowledge that financial liberalization may leave a country more vulnerable to financial crises. They recommend that financial markets and institutions should be developed, prudential regulations enacted and macroeconomic stability achieved before capital flows are deregulated. Inflows of foreign direct investment should be liberalized first, followed by other long-term flows. Full liberalization of all capital inflows should follow an assessment of the impact of the deregulation that has taken place, and should be accompanied by monitoring of potential vulnerabilities in the financial sector.

NOTES

¹ Bank crises were, however, more frequent during the period of 1919-1939, which encompasses the Great Depression.

² Dobson and Hufbauer (2001), p. 68.

³ See Demirgüç-Kunt and Detragiache (2005) for a recent survey of this literature.

⁴ Domaç and Martinez Peria (2003) also studied the incidence, duration and costs of banking crises in their study of 87 countries during the period of 1980-1997.

⁵ For recent evidence see Aizenman, Pinto and Radziwill (2007).

⁶ Joyce and Nalbar (2009) present evidence on the effect of banking crises on investment.

⁷ See Kaminsky and Reinhart (1999).

⁸ See Gourinchas, Valdés and Landerretche (2001) and McKinnon and Pill (1996) on credit booms.

⁹ The rise may be precipitated by an increase in foreign interest rates. See Di Giovanni and Shambaugh (2008) and Frankel, Schmukler and Servén (2004) for evidence of these linkages.

¹⁰ See Stiglitz and Weiss (1981).

¹¹ Prasad et al. (2003) provide an overview of the potential benefits of financial globalization.

¹² See Claessens, Demirgüç-Kunt and Huizinga (2001) on the impact of foreign banks on domestic banking.

¹³ See Chang and Velasco (2000, 2001) for recent models of banking crises in open economies.

¹⁴ See Caramazza, Ricci and Salgado (2004), Claessens and Forbes (2001) and Kaminsky and Reinhart (2000) on the reasons for contagion.

¹⁵ Since we estimated models with fixed effects, we excluded countries such as Pakistan and South Africa that did not experience banking crises.

¹⁶ We did not include the real interest rate as these data are often not reported in merging markets. There were no interest data available for over 40% of our observations.

¹⁷ Among other researchers who used lagged values are Domaç and Martinez Peria (2003), Eichengreen and Arteta (2002) and von Hagen and Ho (2007). It is possible that the lagged values reflect expectations of future bank crises. But given the rapidity of financial events, it is unlikely that a bank crisis would not occur until the year following the change in expectations.

¹⁸ This definition corresponds to categories 1 through 8 in the Reinhart and Rogoff (2004) classification system.

¹⁹ See Chamberlain (1980).

²⁰ The estimated coefficients in a logistic regression measure the impact of a change in the independent variable on the odds ratio, i.e., the ratio of the probability of the occurrence of an event relative to the probability of its non-occurrence.

²¹ Kaminsky and Reinhart (1999) also find that financial crises are preceded by a slowdown in economic activity and an increase in credit relative to GDP.

²² Mendoza and Terrones (2008), p. 14.

²³ See Glick and Hutchison (2005) and Glick, Guo, and Hutchison (2006).

²⁴ Since currency crises and sudden stops are as likely to be affected by the right-hand variables in our model as are banking crises, we did not include them as determinants of the domestic crises. Moreover, Kaminsky and Reinhart (1999) show that banking crises generally precede currency crises. Glick and Hutchison (2001) and Noy (2004) confirm this result.

²⁵ $AIC = -2(\log \text{likelihood}) + \left(\frac{2}{\text{sample size}} \right) (\text{number of estimated parameters})$

²⁶ See Faucette, Rothenberg and Warnock (2005) on capital outflows.

²⁷ The interpretation of the variable would be ambiguous, as governments with longer bank crises might be more likely to adopt a Fund program.

²⁸ Results available from author.

²⁹ See Boyd, Kwak and Smith (2005) and Hutchison and Noy (2005) on the size of the output losses of banking crises.

³⁰ The authors acknowledge that estimates of output losses are dependent on the methodology and time period.

³¹ The deposit insurance data are obtained from Demirgüç-Kunt, Karacaovali and Laeven (2005).

³² The estimated coefficients are the marginal effects of a change in an independent variable on the unobservable latent variable.

³³ See Gupta, Mishra and Sahay (2007) on the impact of currency crises on output.

Table 1

CRISIS DATES AND OUTPUT LOSSES

<i>Country</i>	<i>Systemic Banking Crises (Output Loss as % of GDP)</i>
Argentina	1980-1982 (10.8), 1989-1990 (10.7), 1995 (7.1), 2001-2002 (42.7)
Brazil	1990 (12.2), 1994-1999 (0.0)
Chile	1976 (0.0), 1981-1983 (92.4)
Colombia	1982-1987 (15.1)
Egypt	1980-1983 (38.1)
Hungary	1991-1995
Indonesia	1997-2002 (67.9)
Israel	1977-1983 (0.0)
Korea	1997-2002 (50.1)
Malaysia	1997-2001 (50.0)
Mexico	1981-1991 (51.3), 1994-2000 (4.2)
Morocco	1980-1982 (29.8)
Peru	1983-1990 (25.5)
Philippines	1983-1987 (60.1), 1997-2002 (0.0)
Poland	1992-1995
Sri Lanka	1989-1993 (21.6)
Thailand	1983-1987 (9.4), 1997-2002 (97.7)
Turkey	1982-1985 (0.0), 2000-2002 (5.4)
Venezuela	1994-1995 (9.6)
Zimbabwe	1995-1996 (2.4)

Sources: Caprio, Klingebiel, Laeven and Noguera (2005), Laeven and Valencia (2008)

Note: Output losses are not available for all crises.

Table 2

SUMMARY STATISTICS

<i>Name</i>	<i>Mean</i>	<i>Standard Deviation</i>
BCPSGR	91.272	423.460
BC/Y	63.837	39.735
CAP	-0.318	1.376
CONTAG	0.521	0.500
FA/Y	23.911	17.286
FAL/Y	88.276	40.045
FDI/Y	11.383	11.615
FDL/Y	50.132	21.970
FIX	0.453	0.498
FL/Y	63.048	27.176
FPEL/Y	2.547	4.545
INF	0.282	0.502
M2/RES	377.084	3474.763
XM/Y	57.129	32.692
Y/POP	3402.859	3436.819
YGR	3.914	4.631

Table 3

DETERMINANTS OF BANK CRISES:
DE FACTO FINANCIAL INTEGRATION

	(3.1)	(3.2)	(3.3)	(3.4)
YGR(-1)	-0.216*** (0.082)	-0.201** (0.083)	-0.180** (0.087)	-0.202* (0.109)
INF(-1)	-1.350 (2.633)	-1.175 (2.545)	-1.151 (2.422)	-3.188 (3.176)
M2/RES(-1)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.001)
BCPS/Y(-1)	0.036** (0.018)	0.027 (0.020)	0.023 (0.021)	-0.020 (0.031)
BCPSGR(-1)	0.010 (0.011)	0.010 (0.010)	0.009 (0.009)	0.018 (0.014)
Y/POP(-1)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001 (0.001)
XM/Y(-1)	-	0.011 (0.027)	0.009 (0.027)	0.055 (0.043)
FAL/Y(-1)	-	0.024 (0.020)	-	-
FA/Y(-1)	-	-	-0.028 (0.052)	0.024 (0.060)
FL/Y(-1)	-	-	0.053 (0.033)	-
FDIL/Y(-1)	-	-	-	-0.274** (0.130)
FPEQ/Y(-1)	-	-	-	0.134 (0.113)
FDL/Y(-1)	-	-	-	0.118** (0.056)
χ^2	70.36***	72.91***	74.19***	81.06***
Pseudo-R ²	.490	0.508	0.517	0.590
Observations	357	357	357	337

Note: Equations estimated with conditional logit and time dummies. Constants not reported. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4

DETERMINANTS OF BANK CRISES:
DE JURE CAPITAL ACCOUNT REGIME

	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)
YGR(-1)	-0.264** (0.124)	-0.335** (0.168)	-0.272** (0.131)	-0.317** (0.145)	-0.345** (0.155)
INF(-1)	-5.961 (3.787)	-7.597 (4.786)	-6.406 (4.357)	-5.467 (3.686)	-6.020 (3.801)
M2/RES(-1)	-0.001 (0.001)	-0.000 (0.002)	-0.001 (0.001)	-0.001 (0.002)	-0.001 (0.002)
BCPS/Y(-1)	-0.012 (0.026)	-0.031 (0.030)	-0.014 (0.028)	-0.024 (0.027)	-0.021 (0.027)
BCPSGR(-1)	0.024 (0.015)	0.036* (0.020)	0.025 (0.017)	0.023 (0.014)	0.024 (0.014)
Y/POP(-1)	0.001 (0.000)	0.001 (0.001)	0.001 (0.000)	0.001 (0.001)	0.001 (0.001)
XM/Y(-1)	0.085** (0.042)	0.134** (0.065)	0.090* (0.049)	0.096** (0.046)	0.091* (0.046)
FDIL/Y(-1)	-0.258** (0.128)	-0.440** (0.209)	-0.270* (0.139)	-0.373** (0.156)	-0.372** (0.159)
FDL/Y(-1)	0.105** (0.044)	0.114** (0.056)	0.107** (0.045)	0.145*** (0.054)	0.144*** (0.055)
CAP(-1)	-1.277** (0.584)	-2.378*** (0.921)	-1.521 (1.263)	-2.157*** (0.817)	-2.265** (0.886)
FDIL/Y(-1)*CAP(-1)	-	0.115* (0.059)	-	-	-
FDL/Y(-1)*CAP(-1)	-	-	0.005 (0.021)	-	-
FIX(-1)	-	-	-	2.850** (1.448)	2.771* (1.482)
CONTAG(-1)	-	-	-	-	-0.904 (1.340)
χ^2	86.00***	91.97***	86.04***	90.81***	91.28***
Pseudo-R ²	0.627	0.670	0.627	0.662	0.665
Observations	338	338	338	338	338

Note: See Table 3.

Table 5

DETERMINANTS OF DURATION OF BANK CRISES:
DE FACTO FINANCIAL INTEGRATION

	(5.1)	(5.2)	(5.3)
YGR(-1)	-0.026 (0.061)	-0.027 (0.062)	-0.092 (0.060)
INF(-1)	0.447 (0.440)	0.438 (0.448)	0.551 (0.434)
BCPSY(-1)	-0.006 (0.009)	-0.006 (0.009)	-0.007 (0.009)
GC/Y(-1)	-0.017 (0.031)	-0.018 (0.032)	-0.051 (0.037)
XM/Y(-1)	-0.018 (0.013)	-0.018 (0.013)	-0.002 (0.013)
FAL/Y(-1)	0.034*** (0.013)	-	-
FA/Y(-1)	-	0.036* (0.019)	0.026 (0.020)
FL/Y(-1)	-	0.033* (0.018)	-
FDIL/Y	-	-	0.088*** (0.033)
FPEL/Y	-	-	-0.094 (0.071)
FDL/Y(-1)	-	-	0.014 (0.018)
χ^2	10.57	10.58	17.37**
Observations	28	28	27

Note: The dependent variable is the duration in years of each bank crisis. All explanatory variables are lagged by one period. Equations estimated with Weibull distribution for hazard function. Constants not reported. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6

DETERMINANTS OF DURATION OF BANK CRISES:
DE JURE CAPITAL ACCOUNT REGIME

	(6.1)	(6.2)	(6.3)	(6.4)	(6.5)
YGR(-1)	-0.016 (0.068)	0.026 (0.077)	-0.042 (0.070)	-0.001 (0.065)	0.006 (0.071)
INF(-1)	-0.038 (0.463)	-0.395 (0.541)	0.165 (0.496)	-0.042 (0.506)	-0.007 (0.459)
BCPS/Y(-1)	-0.009 (0.010)	-0.008 (0.011)	-0.011 (0.011)	-0.012 (0.011)	-0.009 (0.010)
GC/Y(-1)	-0.002 (0.035)	-0.003 (0.035)	-0.004 (0.036)	0.062 (0.069)	-0.009 (0.034)
XM/Y(-1)	-0.017 (0.011)	-0.025* (0.013)	-0.016 (0.012)	-0.015 (0.012)	-0.023* (0.012)
FDIL/Y(-1)	0.120*** (0.037)	0.144*** (0.042)	0.118*** (0.037)	0.118*** (0.037)	0.154*** (0.046)
CAP(-1)	-0.556*** (0.190)	-0.613*** (0.200)	-0.659*** (0.216)	-0.582** (0.243)	-0.787*** (0.275)
FIX(-1)	-	-0.757 (0.604)	-	-	-
CURCR	-	-	0.709 (0.578)	-	-
SUDST	-	-	-	0.107 (0.590)	-
CONTAG(-1)	-	-	-	-	-0.149 (0.473)
IMF	-	-	-	-	0.836 (0.753)
χ^2	16.75**	18.22**	18.24**	17.03**	18.48**
Observations	28	28	28	27	28

Note: See Table 5.

Table 7

DETERMINANTS OF OUTPUT COSTS OF BANK CRISES:
DE FACTO FINANCIAL INTEGRATION

	(7.1)	(7.2)	(7.3)	(7.4)
YGR(-1)	0.170 (1.187)	0.680 (1.364)	0.849 (1.338)	0.856 (1.303)
INF(-1)	-32.972*** (9.110)	-31.389*** (9.197)	-30.266*** (9.045)	-31.178*** (8.755)
BCPS/Y(-1)	0.496*** (0.172)	0.472** (0.173)	0.475** (0.169)	0.546*** (0.169)
GC/Y(-1)	-2.730** (1.224)	-2.797** (1.222)	-2.923** (1.213)	-2.835** (1.173)
DEPINS	-0.367* (0.190)	-18.305* (10.299)	-16.314 (10.276)	-8.699 (11.020)
XM/Y(-1)	-16.445 (10.090)	-0.486* (0.248)	-0.519** (0.245)	-0.247 (0.301)
FAL/Y(-1)	-	0.170 (0.230)	-	-
FA/Y(-1)	-	-	-0.104 (0.379)	-
FL/Y(-1)	-	-	0.376 (0.321)	-
FDIL/Y(-1)	-	-	-	0.844 (0.601)
FPEL/Y(-1)	-	-	-	-1.989 (1.485)
FDL/Y(-1)	-	-	-	0.102 (0.363)
χ^2	24.94***	25.48***	26.27***	27.82***
Pseudo-R ²		0.114	0.118	0.130
Observations	26	26	26	25

Note: The dependent variable is the cumulative output loss of the bank crisis. All explanatory variables are lagged by one period. All equations estimated with Tobit model. Constants not reported. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 8

DETERMINANTS OF OUTPUT COSTS OF BANK CRISES:
DE JURE CAPITAL ACCOUNT REGIME

	(8.1)	(8.2)	(8.3)	(8.4)	(8.5)
YGR(-1)	0.252 (1.220)	0.463 (1.302)	-0.100 (1.012)	0.695 (1.183)	1.003 (1.074)
INF(-1)	-33.957*** (9.683)	-36.284*** (10.756)	-25.637*** (8.334)	-30.607*** (9.224)	-19.740** (8.057)
BCPS/Y(-1)	0.501*** (0.173)	0.527*** (0.181)	0.398** (0.146)	0.423** (0.168)	0.398*** (0.134)
GC/Y(-1)	-2.876** (1.321)	-2.846** (1.315)	-3.409*** (1.121)	-2.817** (1.249)	-3.163*** (1.031)
DEPINS	-16.633 (10.122)	-15.785 (10.282)	-26.436*** (8.908)	-20.546* (9.762)	-25.495*** (8.441)
XM/Y(-1)	-0.380* (0.195)	-0.406* (0.203)	-0.398** (0.161)	-0.426** (0.186)	-0.301* (0.151)
CAP(-1)	-1.144 (3.710)	-0.510 (3.896)	-2.562 (3.104)	-4.329 (3.943)	-4.592 (2.930)
EXR(-1)	-	-6.297 (12.249)	-	-	-
CURCR	-	-	28.085*** (8.770)	-	25.139*** (7.946)
SUDST	-	-	-	18.401 (10.601)	-
CONTAG(-1)	-	-	-	-	6.639 (7.088)
IMF	-	-	-	-	21.207* (9.969)
χ^2	25.04***	23.30***	33.45***	24.70***	35.08***
Pseudo-R ²	0.112	0.114	0.150	0.112	0.160
Observations	26	26	26	25	25

Note: See Table 7.

Figure 1

Systemic Crises Per Year, 1976-2002

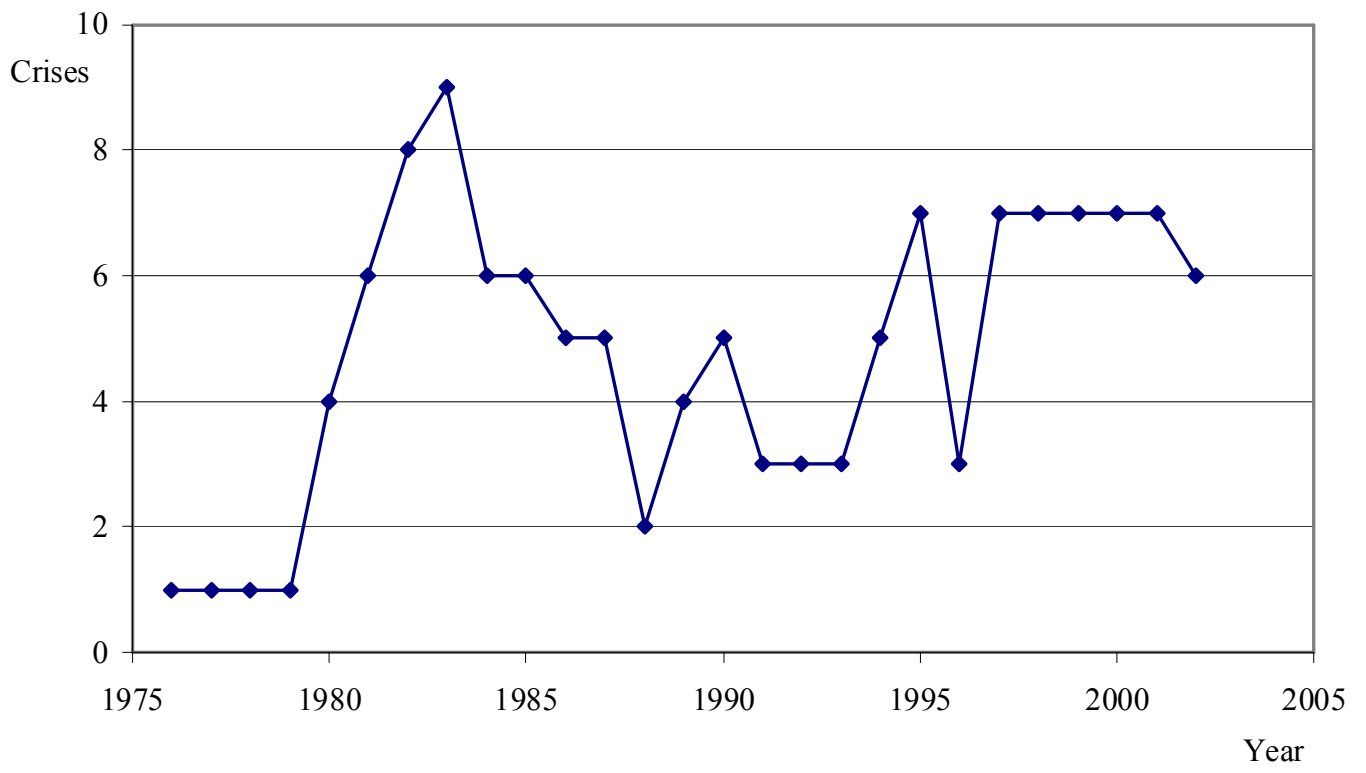


Figure 2
Duration of Banking Crises

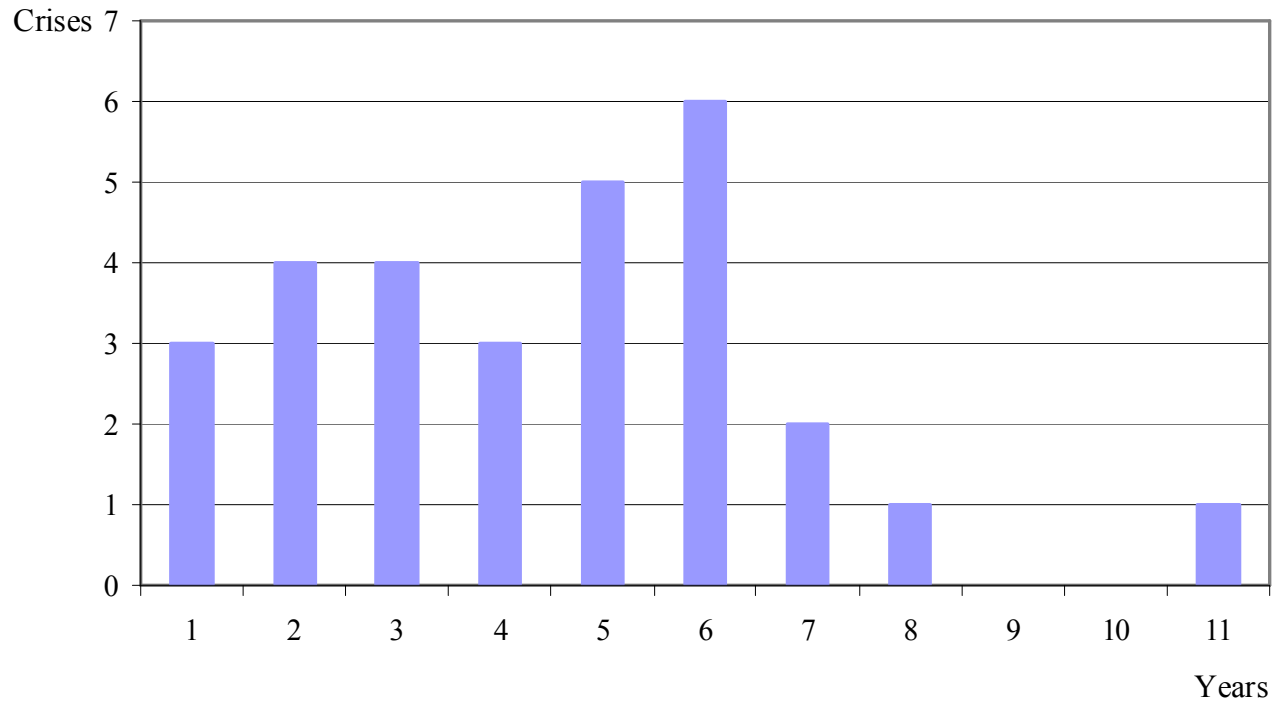
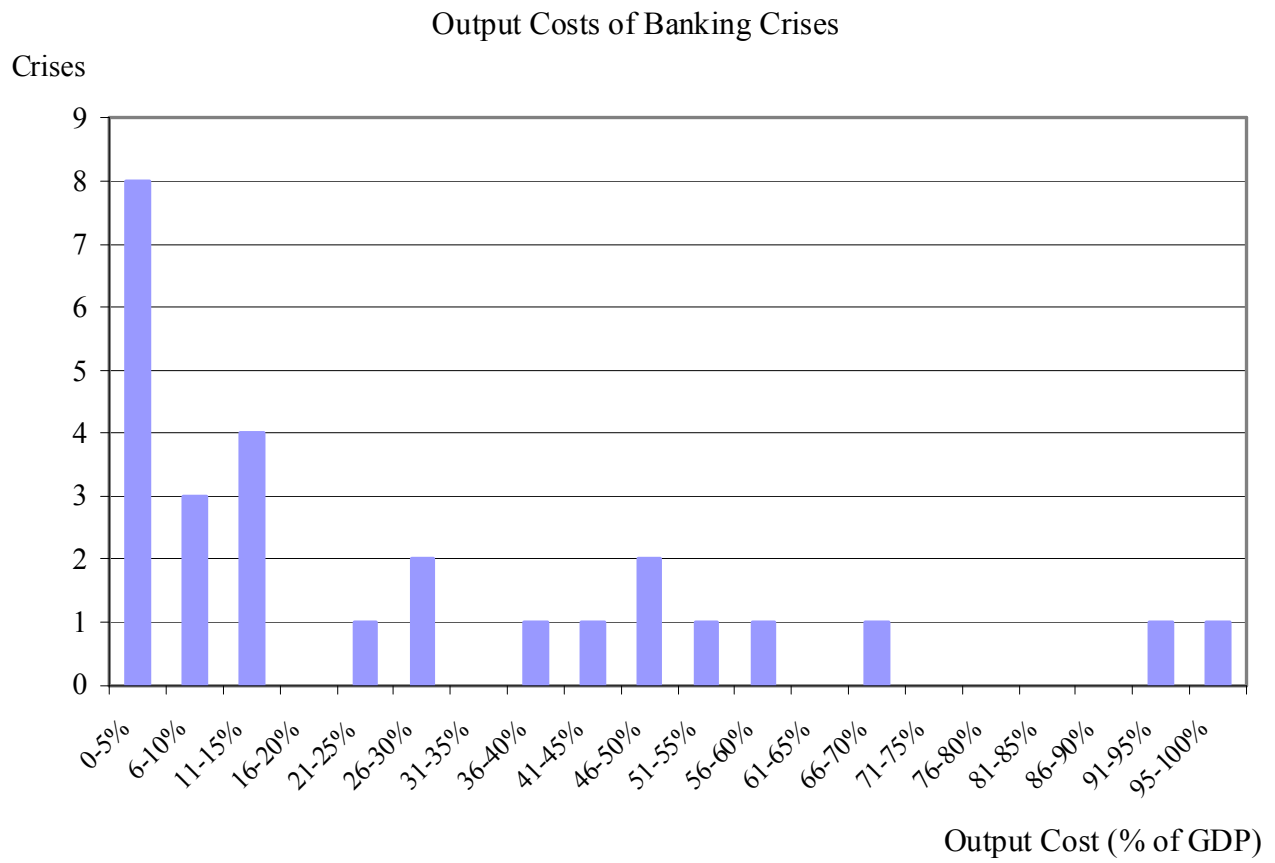


Figure 3



Appendix

Data Sources

<i>Variable Symbol</i>	<i>Variable Definition</i>	<i>Source</i>
BCPSGR	Banking Institutions' Claims on Private Sector Growth Rate (%)	<i>International Financial Statistics</i> , line 32D
BC/Y	Banking Sector Credit (% of GDP)	<i>World Development Indicators</i>
CAP	Chinn-Ito Financial Openness	Chinn and Ito (2007, 2008), http://web.pdx.edu/~ito/
CURCR	Currency Crisis	Laeven and Valencia (2008)
DEPINS	Deposit Insurance	Demirgüç-Kunt, Karacaovali and Laeven. (2005)
EXR	Reinhart-Rogoff Exchange Rate Classifications	http://www.wam.umd.edu/~creinhar/
INF	Natural log of (1 + CPI Growth Rate)	<i>World Development Indicators</i>
FAL/Y	Foreign Assets and Liabilities (% of GDP)	Lane and Milesi-Ferretti (2007),
FL/Y	Foreign Liabilities (% of GDP); FDI	http://www.imf.org/external/pubs/ft/wp/2006/data/wp0669.zip
FDIL/Y	Liabilities (% of GDP); Portfolio Equity	
FPEL/Y	Liabilities (% of GDP); Foreign Debt	
FDL/Y	Liabilities (% of GDP)	
GC/Y	Government consumption expenditures (% of GDP)	<i>World Development Indicators</i>
M2/RES	Money and Quasi-money (% of Reserves)	<i>World Development Indicators</i>
SUDST	Sudden Stop	Calvo, Izquierdo and Mejia (2004), Frankel and Cavallo (2002)
XM/Y	Trade (% of GDP)	<i>World Development Indicators</i>
Y/POP	GDP per capita (constant 2005 dollars)	<i>World Development Indicators</i>
YGR	GDP Growth Rate (%)	<i>World Development Indicators</i>

Note: *International Financial Statistics* in the online database of the IMF.
World Development Indicators is the online database of the World Bank.

The regions used to construct CONTAG were: Western Hemisphere (Argentina, Brazil, Chile, Columbia, Mexico, Peru, Venezuela); Middle East and Africa (Egypt, Israel, Morocco, Turkey, Zimbabwe); Eastern Europe (Hungary, Poland); Asia (Indonesia, South Korea, Malaysia, Philippines, Sri Lanka, Thailand).

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