

# **Financial Liberalization and Financial Fragility**

by

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## **Abstract**

The paper studies the empirical relationship between banking crises and financial liberalization in a panel of 53 countries for the period 1980-95. We find that banking crises are more likely to occur in liberalized financial systems. However, the impact of financial liberalization on banking sector fragility is weaker where the institutional environment is strong. In particular, respect for the rule of law, a low level of corruption, and good contract enforcement are relevant institutional characteristics. We also examine evidence on the behavior of bank franchise values after liberalization, and on the relationship among financial liberalization, banking crises, financial development, and growth. Our results support the view that financial liberalization should be approached cautiously where the institutions necessary to ensure law and contract enforcement and effective prudential regulation and supervision are not fully developed, even if macroeconomic stabilization has been achieved.

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## 1. Introduction

In the last three decades several developed and developing countries have moved towards liberalization of their financial system. Countries eased or lifted bank interest rate ceilings, lowered compulsory reserve requirements and entry barriers, reduced government interference in credit allocation decisions, and privatized many banks and insurance companies. Also, some countries actively promoted the development of local stock markets, and encouraged entry of foreign financial intermediaries.

Generally, the trend towards financial liberalization is part of a broader trend towards reduced direct intervention of the state in the economy. In a number of developing countries, however, financial liberalization is also a deliberate attempt to move away from “financial repression” as a policy to fund government fiscal imbalances and subsidize priority sectors, a move strongly advocated by the influential work of McKinnon (1973) and Shaw (1973).

According to McKinnon and Shaw, financial repression, by forcing financial institutions to pay low and often negative real interest rates, reduces private financial savings, thereby decreasing the resources available to finance capital accumulation. From this perspective, through financial liberalization developing countries can stimulate domestic savings and growth, and reduce excessive dependence on foreign capital flows.<sup>1</sup>

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<sup>1</sup> Empirical research on the relationship between interest rates and savings in countries that liberalize financial markets has generally failed to find clear evidence of a significant and

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sizable positive correlation. This failure is generally attributed to the strong positive wealth effect of interest rate increases (see Fry, 1997, for a survey). However, empirical studies tend to support the proposition that moderately positive real interest rates have a positive effect on growth (see, among others, Roubini and Sala-i-Martin, 1992 and Bandiera and others, 1997).

The work of McKinnon and Shaw also stimulated a fast-growing strand of research that analyzes how financial development can stimulate economic growth by accelerating productivity growth rather than through saving mobilization (see Levine, 1997, for a survey).<sup>2</sup> This research includes a number of empirical studies on the relationship between financial development and growth; most studies find various measures of financial development to be

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<sup>2</sup> Financial markets allow agents to diversify and hedge risk, thereby making high-risk, high-return investments attractive to investors; financial markets also allow the pooling of liquidity risk, as in Diamond and Dybvig (1983); stock markets disseminate information over corporate values (although -- if information revelation is too extensive this may actually make incentives for information collection too low, as argued by Stiglitz, 1985), and allow the market for corporate control to emerge. Financial intermediaries, such as banks, make savings available to entrepreneurs who may lack own resources to finance investment and technology acquisition; they also screen and monitor loan applicants, thereby improving the allocation of resources. By exploiting economies of scale, intermediaries can also make saving mobilization more efficient (Levine, 1997).

positively correlated with both contemporaneous and future growth rates of GDP, suggesting that financial liberalization, by fostering financial development, can increase the long-run growth rate of the economy (King and Levine, 1993).

This positive view of financial liberalization, however, is somewhat clouded by the marked increase in financial fragility experienced by both developed and developing countries in the 1980s and 1990s. Particularly, banking sectors around the world were hit by a remarkable number of problems, some of which erupted in full-fledged systemic crises as documented in the extensive studies of Caprio and Kliengebiel (1995) and Lindgren, Garcia, and Saal (1996). In a number of cases, for example in Chile in 1981, banking sector problems emerged shortly after the financial sector was deregulated.<sup>3</sup> These experiences suggest that the benefits of financial liberalization may have to be weighed against the cost of increased financial fragility, and some prominent voices in the policy debate have taken the view that some degree of financial regulation is preferable to premature liberalization in developing countries (Caprio and Summers, 1993, Stiglitz, 1994).

While the link between financial development and economic growth has been documented through careful empirical studies, the connection between financial liberalization and financial fragility has not been the object of systematic econometric investigation so far. This paper is an attempt to fill this gap. Building upon our previous research on the determinants of banking crises (Demirgüç-Kunt and Detragiache, 1997), we construct a financial liberalization dummy variable for a large number of developed and developing

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<sup>3</sup> The Chilean experience, which shares many features with the current East Asian crises, is analyzed in Diaz-Alejandro (1985). Other case studies of banking crises are presented in Sundararajan and Baliño (1991), Drees and Pazarbaşıoglu (1995), and Sheng (1995)

countries during 1980-95. To date liberalization we choose an observable policy change, namely the deregulation of bank interest rates, since case studies indicate that this is often the centerpiece of the overall liberalization process. The data set encompasses countries that liberalized financial markets well before the 1980s as well as countries that liberalized at different dates during the sample period. Using a multivariate logit framework, we test whether banking crises are more likely to occur in liberalized financial systems when other factors that may increase the probability of a crisis are controlled for. The set of control variables includes macroeconomic variables, characteristics of the banking sector, and institutional variables. We also test whether crises are more likely to occur during the transition to a less controlled financial system, or if fragility is a permanent feature of liberalization.

Another issue often raised in the debate over financial liberalization is whether the dangers of liberalization are greater in countries where the institutions needed to support the efficient functioning of financial markets are not well developed. Such institutions include effective prudential regulation and supervision of financial intermediaries and of organized security exchanges, and a well-functioning mechanism to enforce contracts and regulations. We investigate this issue by testing whether the relationship between banking crises and liberalization is stronger in countries with weaker institutional environments, as proxied by GDP per capita and various indexes of institutional quality. Finally, we subject our results to a variety of robustness checks.

The general result is that banking crises are indeed more likely to occur in countries with a liberalized financial sector, even when other factors (including the real interest rate) are controlled for; furthermore, increased banking sector fragility is not a characteristic of the

immediate aftermath of liberalization; rather, it tends to surface a few years after the liberalization process begins. The data also support the conjecture that a weak institutional environment makes liberalization more likely to lead to a banking crisis; specifically, in countries where the rule of law is weak, corruption is widespread, the bureaucracy is inefficient, and contract enforcement mechanisms are ineffective financial liberalization tends to have a particularly large impact on the probability of a banking crisis. Thus, there is clear evidence that financial liberalization has costs in terms of increased financial fragility especially in developing countries, where the institutions needed to support a well-functioning financial system are generally not well-established.

To explore a possible channel through which liberalization may affect bank fragility, we use bank level data to examine the correlation between variables proxing bank franchise values and the financial liberalization dummy variable. We find evidence that franchise values tend to be lower when financial markets are liberalized, possibly because bank monopolistic power is eroded. This suggests that theories attributing increased moral hazard to low bank franchise value may help explain why financial liberalization tends to make banking crises more likely (Caprio and Summers, 1993, and Hellman, Murdock and Stiglitz, 1994).

These findings raise the question of whether the many benefits of financial liberalization highlighted in the literature may not be offset by the costs in terms of greater vulnerability to banking crises. A rigorous answer to this complex question is beyond the scope of this paper. Nonetheless, using our data set we attempt to throw some light on one particular aspect of the issue, namely the effect of financial liberalization and banking crises on financial development and growth. First, we show that financial development is positively correlated with output growth in our sample, confirming the results of King and Levine

(1993). Second, we find that, conditional on no banking crisis, countries/time periods in which financial markets are liberalized have higher financial development than countries/time periods in which markets are controlled. However, countries/time periods with both financial liberalization and a banking crisis have approximately the same level of financial development as countries/time periods with neither, so that the net effect on growth through financial development is not significantly different from zero.

To explore this issue further, we split the sample between countries that were financially repressed at the time of liberalization and countries that were financially restrained, where the state of financial repression (restraint) is identified by the presence of negative (positive) interest rates in the period before liberalization. The same tests described above are then performed for the two subsamples. For the restrained group, the results resemble those for the whole sample. In contrast, for the repressed group financial liberalization is accompanied by higher financial development even if a banking crisis also takes place. These findings suggest that financial liberalization is likely to have a positive effect on growth through financial development in countries characterized by financial repression, even if it increases financial fragility.

The paper is organized as follows: the next section reviews the mechanisms through which financial deregulation may increase banking sector fragility. Section 3 describes the data set and explains the methodology used in the empirical tests. Section 4 contains the main results, while Section 5 summarizes the outcome of various sensitivity tests. Section 6 discusses the relationship between liberalization and bank franchise value. Section 7 discusses the effects of financial liberalization and banking crises on financial development and growth. Finally, Section 8 concludes.

## 2. Theory

While the focus of this paper is primarily empirical, to put the empirical results in perspective it is useful to briefly review some of the theoretical reasons why a liberalized banking system may be more vulnerable to crises.

In tightly controlled financial systems, bank lending interest rates are usually subject to ceilings, which make it impossible for banks to charge high risk premia. Thus, loans to high risk customers cannot be profitable. As ceilings are lifted during financial liberalization, it becomes possible for banks to finance riskier ventures in return for a higher promised return. Indeed, one of the benefits of financial liberalization is that socially desirable high-risk, high-return projects will find the necessary financing.<sup>4</sup> If loan-specific risk is hedged by holding a well-diversified portfolio, then financing riskier loans need not increase the risk of bank insolvency nor, at an aggregate level, the risk of a systemic banking crisis. However, portfolios of risky loans, even if they are well-diversified, are typically still vulnerable to the risk of economy-wide adverse shocks (such as a recession). Also, managing the risk of a bank loan portfolio is a complex task, and bank staff trained in a tightly regulated financial system may not have the skills and experience necessary. Evaluation of risky investment projects and monitoring of the borrower during the life of the loan also require skills that may be in short supply in a banking system where lending to the government and collateral-based private

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<sup>4</sup> In some countries, the authorities may explicitly forbid commercial banks from entering certain segments of the credit market that are deemed excessively risky, such as credit to security dealers. Such restrictions are sometimes relaxed as part of the liberalization process.

lending were the primary activities for many years. Such skills may also be difficult to import from abroad.

In a liberalized financial system where interest rates are market-determined, nominal interest rates are likely to be more variable than in a controlled one (although real rates may not be)<sup>5</sup>; since one of the functions of banks as financial intermediaries is to “transform” short-term liabilities (deposits) into long-term assets (business and consumer loans), banks are exposed to the risk of an increase in nominal interest rates, and may become more vulnerable in an environment where interest rates are more volatile. Also, when liberalization takes place before a well-developed interbank market develops, banks may find it difficult to deal with temporary liquidity shortages, unless the central bank is ready to step in. Liquidity problems at an individual bank may spread to other banks and become a panic when agents are imperfectly informed, as described by Chari and Jagannathan (1988).

Since liberalization increases the opportunity for banks to take on risk, any mechanism that may prevent bank managers from appropriately evaluating the downside risk of their lending decisions becomes especially dangerous. Clearly, limited liability is such a mechanism. The presence of implicit or explicit government guarantees to depositors and/or other bank claimholders makes moral hazard even more dangerous. As emphasized by Caprio and

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<sup>5</sup> This problem is exacerbated if financial liberalization takes place before macroeconomic stabilization, as emphasized by McKinnon (1993).

Summers (1993) and Hellmann, Murdock and Stiglitz, (1994), another factor that may contribute to moral hazard is the erosion of bank franchise value due to the removal of ceilings on deposit interest rates and to the reduction of other barriers to entry: as monopolistic profits disappear due to increased bank competition, the cost of losing a banking license when the bank becomes insolvent is reduced, and incentives to choose a riskier loan portfolio increase. Unless these perverse incentives are controlled through effective prudential regulation and supervision, increased risk taking due to moral hazard can become a powerful source of financial fragility, as demonstrated in numerous banking crisis episodes.

In many countries financial liberalization was accompanied by the reduction or removal of controls on international capital movements. This process opened the way for the newly liberalized financial intermediaries to take on yet another type of risk, foreign exchange risk, by raising funds in foreign currency on international markets and lending them to local borrowers. Prudential limits on foreign currency exposure were often circumvented in various ways, or currency risk was transformed into credit risk by lending in foreign currency to unhedged domestic borrowers; not surprisingly, currency crises often preceded or accompanied banking crises (Kaminsky and Reinhart, 1996).

To summarize, financial liberalization, by giving banks and other financial intermediaries more freedom of action, increases the opportunities to take on risk. This tends to increase financial fragility, but it is not necessarily bad for the economy, as high-risk, high-returns investment projects may dominate low risk-low return ventures. However, because of limited liability compounded with other forms of implicit and explicit guarantees, bankers' appetite for risk is likely to be far greater than what is socially desirable. If prudential regulation and supervision are not effective at controlling bank behavior and at realigning

incentives, liberalization may increase financial fragility well above what is socially desirable. Also, to the extent that the skills to screen and monitor risky borrowers and to manage a risky loan portfolio, as well as the skills to perform efficient supervision, can only be acquired gradually and through “learning-by-doing”, banks in newly liberalized systems are likely to be more vulnerable.

All these considerations suggest that, other things being equal, the risk of bank insolvency and, more generally, of systemic banking crises may be greater in liberalized financial systems. In the next section, we perform an econometric test of various aspects of this linkage.

### **3. Data and Methodology**

#### The Sample

To select which countries to include in the panel, we began with all the countries in the *International Financial Statistics* of the IMF except for centrally planned economies and economies in transition. To obtain a sufficiently large number of time series, we decided to limit our study to the 1980-95 period; as will be shown below, this period includes a substantial number of banking crises and of financial liberalization episodes, so that the data set is sufficiently rich for the purposes of our investigation.<sup>6</sup> Some countries had to be eliminated because of missing data, or because we could not find sufficient information on financial liberalization. A few countries were left out because their banking systems were in a state of chronic distress for the entire period under consideration, and it was therefore

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<sup>6</sup> Due to lack of data, for some countries the observations included in the panel do not cover the entire 1980-95 period.

impossible to pinpoint a specific subperiod as a banking crisis period. Finally, two countries (Argentina, and Bolivia) were excluded because they are outliers with respect to two of the regressors that we use (inflation and the real interest rate).<sup>7</sup> This process of elimination left us with 53 countries in the baseline specification (see Table 1).

### A Multivariate Logit Model

To identify the impact of financial liberalization on financial fragility we estimate the probability of a banking crisis using a multivariate logit model, and we test the hypothesis that a dummy variable capturing whether the financial system is liberalized or not significantly increases the probability of a crisis when other factors are controlled for. Accordingly, our dependent variable, the banking crisis dummy, is equal to zero if there is no banking crisis, and it is equal to one if there is a crisis. The probability that a crisis will occur at a particular time in a particular country is hypothesized to be a function of a vector of  $n$  variables  $X(i, t)$  including the financial liberalization dummy variable and  $n-1$  control variables. Let  $P(i, t)$

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<sup>7</sup> If the outliers are introduced in the panel, the results do not change much, except that the estimated coefficient for inflation and the real interest rate become smaller. Peru also had a hyperinflation during the sample period, but the hyperinflation years are excluded from the panel because of missing data.

denote a dummy variable that takes the value of one when a banking crisis occurs in country  $i$  and time  $t$  and a value of zero otherwise.  $\beta$  is a vector of  $n$  unknown coefficients and  $F(\beta'X(i, t))$  is the cumulative probability distribution function evaluated at  $\beta'X(i, t)$ . Then, the log-likelihood function of the model is:

$$\ln L = \sum_{t=1..T} \sum_{i=1..n} \{P(i,t) \ln[F(\beta'X(i,t))] + (1-P(i,t)) \ln[1 - F(\beta'X(i,t))]\}.$$

To model the probability distribution function  $F$  we use the logistic functional form, thus the estimated coefficients do not indicate the increase in the probability of a crisis given a one-unit increase in the corresponding explanatory variables as in standard linear regression models. Instead, the coefficients capture the effect of a change in an explanatory variable on  $\ln(P(i,t)/(1-P(i,t)))$ . Therefore, while the sign of the coefficient does indicate the direction of the change, the magnitude depends on the slope of the cumulative distribution function at  $\beta'X(i,t)$ .

After the onset of a banking crisis, the behavior of some of the explanatory variables is likely to be affected by the crisis itself; since these feed-back effects would muddle the estimation, years in which banking crises are under way are eliminated from the panel.<sup>8</sup> Also, the probability that a crisis occurs in a country that had problems in the past is likely to differ from that of a country where no crisis ever occurred. To take this dependence into account,

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<sup>8</sup> See Section 5 on sensitivity analysis for alternative approaches.

we include different additional regressors in the estimated equations such as the number of past crises, the duration of the last spell, and the time since the last crisis.

### The Banking Crisis Variable

To construct a banking crisis dummy variable, we have identified and dated episodes of banking sector distress during the period 1980-95 using primarily two recent studies, Caprio and Klingebiel (1996), and Lindgren, Garcia, and Saal (1996). For an episode of distress to be classified as a full-fledged crisis, we established -- somewhat arbitrarily -- that at least one of the following conditions must apply: the ratio of non-performing assets to total assets in the banking system exceeded 10 percent; the cost of the rescue operation was at least 2 percent of GDP; banking sector problems resulted in a large scale nationalization of banks; extensive bank runs took place or emergency measures such as deposit freezes, prolonged bank holidays, or generalized deposit guarantees were enacted by the government in response to the crisis. In Section 5 below we explore the sensitivity of the results to the definition of a crisis. To establish the length of the crisis, we relied solely on the dates provided by the case studies. A list of the crisis episodes is presented in Table 1.

### The Financial Liberalization Variable

Empirical studies of financial liberalization have often used the real interest rate as a proxy for financial liberalization (Fry, 1997 and Bandiera and others, 1997). Real interest rates, however, especially when measured *ex post*, are likely to be affected by a variety of factors that have little to do with changes in the regulatory framework of financial markets. This problem may be limited in a cross-country study, in which interest rates are averaged

over long periods of time, but in a panel study like ours with an important time-series dimension proxying financial liberalization with the real interest rate would be potentially misleading. For instance, a positive correlation between real interest rates and the probability of a banking crisis may simply reflect the fact that both variables tend to be high during cyclical economic downturns, while financial liberalization plays no role.

To avoid this problem, in this study we construct a financial liberalization variable based on observed policy changes. This strategy, however, is not without its difficulties: first, no available data base records such policy changes, and we had to resort to case studies, IMF country reports, and other miscellaneous sources of information. Furthermore, the process of financial liberalization has taken many different forms: some countries eliminated some restrictions before others; some countries, such as Greece or Japan, opted for a very gradual approach, while others like Egypt or Mexico switched regime quite rapidly; also, in some cases there were temporary reversals. After reviewing our information sources, it became clear that in most countries the removal of interest rate controls was the centerpiece of the liberalization process; thus, we chose this policy change as the indicator of financial liberalization. This left us with the choice of what to consider as the beginning date in countries where the process was gradual. Lacking a good theoretical ground for preferring one option over another, we chose the first year in which some interest rates were liberalized as the beginning date because it was easier to identify. Table 1 shows the dates of interest rate liberalization for the countries in our sample. For some countries, two sets of dates are entered because liberalization was temporarily reversed. While 63 percent of our observations are classified as periods of liberalization, 78 percent of banking crises occurred in periods of financial liberalization.

### The Control Variables

The set of control variables is taken from our previous study of banking crises (Demirgüç-Kunt and Detragiache, 1997), and it reflects both the theory of the determinants of banking crises and data availability.<sup>9</sup> A list of the variables and their sources is in the data appendix. The first group of control variables captures macroeconomic developments that affect bank performance especially through the level of non-performing loans; this group includes the rate of growth of real GDP, the external terms of trade, and the rate of inflation. The real short-term interest rate is also introduced as a control variable because, whether financial markets are liberalized or not, banking sector problems are more likely to emerge if real interest rates are high.<sup>10</sup> The second set of control variables includes characteristics of the banking system, such as vulnerability to sudden capital outflows (measured by the ratio of M2 to foreign exchange reserves, as suggested by Calvo, 1996), liquidity (measured by the ratio of bank cash and reserves to bank assets), exposure to the private sector (measured by the ratio of loans to the private sector to total loans), and lagged credit growth. This last variable is introduced because high rates of credit expansion may finance an asset price bubble that, when it bursts, causes a banking crisis. Finally, GDP per-capita is used to control for the level of development of the country.

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<sup>9</sup> For more details on the relationship between the theory of banking crises and the choice of control variables, see Demirgüç-Kunt and Detragiache (1997).

<sup>10</sup> To minimize potential endogeneity problems, to measure the real interest rate we use the rate on short-term government paper or a central bank rate, such as the discount rate, and not a bank interest rate. In six countries, however, neither measure was available, and we used the bank deposit rate.

### Measures of Institutional Quality

Since the quality of institutions may affect the degree to which financial liberalization increases the probability of a banking crisis, in alternative specifications we interact proxies of institutional quality with the liberalization dummy variables, and introduce the interaction term as a separate variable in the regression. We experiment with six alternative measures of institutional quality, GDP-per-capita and five indexes measuring the degree to which the rule of law is respected (“law and order”), the extent of bureaucratic delays, the quality of contract enforcement, the quality of the bureaucracy, and the degree of corruption. These indexes are increasing in the quality of the institutions.

## **4. Empirical Results**

Table 2 contains the results of the logit regressions estimating the probability of a banking crisis as a function of the financial liberalization dummy variable and of a set of control variables. The table also presents the usual diagnostic tests to assess the goodness of fit of the model.<sup>11</sup> The columns correspond to different definitions of the financial

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<sup>11</sup> The model  $\chi^2$  tests the joint significance of the regressors by comparing the likelihood of the model with that of a model with the intercept only. The AIC criterion is computed as minus the log-likelihood of the model plus the number of parameters being estimated, and it is therefore smaller for better models. This criterion is useful in comparing models with different degrees of freedom. The percentage of crises that are correctly classified and the total percentage of observations that are correctly classified are reported to assess the prediction accuracy of the model. A crisis is deemed to be accurately predicted when the estimated probability exceeds the frequency of crisis observations in the sample (around 5 percent). This criterion tends to downplay the performance of the model, because in a number of episodes the estimated probability of a crisis increases significantly a few years before the episode begins and those observations are considered as incorrectly classified by the criterion (see Demirgüç-Kunt and Detragiache, 1997, for some examples).

liberalization dummy: in the first column, which is the baseline specification, the dummy is zero for periods in which interest rates are subject to controls, and one when liberalization begins. The dummy remains one even if the liberalization is temporarily reversed under the assumption that the effects of liberalization persist even through short reversals. In the second column, the dummy variable is modified by treating periods of reversal as zeroes.

The baseline specifications fits the data well, and it classifies correctly 77 percent of the observations. The macroeconomic control variables are all significant at least at the 5 percent level, and have the expected signs: banking crises tend to be associated with low GDP growth, adverse terms of trade changes, high real interest rates, and high inflation. Of the characteristics of the banking sector, vulnerability to a speculative attack against the currency is significant at the 1 percent level, while credit growth lagged by two periods is significant at the 10 percent level. The other variables are not significant. Finally, GDP per capita is significantly negatively correlated to the probability of a banking crisis, suggesting that, other things being equal, developing countries are more vulnerable.

More interestingly, the financial liberalization dummy variable is strongly positively correlated with the probability of a banking crisis; as evident from column two, this is true regardless of the treatment of reversals. These results suggest that financial liberalization is a significant factor leading to banking sector fragility; furthermore, this effect is at work even after controlling for variables capturing the state of the macroeconomy (including the level of the risk-free short-term real interest rate). This suggests that, even if it is carried out after macroeconomic stabilization is achieved as recommended by McKinnon (1993), financial liberalization still increases financial fragility.

An important question is whether the effect of liberalization on the probability of a crisis tends to be a transitional effect, that is to manifest itself only during the years immediately following the change in policy. To test this hypothesis, in columns 3 to 6 of Table 2 we presents estimates of the baseline regression using a liberalization dummy that takes the value of one only in the first 3, 4, 5, and 6 years after liberalization, as opposed to the entire period following the policy change. The redefined dummies are all less significant than the baseline one, and the overall goodness of fit of the model does not improve. In fact, the dummy corresponding to a transition of only 3 years is not significant, and that corresponding to a transition of 4 years is significant only at the 10 percent confidence level. Thus, the effect of financial liberalization on banking fragility does not appear to be characteristic of the immediate aftermath of the change in policy, but rather it manifests itself only over time. This result may also be due to the fact that in a number of countries interest rate deregulation was gradual, and we chose the beginning of deregulation as the date of the policy change.

Another interesting question is whether the effects of financial liberalization on financial fragility differ in countries that were severely repressed at the time of liberalization relative to countries that were only financially restrained. To explore this issue, we interact the financial liberalization dummy variable with a the average real interest rate in the three years prior to liberalization, and introduce this interaction term as an additional regressor. A negative and significant coefficient for the new variable would suggest that fragility is less severely affected by liberalization in countries that were more financially repressed at the beginning of liberalization. As shown in column seven of Table 2, the estimated coefficient is negative but it is not significantly different from zero.

Table 3 provides an illustration of the magnitude of the effect of financial liberalization on financial fragility according to our empirical model: the third column contains the probability of a crisis as estimated by the baseline model for the 26 crisis episodes that took place in a liberalized regime. For those episodes, the probability of a crisis is then recalculated after setting the liberalization dummy equal to zero (column 4, Table 3). As it is apparent, for all countries the predicted crisis probability falls substantially, and of the 20 episodes that were correctly classified as crises 11 would have switched to non-crisis status in the absence of financial liberalization. Thus, the effect of financial liberalization on the probability of a banking crisis not only is statistically significant, but it is also of a non-trivial magnitude.

#### The Role of the Institutional Environment

The theory reviewed in Section 2 suggests that the adverse effect of financial liberalization on banking sector fragility is stronger where the institutions needed for the correct functioning of financial markets are not well-established. To test whether this effect is supported by the data, in Table 4 we add to the baseline regression various alternative variables in the form of interaction terms between the liberalization dummy and proxies of the quality of the institutional environment. Negative and significant coefficients for the interaction variables mean that a better institutional environment tends to weaken the effect of financial liberalization on the probability of a banking crisis.

The first proxy for the institutional environment is GDP per-capita, which was also used as a control variable in the baseline regression. The other five proxies are indexes of the degree to which the rule of law is respected (“law and order”), of bureaucratic delay, of the quality of contract enforcement, of the quality of the bureaucracy, and of the degree of

corruption.<sup>12</sup> All six interaction variables have the expected negative sign, and all except the index of bureaucratic delay are significant at least at the 10 percent confidence level. The degree of law enforcement, GDP per capita, and corruption have the highest significance levels. Furthermore, the size of the effect is not trivial: for instance, consider the “law and order index”. For a country with a score of zero (the lowest score), the net impact of financial liberalization on the crisis probability is 1.770, while for a country with an intermediate score of three the net impact falls to 0.555, and for a country with the maximum score of six the net impact becomes negative, namely financial liberalization tends to make banking crises less likely. Similarly, moving from the worst quality of contract enforcement to the best (a change in the index from zero to four) reduces the impact of liberalization on the crisis probability from 4.732 to 0.980.

These results suggest that improving the quality of the institutional environment, especially reducing the amount of corruption and strengthening the rule of law, can curb the tendency of liberalized financial markets to harbor systemic banking crises.<sup>13</sup>

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<sup>12</sup> The indexes measuring “law and order”, the quality of the bureaucracy, and corruption range between 0 and 6, while the index of bureaucratic delay and that of contract enforcement range from 0 to 4.

<sup>13</sup> It is worth noticing that the proxies do not measure the quality of the laws and regulations in a particular country, but rather factors that affect the extent to which laws and regulations are enforced.

## 5. Sensitivity Analysis

In this section, we report a number of robustness tests performed on the baseline regression. The first test concerns the treatment of years during which the crisis is under way. Those years are omitted from the baseline specification, an approach that requires accurate information on the year in which a crisis ended. Since the end of a crisis may be difficult to determine in practice, we also estimate the baseline regression using three alternative panels: one that omits all years following a crisis, one that treats all crisis years as ones, and one that treats all crisis years (except the first) as zeroes. The results, reported in Table 5, show that, while there are some changes in the coefficients and standard errors of the control variables, the liberalization dummy remains strongly significant in all specifications.

A second set of sensitivity tests (Table 6) uses a more stringent definition of a banking crisis relative to the baseline (ratio of non-performing loans to total loans of at least 15 percent and/or a cost of crisis of at least 3 percent of GDP) as well as a looser definition of crisis (ratio of non-performing loans to total loans of at least 5 percent, and/or cost of the crisis of at least 1 percent of GDP). Nothing much changes concerning the control variables, and the liberalization dummy remains significant, albeit only at the 10 percent confidence level.

A third methodological issue, which always arises in panel estimation, is whether to include country (time) fixed effects to allow for the possibility that the dependent variable may vary across countries (years) independently of the explanatory variables included in the regression. In logit estimation, including fixed effects requires excluding from the panel countries (years) in which there was no crisis during the period under consideration (Greene,

1997, p. 899), and hence it excludes a large amount of information. For this reason, we omit fixed effects from the baseline, and estimate a model with fixed effects as part of the sensitivity analysis (Table 7, columns 2 and 3). In the case of both country and time fixed effects, the hypothesis that the coefficients of the country and time dummies are jointly significantly different from zero is rejected, suggesting that there are no fixed effects. In any case, the liberalization dummy is still positively and significantly correlated with the probability of a crisis.

Another sensitivity test involves using lagged values of the explanatory variables to reduce the risk that the regressors may not be exogenous determinants of a crisis (Table 7, column 2). The drawback of using lagged values on the right-hand side, of course, is that if the macroeconomic shocks that trigger the crisis work relatively quickly, then their effect would not be evident a year before the crisis erupts. In this regression, most macroeconomic control variables lose significance (except for the real interest rate), while the other controls remain significant; more interestingly, the liberalization dummy continues to be positively and significantly correlated to the probability of a crisis.

To summarize, the relationship between financial liberalization and banking sector fragility appears to be robust to various changes in the specification of the logit regression.

## **6. Financial Liberalization and Bank Franchise Values**

The results of the previous sections suggest that liberalization increases the fragility of the financial system. One reason why financial liberalization may lead to increased banking sector fragility is that the removal of interest rate ceilings and/or the reduction of barriers to entry reduces bank franchise values, thus exacerbating moral hazard problems. As discussed

in Caprio and Summers (1993) and Hellmann, Murdock, and Stiglitz (1994), interest rate ceilings and entry restrictions create rents that make a banking license more valuable to the holder. It is the risk of losing this valuable license which induces banks to become more stable institutions, with better incentives to monitor the firms they finance and manage the risk of their loan portfolio. Thus, when a reform -- such as financial liberalization -- leads to increased bank competition and lower profits, this erodes franchise values, distorting the risk-taking incentives of the institutions. Unless the reform effort incorporates adequate strengthening of the prudential regulations and supervision to realign incentives, lower franchise values are likely to lead to increased fragility.<sup>14</sup>

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<sup>14</sup> Keeley (1990) presents empirical evidence that supports this view. First, he shows that in the 1970s U.S. thrift institutions began to lose charter value owing to the relaxation of various regulatory entry restrictions and because of technological changes. Second, he shows that banks with larger charter value were less risky, as measured by the risk-premium on uninsured bank CDs.

In this section we use bank level data from the BankScope data base of IBCA to investigate whether there is any empirical evidence that bank franchise values fall with financial liberalization. The data set includes bank-level accounting data for 80 countries over the 1988-1995 period. In most countries, the banks covered in the IBCA survey account for at least 90 percent of the banking system. For each bank we construct three profitability measures: net interest margin, after tax-return on assets, and after-tax return on equity. Since none of these measures is a perfect indicator of future profitability, we also look at additional balance sheet ratios which may be associated with a fall in franchise value: a measure of capital adequacy (the book value of equity divided by total assets); a measure of liquidity (the ratio of liquid assets to total assets); and the share of deposits to total liabilities. These ratios are country averages of bank level figures. Both high capitalization and high liquidity should have an adverse effect on bank franchise value, since they decrease the amount of loans that a bank can extend for any given amount of deposits.<sup>15</sup> Also, we examine the behavior of an indicator of market concentration (the ratio of assets of the largest three banks to total banking assets) and an indicator of foreign bank penetration (the proportion of foreign bank assets in total bank assets). More market concentration and less foreign bank penetration should be associated with more monopolistic powers for domestic banks, and, therefore, with higher franchise values.

Table 8 reports the correlations of these banking variables with the financial liberalization dummy variable. Of course, simple correlations do not imply causality. However, this exercise can at least tell us whether the hypothesis that financial liberalization leads to

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<sup>15</sup> Of course, for given franchise value, large capitalization and large liquidity should create less incentives to take on risk.

lower bank franchise values can be dismissed out-of-hand or needs to be taken seriously. The correlations in the first column of the table are calculated using a dummy variable that is equal to one in all periods in which the financial market is liberalized, and zero otherwise; in the remaining columns, the liberalization dummy is redefined to take a value of one during the transition to a liberalized system (where the transition is taken to last three, four, five, or six years alternatively), and zero otherwise. Thus, by comparing these sets of correlations we can see to what extent the fall in bank franchise value (if there is one) is a temporary or permanent effect of liberalization.

The results in the first column indicate that liberalization leads to permanently lower bank profits measured as return on equity, while neither the net interest margin nor the return on assets are significantly correlated with the liberalization dummy. There is also evidence that financial liberalization leads to higher capitalization (which should reduce bank profitability), and lower liquidity (which should have the opposite effect). The extent of deposit mobilization in the long run does not appear to change significantly with liberalization. More interestingly, liberalization appears to be permanently associated with a lower bank concentration ratio (albeit significant only at the 13 percent confidence level) and a greater presence of foreign banks. Both of these effects are consistent with lower bank franchise values due to reduced monopolistic profits resulting from greater competition.

When we look at the correlations with the transition to a liberalized system, we see that bank margins, profits, capital, liquidity, and deposit mobilization are all higher during the transition period. However, a comparison with the correlations in the first column suggest that most of these effect do not survive in the long-run. During the transition, we do not see a

significant coefficient for bank concentration or foreign bank penetration, suggesting that the structure of the banking sector changes only slowly after the liberalization process begins.

Despite the cursory nature of the analysis, these results are broadly consistent with the theories that conjecture that liberalization would lead to increased bank fragility due to its negative impact on bank franchise values. The next logical step would be to test whether low bank franchise values are associated to increased bank fragility; unfortunately, we are unable to examine this issue because the number of banking crises that take place during the period covered by the BankScope data set is too small.

## **7. Financial Liberalization, Banking Crises, Financial Development, and Growth**

So far, we have established that financial liberalization has a cost in terms of increased financial fragility. Do these results imply that policy-makers should abandon liberalization in favor of increased direct intervention in financial markets? Of course, the answer depends on whether the welfare costs of financial fragility exceed the welfare benefits of liberalization, and on whether governments can be expected to design and implement regulations that correct market failures rather than reinforce them. An answer to these complex questions is well beyond the scope of this paper. Nonetheless, it is possible to use our data set to explore one aspect of this issue, namely whether financial liberalization and banking crises affect economic growth through their effect on financial development.

The focus on growth effects through financial development is suggested by the large existing literature documenting how financial development increases long-run growth rates (King and Levine, 1993, Levine, 1997): presumably, one of the main benefits of financial liberalization is that it fosters financial development and, through it, increases long-run

growth. Conversely, the disruption caused by a systemic banking crisis is likely to have a direct adverse effect on financial development (at least in the short or medium term) and, through that avenue, have a negative impact on growth. The question addressed in this section is whether these effects can be detected in our data set, and, if so, how the magnitude of the adverse effect of banking crises on financial development compares with that of the positive effect of financial liberalization.

To verify whether financial development tends to increase growth in our sample, we estimate growth regression using a panel obtained by splitting the sample period (1980-94) in three subperiods of five years each. The regressors include a set of control variables and four alternative indicators of financial development proposed by King and Levine (1993).<sup>16</sup> These indicators are the ratio of liquid liabilities of the financial system to GDP (liquidity), the share of bank credit that goes to the private sector (private credit), the ratio of domestic bank assets to the sum of central bank assets and domestic bank assets (bank assets), and the ratio of central bank domestic assets to GDP (central bank). The first three indicators are increasing with financial development, while the fourth is decreasing. The results of the growth regressions are reported in the top panel of Table 9: although the  $R^2$  are generally quite low,

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<sup>16</sup> The control variables, also similar to those used by King and Levine (1993), are the logarithm of GDP per-capita and of the secondary school enrollment ratio at the beginning of the subperiod, the share of government consumption expenditure in GDP, the inflation rate, the ratio of the sum of imports and exports to GDP, the real interest rate, and a period dummy variable.

two out of four indicators have significant coefficients of the expected sign (bank assets and central bank). Thus, there is some evidence that financial development is positively correlated with growth in our panel.

To assess the impact of financial liberalization and banking crises on financial development, we then regress each financial development indicator on a constant, the liberalization dummy, and the banking crisis dummy, using the same panel as in the growth regressions.<sup>17</sup> The estimated coefficients have a simple interpretation: the constant is the mean level of financial development for observations with neither financial liberalization nor a banking crisis. The coefficient of the liberalization dummy, on the other hand, indicates the difference between the level of financial development in a country/time period with financial liberalization but no banking crisis and the level of financial development in countries/time periods with neither liberalization nor a banking crisis. Similarly, the coefficient of the banking crisis dummy, if significantly less than zero, would indicate that, on average, observations corresponding to banking crises are accompanied by lower financial development, conditional on no liberalization having occurred. Finally, if the difference between the coefficients of the two dummies is significantly greater than zero, then a country/period with both financial liberalization and a banking crisis has, on average, a higher level of financial development than one with no crisis and controlled financial markets.

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<sup>17</sup> The financial liberalization dummy variable takes the value of one if interest rate liberalization began in any of the years of the subperiod or if markets were liberalized in the preceding subperiod; the banking crisis dummy variable takes the value of one if a crisis was on-going in any of the years of the subperiod. The results are robust to redefining the dummy variables by treating a subperiod as a one only if the change in policy (crisis) occurs in the first three years of the subperiod. If the change in policy (crisis) takes place in the last or second-to-last period, then the dummy for the following period is set to one.

Table 9 contains estimation results. The coefficient of the liberalization dummy is positive and significant in all the specifications, while the banking crisis dummy has a negative coefficient which is significant in all specifications except one. Thus, both financial liberalization and the occurrence of banking crises appear to significantly affect financial development. Turning now to the difference between the two coefficients, it appears that countries/ periods with both banking crises and financial liberalization have greater financial development but only if financial development is measured by private credit or by bank assets. For liquidity and central bank, the difference in the coefficients is not significantly different from zero. Private credit, however, does not have a significant impact on growth in our panel, as shown in the first row of Table 9. Only in one regression, the one using bank assets as an indicator of financial development, are both the net effect of the dummies on financial development and the effect of financial development on growth significant. Thus, these tests do not show clear evidence that choosing financial liberalization at the cost of experiencing a banking crisis pays off in terms of higher growth through higher financial development, or vice versa, at least in a medium term time frame.<sup>18</sup>

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<sup>18</sup> When we estimate a growth regression including the banking crisis dummy and the financial liberalization dummy, however, the coefficients are not significant, suggesting that the dummies have a negligible direct impact on growth.

Additional insights on this issue can be obtained by splitting the sample between countries that were repressed at the time of financial liberalization and countries that were only restrained. Countries are classified as repressed if they had a negative interest rate (on average) during the three years preceding financial liberalization, and they are classified as restrained if they liberalized from a position of positive interest rates.<sup>19</sup> Countries that maintained controlled financial markets during the entire sample period are omitted from this panel, since they cannot be classified in either group.<sup>20</sup> When the sample is split in this fashion, for the restrained countries the results are quite similar to those for the sample as a whole

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<sup>19</sup> Roubini and Sala-i-Martin (1992) find the negative growth effects of financial repression to be stronger in financially repressed countries than in financially restrained countries.

<sup>20</sup> The panel includes countries that liberalized well before the beginning of the sample period. It may be argued that whether those countries were financially repressed or restrained at the time of liberalization should not affect their economic performance in 1980-94. As a robustness test, we repeated the tests described below dropping those countries from the panel. The basic results remain unchanged.

(bank assets and central bank are significant), while for the repressed group, also private credit is significant (Tables 10 and 11).

More interestingly, when we regress the financial development indicators on the liberalization dummy and on the crisis dummy, banking crises do not seem to lead to significantly lower financial development in repressed countries (where financial development is in any case lower than in the restrained group), while they do so in restrained countries, at least in two out of four regressions (Tables 10 and 11). In contrast, the positive impact of financial liberalization is present in both groups of countries. Thus, based on these estimated coefficients, a country that liberalized from a position of financial restraint and experienced a banking crisis has a level of financial development similar to a country that did not liberalize and escaped banking sector problems. In contrast, for countries that liberalized from a position of financial repression, the level of financial development is higher with liberalization even if the country experiences a banking crisis. Based on the coefficient estimated in the growth regression, the net positive effect on growth for this group of countries is of the order of 7/10 to 9/10 of a percentage point per-year (Table 11).

To summarize, this section has shown some empirical evidence supporting the hypothesis that financial liberalization is associated with higher financial development and, through it, with higher output growth, while banking crises have the opposite effects. For countries that liberalize from a position of financial restraint, the gains from liberalization in terms of financial development are comparable to the costs of having a banking crisis, while in the case of financially repressed countries the gains from financial liberalization are larger.

Although these results are suggestive, it is important to stress that they are tentative, and that the methodology used in deriving them leaves a lot to be desired: first, growth

regressions are intended to study the determinants of long-run growth rates, which are usually taken to be averages of many years of data. To have enough data points, here we are forced to use five-year averages, which may not really capture the long-run rate of economic growth. In fact, the low  $R^2$  in the growth regressions may indicate that cyclical and other factors not controlled for are important in explaining the dependent variable. If there are omitted variables, and these variables are correlated with the development indicators, the estimates of the coefficient of the financial development indicator would be biased. This criticism, however, concerns only the growth regressions, where the linkage between financial development and growth is established for our panel. Since this linkage has already been documented in other, more rigorous studies, we are not excessively worried by this shortcoming.

The more interesting part of the exercise is the test of the relationship between financial development, financial liberalization, and banking crises. Here our tests, besides being confined to a short and medium-term horizon, are limited because they are basically differences of means, and ignore that factors other than liberalization and banking crises affect financial development. Also, the effect of financial liberalization on the probability of a banking crisis is not explicitly incorporated in the analysis. We leave more sophisticated explorations of this important issue to future research.

## **8. Concluding Remarks**

Increased liberalization of financial markets in general and of the banking sector in particular have been major items in the economic policy agenda of many countries during the last 30 years. In this time period, the frequency of systemic banking problems has increased

markedly all over the world, raising the issue of whether greater fragility may be a consequence of liberalization. In this paper we have attempted to shed light on the issue by studying a large panel data set, covering 53 developed and developing economies during the period 1980-95. The panel includes countries that liberalized their financial markets several years before 1980, and others that liberalized at different dates over the sample period; also, countries that experienced one or more banking crises are represented along with countries that had a stable banking system throughout the period. Thus, the data set covers a large variety of experiences, from which it would be impossible to draw lessons without the help of econometric techniques.

The first result that emerges from the analysis is that financial fragility is affected by a multiplicity of factors, including adverse macroeconomic developments, bad macroeconomic policies, and vulnerability to balance-of-payments crises. When these factors are controlled for, financial liberalization exerts an independent negative effect on the stability of the banking sector, and the magnitude of the effect is not trivial. However, a strong institutional environment, characterized by effective law enforcement, an efficient bureaucracy, and little corruption, can curb the adverse effects of liberalization on the financial system.

These findings suggests that institutional development needs to be emphasized early in the liberalization process; in countries where the institutional environment is weak, achieving macroeconomic stabilization before or during liberalization would certainly bring an important independent source of financial instability under control. However, even in an otherwise well-functioning economy weaknesses in the institutions and in the regulatory framework necessary for financial markets to operate efficiently may fail to check perverse behavior on the part of financial intermediaries, creating the foundations for systemic financial sector problems.

Unfortunately, strong institutions cannot be created overnight, not even by the most reform-oriented government; thus, the path to financial liberalization should be a gradual one, in which the benefits of each further step towards liberalization are carefully weighed against the risks. Another implication of our findings is that more research effort should be focussed on the design and implementation of prudential regulations and supervision especially in developing countries.

Support for a gradual approach towards financial liberalization also comes from our findings about the effects of liberalization and fragility on financial development and, through it, on growth: while for countries that were initially in a state of financial repression the positive effect of liberalization on financial development appears to be stronger than the negative effect of a banking crisis, this is not the case for countries that liberalized from a situation of financial restraint, where the two effects roughly offset each other. One way of reading these findings is that, once financial sector reforms are carried out to secure positive interest rates, steps towards further liberalization may not necessary yields gains that offset the negative impact of increased fragility.

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Table 1  
Interest Rate Liberalization and Banking Crisis Dates

COUNTRY	PERIODS OF INTEREST RATE LIBERALIZATION DURING 1980-95	BANKING CRISIS DATE
Austria	1980-95	
Australia	1981-95	
Belgium	1986-95	
Canada	1980-95	
Switzerland	1989-95	
Chile	1980-95	1981-87
Colombia	1980-95	1982-85
Denmark	1981-95	
Ecuador	1986-87, 1992-95	
Egypt	1991-95	
Finland	1986-95	1991-94
France	1980-95	
Germany	1980-95	
Greece	1980-95	
Guatemala	1989-95	
Guyana	1991-95	1993-95
Honduras	1990-95	
Indonesia	1983-95	1992-94
India	1991-95	1991-94
Ireland	1985-95	
Israel	1990-95	1983-84
Italy	1980-95	1990-94
Jamaica	1991-95	
Jordan	1988-95	1989-90

Japan	1985-95	1992-94
Kenya	1991-95	1993
Korea	1984-88, 1991-95	
Sri Lanka	1980-95	1989-93
Mexico	1989-95	1982, 1994-95
Malaysia	1980-95	1985-88
Mali		1987-89
Nigeria	1990-93	1991-95
Netherlands	1980-95	
Norway	1985-1995	1987-93
New Zealand	1980, 1984-95	
Papua New Guinea	1980-95	1989-95
Peru	1980-84, 1990-95	1983-90
Philippines	1981-95	1981-87
Portugal	1984-95	1986-89
Paraguay	1990-95	1995
El Salvador	1991-95	1989
Tanzania	1993-95	1988-95
Syria		
Sweden	1980-95	1990-93
Togo	1993-95	
Thailand	1989- 95	1983-87
Turkey*	1980-82, 1984-95	1991, 1994-95
Uganda*	1991-95	
Uruguay	1980-95	1981-85
US	1980-95	1980-92
Venezuela	1989-95	1993-95
Zaire*	1980-95	
Zambia*	1992-95	

\* This country had additional banking crises during 1980-95, but these crises are not included in the panel because of missing data.

Table 2. Financial Liberalization and Banking Crises

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<b>Control Variables:</b>							
GROWTH	-.168*** (.040)	-.164*** (.039)	-.163*** (.039)	-.162*** (.039)	-.167*** (.039)	-.168*** (.039)	-.191*** (.044)
TOT CHANGE	-.052** (.023)	-.050** (.022)	-.043** (.020)	-.043** (.020)	-.049** (.022)	-.049** (.022)	-.050** (.025)
REAL INTEREST	.047*** (.015)	.046*** (.015)	.048*** (.015)	.050*** (.015)	.051*** (.015)	.050*** (.015)	.044*** (.015)
INFLATION	.027*** (.009)	.027*** (.008)	.027*** (.009)	.027*** (.009)	.027*** (.009)	.028*** (.009)	.022** (.011)
M2/RESERVES	.022*** (.007)	.021*** (.007)	.016*** (.007)	.017*** (.007)	.017*** (.007)	.017** (.007)	.024*** (.007)
PRIVATE/GDP	.007 (.012)	.007 (.013)	.006 (.012)	.006 (.012)	.006 (.012)	.006 (.012)	.013 (.013)
CASH/BANK	-.018 (.014)	-.019 (.014)	-.020 (.014)	-.020 (.014)	-.021 (.014)	-.020 (.014)	-.022 (.016)
CREDIT GRO <sub>t-2</sub>	.023* (.013)	.022* (.013)	.023* (.013)	.023* (.013)	.023* (.013)	.023* (.013)	.013 (.014)
GDP/CAP	-.108** (.051)	-.103** (.051)	-.078* (.051)	-.077* (.051)	-.079* (.051)	-.080* (.051)	-.101* (.057)
<b>Financial Liberalization:</b>							
FIN. LIB.	1.761*** (.634)						1.449** (.712)
FIN. LIB (R)		1.423*** (.589)					
FIN. LIB. (3)			.488 (.434)				
FIN. LIB. (4)				.639* (.415)			
FIN. LIB. (5)					.892** (.415)		
FIN. LIB. (6)						.811** (.418)	
FIN. LIB. x INITIAL INT.							-.026 (.020)
<b>Past Crisis:</b>							
DURATION of last period	.108** (.051)	.115** (.051)	.139*** (.051)	.147*** (.050)	.139*** (.050)	.140*** (.051)	.130** (.062)
No. of Crisis	32	32	31	32	32	32	26
No. of Obs.	639	639	602	639	632	632	525
% correct	77	77	77	76	76	77	78
% crisis correct	63	63	68	59	59	56	62
model $\chi^2$	61.42***	58.79***	52.52***	54.49***	57.32***	56.48***	55.95***

AIC	217	219	218	224	219	221	177
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\*, \*\*and \*\*\* indicate significance levels of 10, 5 and 1 percent respectively.

Table 3. Impact of Interest Liberalization on Crisis Probability

Country†	Bank Crisis Start Date	Probability of Crisis Predicted by Baseline at Crisis Date‡	Predicted Probability of Crisis had the Country not Liberalized on or prior to the Bank Crisis Date
Chile	1981	.174	.035
Colombia	1982	.047	.008
Finland	1991	.119	.023
Guyana	1993	.028	.005
India	1991	.221	.047
Indonesia	1992	.306	.071
Italy	1990	.028	.005
Japan	1992	.071	.012
Jordan	1989	.786	.387
Kenya	1993	.412	.108
Malaysia	1985	.170	.034
Mexico	1994	.207	.043
Nigeria	1991	.044	.008
Norway	1987	.031	.006
Papua N.Guinea	1989	.259	.057
Paraguay	1995	.114	.022
Peru	1983	.347	.084
Philippines	1981	.052	.009
Portugal	1986	.133	.026
Sri Lanka	1989	.104	.019
Sweden	1990	.033	.006
Turkey	1991	.221	.047
	1994	.443	.121
Uruguay	1981	.358	.087
United States	1980	.459	.126
Venezuela	1993	.424	.113

† Probabilities for Mali, Mexico 1982, El Salvador, Israel, Tanzania, and Thailand are not reported since these countries had not liberalized prior to the banking crisis.

‡ Countries in the baseline specification are classified as crisis cases if the predicted probability is greater than .05, which is equal to the ratio of number of crisis observations to total number of observations.

Table 4. Financial Liberalization and Banking Crises -- Institutional Environment

	(1)	(2)	(3)	(4)	(5)	(6)
<b>Control Variables:</b>						
GROWTH	-.171*** (.040)	-.214*** (.054)	-.233*** (.072)	-.238*** (.070)	-.219*** (.054)	-.223*** (.054)
TOT CHANGE	-.054** (.023)	-.040* (.027)	-.056* (.034)	-.060* (.033)	-.042* (.026)	-.040* (.026)
REAL INTEREST	.045*** (.015)	.052** (.024)	.053** (.021)	.050*** (.021)	.049** (.024)	.049** (.023)
INFLATION	.026*** (.009)	.024* (.015)	.022* (.013)	.020* (.013)	.021 (.015)	.022 (.015)
M2/RESERVES	.022*** (.007)	.018* (.010)	.025** (.012)	.025** (.012)	.022** (.010)	.019** (.010)
PRIVATE/GDP	.002 (.011)	-.003 (.011)	.005 (.012)	.006 (.012)	-.003 (.011)	-.003 (.011)
CASH/BANK	-.018 (.014)	-.030 (.023)	.020 (.026)	.015 (.026)	-.030 (.022)	-.027 (.021)
CREDIT GRO <sub>t-2</sub>	.024* (.013)	.013 (.018)	.045*** (.017)	.043*** (.016)	.011 (.018)	.009 (.018)
<b>Financial Liberalization and Institutions:</b>						
FIN. LIB.	1.956*** (.657)	1.770* (.986)	4.053*** (1.542)	4.732*** (1.557)	1.803* (1.082)	1.823* (1.030)
FIN. LIB. x GDP/CAP	-.089*(6%) (.048)					
FIN. LIB. x LAW & ORDER		-.405** (.205)				
FIN. LIB. x DELAY			-.727 (.678)			
FIN. LIB. x CONT. ENFORCEMENT				-.938* (.574)		
FIN. LIB. x BUR. QUALITY					-.380* (.223)	
FIN. LIB. x CORRUPTION						-.403*(6%) (.215)
<b>Past Crisis:</b>						
DURATION of last period	.112** (.051)	.181** (.081)	.028 (.067)	.031 (.067)	.171** (.079)	.156** (.078)
No. of Crisis	32	22	21	21	22	22
No. of Obs.	639	425	406	406	418	418
% correct	77	72	78	80	72	73
% crisis correct	63	55	67	71	59	59
model $\chi^2$	60.08***	35.69***	49.65***	51.34***	34.16***	34.77***
AIC	218	161	140	138	162	162

\*, \*\*and \*\*\* indicate significance levels of 10, 5 and 1 percent respectively.

Table 5. Sensitivity Analysis: Different Treatment of Crisis Years

	Baseline	No years after first crisis	Years of crisis=1	Years of crisis=0
<b>Control Variables:</b>				
GROWTH	-.168*** (.040)	-.136*** (.041)	-.067*** (.023)	-.137*** (.036)
TOT CHANGE	-.052** (.023)	-.043** (.023)	-.014 (.014)	-.047** (.021)
RL. INTEREST	.047*** (.015)	.046*** (.017)	.016*** (.007)	.013** (.006)
INFLATION	.027*** (.009)	.025*** (.010)	.016*** (.005)	.004 (.005)
M2/RESERVES	.022*** (.007)	.017*** (.007)	.017*** (.004)	.008* (.005)
PRIVATE/GDP	.007 (.012)	.015 (.012)	.011** (.005)	-.003 (.009)
CASH/BANK	-.018 (.014)	-.007 (.014)	-.016** (.008)	-.005 (.012)
CREDIT GRO <sub>t-2</sub>	.023* (.013)	.018 (.014)	.002 (.008)	.019* (.012)
GDP/CAP	-.108** (.051)	-.134*** (.052)	-.091*** (.022)	-.080** (.041)
<b>Financial Liberalization:</b>				
FIN. LIB.	1.761*** (.634)	2.154*** (.618)	2.187*** (.343)	1.178** (.557)
<b>Past Crisis:</b>				
DURATION of last period	.108** (.051)		-.133*** (.030)	.144*** (.049)
No. of Crisis	32	29	128	32
No. of Obs.	639	531	735	735
% correct	77	77	72	73
% crisis correct	63	66	69	59
model $\chi^2$	61.42***	50.50***	141.82***	42.67***
AIC	217	197	562	245

\*, \*\*and \*\*\* indicate significance levels of 10, 5 and 1 percent respectively.

Table 6. Sensitivity Analysis: Different Crisis Definitions

	Baseline	More Stringent Definition	Less Stringent Definition
<b>Control Variables:</b>			
GROWTH	-.168*** (.040)	-.126*** (.044)	-.160*** (.039)
TOT CHANGE	-.052** (.023)	-.054** (.023)	-.045** (.022)
RL. INTEREST	.047*** (.015)	.067*** (.023)	.044*** (.014)
INFLATION	.027*** (.009)	.032*** (.012)	.025*** (.009)
M2/RESERVES	.022*** (.007)	.009 (.007)	.020*** (.007)
PRIVATE/GDP	.007 (.012)	-.003 (.017)	.001 (.011)
CASH/BANK	-.018 (.014)	-.017 (.018)	-.021 (.015)
CREDIT GRO <sub>t-2</sub>	.023* (.013)	.022 (.015)	.027** (.013)
GDP/CAP	-.108** (.051)	-.150** (.071)	-.069* (.044)
<b>Financial Liberalization:</b>			
FIN. LIB.	1.761*** (.634)	1.098* (.692)	1.732*** (.607)
<b>Past Crisis:</b>			
DURATION of last period	.108** (.051)	.106* (.059)	.109** (.047)
No. of Crisis	32	24	36
No. of Obs.	639	639	623
% correct	77	78	74
% crisis correct	63	58	61
model $\chi^2$	61.42***	52.88***	59.73***
AIC	217	176	239

\*, \*\*and \*\*\* indicate significance levels of 10, 5 and 1 percent respectively.

Table 7. Sensitivity Analysis: Country and Time Fixed Effects, and Lagged Explanatory Variables<sup>1</sup>

	Baseline	Country Fixed Effects	Time Fixed Effects	Lagged Explanatory Variables
<b>Control Variables:</b>				
GROWTH	-.168*** (.040)	-.246*** (.060)	-.177*** (.047)	.057 (.044)
TOT CHANGE	-.052** (.023)	-.054* (.031)	-.044* (.026)	-.004 (.022)
RL. INTEREST	.047*** (.015)	.122*** (.042)	.049*** (.015)	.007* (.004)
INFLATION	.027*** (.009)	.064*** (.027)	.028*** (.009)	.004 (.003)
M2/RESERVES	.022*** (.007)	.026** (.012)	.024*** (.007)	.007** (.003)
PRIVATE/GDP	.007 (.012)	-.011 (.039)	.012 (.014)	-.001 (.012)
CASH/BANK	-.018 (.014)	.002 (.024)	-.016 (.015)	-.002 (.009)
CREDIT GRO <sub>t-2</sub>	.023* (.013)	.032* (.021)	.024* (.014)	.019* (.012)
GDP/CAP	-.108** (.051)	-.402 (.423)	-.138*** (.056)	-.077* (.046)
<b>Financial Liberalization:</b>				
FIN. LIB.	1.761*** (.634)	1.962* (1.196)	2.077*** (.702)	1.113** (.555)
<b>Past Crisis:</b>				
DURATION of last period	.108** (.051)	.501*** (.132)	.229** (.113)	.073 (.049)
No. of Crisis	32	32	32	31
No. of Obs.	639	333	565	605
% correct	77	75	76	67
% crisis correct	63	44	53	58
model ? <sup>2</sup>	61.42***	81.85***	66.39***	22.44***
AIC	217	210	235	246

\*, \*\*and \*\*\* indicate significance levels of 10, 5 and 1 percent respectively.

<sup>1</sup> The coefficients of the country and time dummy variables are not reported.

Table 8. Correlation Coefficient between Financial Liberalization and Bank Franchise Value Indicators<sup>1</sup>

	FIN. LIB.	FIN. LIB (3)	FIN. LIB (4)	FIN. LIB (5)	FIN. LIB (6)
net interest margin	.024 <i>.653</i>	.175*** <i>.001</i>	.150*** <i>.006</i>	.157*** <i>.004</i>	.158*** <i>.004</i>
return on assets	.088 <i>.139</i>	.202*** <i>.001</i>	.168*** <i>.006</i>	.167*** <i>.006</i>	.132** <i>.030</i>
return on equity	-.118** <i>.028</i>	.120** <i>.029</i>	.097* <i>.076</i>	.077 <i>.158</i>	.068 <i>.212</i>
capital	.207*** <i>.000</i>	.058 <i>.289</i>	.119** <i>.028</i>	.116** <i>.032</i>	.121** <i>.026</i>
liquidity	-.155*** <i>.004</i>	.154*** <i>.005</i>	.184*** <i>.001</i>	.152*** <i>.005</i>	.168*** <i>.002</i>
deposit share	-.033 <i>.541</i>	.069 <i>.210</i>	.161*** <i>.003</i>	.170*** <i>.002</i>	.121** <i>.026</i>
market concentration	-.087 <i>.137</i>	.092 <i>.121</i>	.053 <i>.377</i>	.042 <i>.476</i>	.035 <i>.552</i>
share of foreign banks	.109** <i>.062</i>	-.012 <i>.840</i>	.015 <i>.799</i>	.020 <i>.734</i>	.031 <i>.606</i>

<sup>1</sup> Pearson correlation coefficients are reported. P-values are given in italics. \*, \*\* and \*\*\* indicate significance levels of 10, 5 and 1 percent respectively. Net interest margin is given by interest income minus interest expenses divided by total assets. Return on assets given by net profits divided by total assets. Return on equity is given by net profits divided by book value of equity. Capital is the book value of equity divided by total assets. Liquidity is the ratio of liquid assets to total assets. Deposit share is the share of deposits (customer and short term funding) in total liabilities. Market concentration is measured as the ratio of assets in the largest three banks to total bank assets. The share of foreign banks is the ratio of foreign bank assets to total bank assets. All bank level variables are average ratios for all banks in the BankScope data base in a country in a given year.

Table 9. Growth, Financial Development, Financial Liberalization, and Banking Crises - Full Sample

	Liquidity	Private credit	Bank assets	Central bank
<b>Growth regressions<sup>1</sup></b>				
financial development	-.407 (.765)	.243 (1.007)	3.450** (1.633)	-2.010* (1.166)
Adjusted R <sup>2</sup>	.11	.11	.14	.11
No of observation	136	136	137	134
<b>Financial development regressions<sup>2</sup></b>				
constant	.466*** (.044)	.252*** (.032)	.682*** (.028)	.187*** (.048)
financial liberalization dummy	.108** (.050)	.202*** (.044)	.152*** (.034)	-.103** (.043)
banking crisis dummy	-.104* (.055)	-.085* (.047)	-.066* (.037)	.040 (.039)
Adjusted R <sup>2</sup>	.03	.09	.10	.03
No. of observations	156	156	159	153
aggregate impact on financial development	.004 F=.00	.117** F=4.62	.086* F=3.32	-.063 F=.88
coefficient in growth regression	-.407	.243	3.450**	-2.010*
impact on growth	.002	.028	<b>.297</b>	.127

<sup>1</sup> The dependent variable is the real per capita GDP growth rate. Each growth regression includes an alternative financial development indicator, as specified in the column header. Liquidity is ratio of liquid liabilities of the financial system to GDP. Private credit is the ratio of bank credit to private sector to GDP. Bank assets is ratio of deposit money bank domestic assets to deposit money banks domestic assets plus central bank domestic assets. Central bank is the ratio of central bank domestic assets to GDP. Besides the financial development indicators, the regressions include the logarithm of initial real per capita GDP, the logarithm of initial secondary school enrollment, the ratio of government consumption expenditure to GDP, inflation rate, ratio of exports plus imports to GDP, the real interest rate, dummy variables for 5-year periods. White's heteroscedasticity-consistent standard errors are given in parentheses. \*, \*\* and \*\*\* indicate significance levels of 10, 5 and 1 percent respectively.

<sup>2</sup> The dependent variable is the financial development indicator listed in the column header. Regressions include a constant.

Table 10. Growth, Financial Development, Financial Liberalization, and Banking Crises - Financially Restrained Countries

	<b>Liquidity</b>	<b>Private credit</b>	<b>Bank assets</b>	<b>Central bank</b>
<b>Growth regressions<sup>1</sup></b>				
financial development	-.735 (.841)	-.775 (1.007)	12.418*** (4.757)	-13.417* (7.362)
Adjusted R <sup>2</sup>	.09	.09	.25	.13
No of observation	64	64	64	62
<b>Financial development regressions<sup>2</sup></b>				
constant	.518*** (.075)	.363*** (.059)	.788*** (.030)	.094*** (.012)
financial liberalization dummy	.157* (.084)	.173** (.074)	.112*** (.033)	-.038*** (.014)
banking crisis dummy	-.019 (.111)	-.082 (.082)	-.074* (.040)	.038** (.019)
Adjusted R <sup>2</sup>	.01	.04	.14	.10
No. of observations	72	72	72	69
aggregate impact on financial development	.138 F=.86	.091 F=.75	.038 F=.51	.000 F=.00
coefficient in growth regression	-.735	-.775	12.418***	-13.417*
impact on growth	-.101	-.071	.472	.000

<sup>1</sup> The dependent variable is the real per capita GDP growth rate. Each growth regression includes an alternative financial development indicator, as specified in the column header. Liquidity is ratio of liquid liabilities of the financial system to GDP. Private credit is the ratio of bank credit to private sector to GDP. Bank assets is ratio of deposit money bank domestic assets to deposit money banks domestic assets plus central bank domestic assets. Central bank is the ratio of central bank domestic assets to GDP. Besides the financial development indicators, the regressions include the logarithm of initial real per capita GDP, the logarithm of initial secondary school enrollment, the ratio of government consumption expenditure to GDP, inflation rate, ratio of exports plus imports to GDP, the real interest rate, dummy variables for 5-year periods. White's heteroscedasticity-consistent standard errors are given in parentheses. \*, \*\* and \*\*\* indicate significance levels of 10, 5 and 1 percent respectively.

<sup>2</sup> The dependent variable is the financial development indicator listed in the column header. Regressions include a constant.

Table 11. Growth, Financial Development, Financial Liberalization, and Banking Crises - Financially Repressed Countries

	<b>Liquidity</b>	<b>Private credit</b>	<b>Bank assets</b>	<b>Central bank</b>
<b>Growth regressions<sup>1</sup></b>				
financial development	.421 (2.217)	5.189** (2.266)	4.466** (2.018)	-2.865** (1.453)
Adjusted R <sup>2</sup>	.04	.12	.10	.08
No of observation	57	57	58	57
<b>Financial development regressions<sup>2</sup></b>				
constant	.411*** (.065)	.178*** (.024)	.607*** (.048)	.267*** (.100)
financial liberalization dummy	.060 (.073)	.163*** (.048)	.183*** (.058)	-.162* (.097)
banking crisis dummy	-.085 (.058)	-.022 (.061)	-.009 (.060)	.026 (.079)
Adjusted R <sup>2</sup>	.00	.08	.11	.02
No. of observations	64	64	66	64
aggregate impact on financial development	-.025 F=.09	.141*** F=6.17	.174** F=5.68	-.136 F=.97
coefficient in growth regression	.421	5.189**	4.466***	-2.865**
impact on growth	-.011	<b>.732</b>	<b>.777</b>	.390

<sup>1</sup> The dependent variable is the real per capita GDP growth rate. Each growth regression includes an alternative financial development indicator, as specified in the column header. Liquidity is ratio of liquid liabilities of the financial system to GDP. Private credit is the ratio of bank credit to private sector to GDP. Bank assets is ratio of deposit money bank domestic assets to deposit money banks domestic assets plus central bank domestic assets. Central bank is the ratio of central bank domestic assets to GDP. Besides the financial development indicators, the regressions include the logarithm of initial real per capita GDP, the logarithm of initial secondary school enrollment, the ratio of government consumption expenditure to GDP, inflation rate, ratio of exports plus imports to GDP, the real interest rate, dummy variables for 5-year periods. White's heteroscedasticity-consistent standard errors are given in parentheses. \*, \*\* and \*\*\* indicate significance levels of 10, 5 and 1 percent respectively.

<sup>2</sup> The dependent variable is the financial development indicator listed in the column header. Regressions include a constant.

## APPENDIX

### Definitions and Data Sources for Variables Included in the Logit Regressions

Variable Name	Definition	Source
Growth	Rate of growth of real GDP	IFS where available. Otherwise, WEO.
Tot change	Change in the terms of trade	WEO
Real interest rate	Nominal interest rate minus the contemporaneous rate of inflation	IFS. Where available, nominal rate on short-term government securities. Otherwise, a rate charged by the Central Bank to domestic banks such as the discount rate; otherwise, the commercial bank deposit interest rate
Inflation	Rate of change of the GDP deflator	IFS
M2/reserves	Ratio of M2 to foreign exchange reserves of the Central Bank	M2 is money plus quasi-money (lines 34 + 35 from the IFS) converted into US\$. Reserves are line 1dd of the IFS.
Private/GDP	Ratio of domestic credit to the private sector to GDP	Domestic credit to the private sector is line 32d from the IFS.
Cash/bank	Ratio of bank liquid reserves to bank assets	Bank reserves are line 20 of the IFS. Bank assets are lines 21 + lines 22a to 22f of the IFS.
Credit growth	Rate of growth of real domestic credit to private sector	IFS line 32d divided by the GDP deflator.
GDP/CAP	Real GDP per capita	GDP data are from the World Bank National Accounts data base. Population is IFS line 99z.
Law and order	Index ranging from 0 to 6	International Country Risk Guide (ICRG), published by Political Risk Service, Syracuse, NY.
Bureaucratic delay	Index ranging from 0 to 4	Business Environmental Risk Intelligence (BERI), Washington DC
Contract enforcement	Index ranging from 0 to 4	BERI
Quality of bureaucracy	Index ranging from 0 to 6	ICRG
Corruption	Index ranging from 0 to 6	ICRG