Financial Liberalization and Financial Fragility

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Abstract

Analysis of the empirical relationship between banking crises and financial liberalization in a panel of 53 countries for the period 1980–95 shows that banking crises are more likely to occur in liberalized financial systems. However, the effect of financial liberalization on the fragility of the banking sector is weaker when 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. Examination of the behavior of bank franchise values after liberalization and of the relationships among financial liberalization, banking crises, financial development, and growth supports 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.

The work of McKinnon and Shaw also stimulated a fast-growing strand of research that analyzes how financial development can boost economic growth by accelerating productivity growth as well as by mobilizing savings (see Levine 1997, for a survey).[2] 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 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 has been somewhat clouded by the marked increase in financial fragility experienced by both industrial and developing countries in the 1980s and 1990s. In particular, banking sectors around the world were confronted by a remarkable number of problems, some of which erupted into 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.[3] These experiences suggest that the benefits of financial liberalization may have to be weighed against the cost of increased financial fragility. 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 yet been subjected to systematic econometric investigation. This

paper is an attempt to fill this gap. Building on 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 industrial and developing countries during 1980–95. The deregulation of bank interest rates is used as the observable policy change to date liberalization, 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 other times during the sample period. Using a multivariate logit framework and controlling for other factors that may increase the probability of a cirsis we test whether banking crises are more likely to occur in liberalized financial systems. 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 whether 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 checks for robustness.

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

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, when there is no banking crisis, countries and time periods in which financial markets are liberalized have higher financial development than countries and time periods in which markets are controlled. However, in countries and time periods with both financial liberalization and a banking crisis the level of financial development is about the same as in countries and 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 (defined as having negative real interest rates) at the time of liberalization and countries that were financially restrained (rates were positive). The same tests described above are performed for the two subsamples. For the restrained group the results resemble those for the whole sample. 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 with a prior policy of financial repression, even if it increases financial fragility.

Theoretical Basis for Vulnerability to Banking Crises

To put the empirical results in perspective, it is useful to briefly review some of the theoretical reasons why a liberalized banking system might be more vulnerable to crises.

In tightly controlled financial systems bank lending 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.[4] If loan-specific risk is hedged by holding a well-diversified portfolio, 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 with risky loans, even if they are well diversified, are typically still vulnerable to the risk of economywide 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 necessary skills and experience. Evaluating risky investment projects and monitoring the borrower during the life of the loan also require skills that may be in short supply in a banking system in which lending to the government and collateral-based private lending were the primary activities for many years. Such skills may also be difficult to import from abroad.

Nominal interest rates are likely to be more variable in a liberalized financial system where interest rates are market-determined than in a controlled system (although real rates may not be).[5] 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 may become more vulnerable in an environment where interest rates are more volatile. Also, when liberalization takes place before a well-functioning 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 one bank may spread to others 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 one such mechanism. The presence of implicit or explicit government guarantees to depositors or other bank claimholders makes moral hazard even more dangerous. As emphasized by Caprio and Summers (1993) and Hellmann, Murdock, and Stiglitz (1994), another factor that may contribute to moral hazard is the erosion of bank franchise value as ceilings are lifted on deposit interest rates and barriers to entry are reduced. As increased bank competition causes monopolistic profits to disappear, 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.

Many countries combined financial liberalization with 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 foreign currency funds on international markets and lending them to local borrowers. Prudential limits on foreign currency exposure were often circumvented, 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, because high-risk, high-return investment projects may outnumber low-risk, low-return ventures. However, because of limited liability and other forms of implicit and explicit guarantees, bankers' appetite for risk is likely to be far greater than is socially desirable. If prudential regulation and supervision are ineffective at controlling bank behavior and realigning incentives, liberalization may increase financial fragility beyond socially desirable limits. Also, because the skills to screen and monitor risky borrowers, to manage a risky loan portfolio and 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. The next sections present the results of econometric tests of various aspects of this linkage.

Data and Methodology

In setting up the panel, we began with all the countries reported on in the International Monetary Fund's (IMF) *International Financial Statistics*, excluding only centrally planned economies and economies in transition. To obtain a sufficiently large number of time series, we limited the study

to 1980–95; as is shown below, this period includes a substantial number of banking crises and episodes of financial liberalization, so the data set is sufficiently rich for the purposes of our investigation.[6] 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 chronic distress during the period under consideration, making it impossible to pinpoint a specific subperiod as a banking crisis period. Finally, two countries (Argentina and Bolivia) were excluded because they are outliers for two of the regressors that we use (inflation and the real interest rate).[7] This process of elimination left us with 53 countries in the baseline specification (table 1).

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	
Chile	1980–95	1981–87
Colombia	1980–95	1982–85
Denmark	1981–95	
Ecuador	1986–87, 1992–95	
Egypt	1991–95	
El Salvador	1991–95	1989
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	
Japan	1985–95	1992–94
Jordan	1988–95	1989–90
Kenya	1991–95	1993
Korea, Rep. of	1984–88, 1991–95	
Malaysia	1980–95	1985–88
Mali		1987–89
Mexico	1989–95	1982, 1994–95
Netherlands	1980–95	
New Zealand	1980, 1984–95	
Nigeria	1990–93	1991–95
Norway	1985–1995	1987–93
Papua New Guinea	1980–95	1989–95
Paraguay	1990–95	1995
Peru	1980–84, 1990–95	1983–90
Philippines	1981–95	1981–87
Portugal	1994–95	1986–89
Sri Lanka	1980–95	1989–93
Sweden	1980–95	1990–93
Switzerland	1989–95	
Syria		
Tanzania	1993–95	1988–95
Thailand	1989– 95	1983–87
Togo	1993–95	
Turkey[a]	1980–82, 1984–95	1991, 1994–95
Uganda[a]	1991–95	
United States	1980–95	1980–92
Uruguay	1980–95	1981–85
Venezuela	1989–95	1993–95
Zaire[a]	1980–95	
Zambia[a]	1992–95	

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

Source: Caprio and Klingebiel 1996; Lindgren, Garcia, and Saal 1996.

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 equals zero if there is no banking crisis and 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 $\mathbf{X}(i, t)$ including the financial liberalization dummy variable and n-1 control variables. Let $P(i, t)$ 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. β is a vector of n unknown coefficients and $F(\beta' \mathbf{X}(i, t))$ is the cumulative probability distribution function evaluated at $\beta' \mathbf{X}(i, t)$. Then the log-likelihood function of the model is:

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

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 $\beta' \mathbf{X}(i, t)$.

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 feedback effects would muddle the estimation, years in which banking crises are under way are eliminated from the panel (alternative approaches are discussed in the section on sensitivity analysis). Also, the probability of a crisis occurring in a country that has had problems in the past is likely to differ from that for a country that has never experienced a banking crisis. To take this difference into account, we include different additional regressors in the estimated equations, such as number of past crises, duration of the last crisis, and the time since the last crisis.

The Banking Crisis Variable

In constructing a banking crisis dummy variable, we identified and dated episodes of banking sector distress during 1980–95 using primarily two recent studies, Caprio and Klingebiel (1996) and Lindgren, Garcia, and Saal (1996). For an episode of distress to qualify as a full-fledged crisis, we established—somewhat arbitrarily—that at least one of the following conditions must apply: the ratio of nonperforming 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; or extensive bank runs occurred or emergency measures such as deposit freezes, prolonged bank holidays, or generalized deposit guarantees were enacted by the government in response to the crisis. (Later, we explore the sensitivity of the

results to the definition of a crisis.) For the length of the crisis, we relied solely on the dates provided in 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; 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. In a panel study like ours, however, with an important time-series dimension, proxying financial liberalization with the real interest rate could be 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, and financial liberalization may play no role.

To avoid this problem, we construct a financial liberalization variable based on observed policy changes. This strategy is not without its own difficulties, however. First, no available database records such policy changes, so we had to resort to case studies, IMF country reports, and other sources of information. Furthermore, the process of financial liberalization has taken many different forms. Not all countries eliminated some restrictions in the same order, and some countries, such as Greece and Japan, opted for a very gradual approach, while others like Egypt and Mexico switched regimes quite rapidly. Also, in some cases there were temporary reversals.

A review of our information sources showed that in most countries the removal of interest rate controls was the centerpiece of the liberalization process, and so we chose this policy change as the indicator of financial liberalization. This left us with the need to identify a 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 easiest to identify. For some countries, we identified two sets of dates because liberalization was temporarily reversed (see table 1). 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.[8] (A list of the variables and their sources is provided in the data appendix.) The first group of control variables captures macroeconomic developments that affect bank performance, especially through the level of nonperforming 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.[9] 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 can burst and cause a banking crisis. Finally, GDP per capita is used to control for a country's level of development.

Measures of Institutional Quality

Since the quality of institutions may affect the extent 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 indexes measuring the degree to which the rule of law is respected ("law and order"), the extent of bureaucratic delay, 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.

Empirical Results

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 are presented in table 2, along with the usual diagnostic tests to assess the goodness of fit of the model.[10]

Table 2. Financial Liberalization and Banking Crises

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Control variables							
GROWTH	–.168***	–.164***	–.163***	–.162***	–.167***	–.168***	–.191***
	(.040)	(.039)	(.039)	(.039)	(.039)	(.039)	(.044)
TOT CHANGE	–.052**	–.050**	–.043**	–.043**	–.049**	–.049**	–.050**
	(.023)	(.022)	(.020)	(.020)	(.022)	(.022)	(.025)
REAL INTEREST	.047***	.046***	.048***	.050***	.051***	.050***	.044***
	(.015)	(.015)	(.015)	(.015)	(.015)	(.015)	(.015)
INFLATION	.027***	.027***	.027***	.027***	.027***	.028***	.022**
	(.009)	(.008)	(.009)	(.009)	(.009)	(.009)	(.011)
M2/RESERVES	.022***	.021***	.016***	.017***	.017***	.017**	.024***
	(.007)	(.007)	(.007)	(.007)	(.007)	(.007)	(.007)
PRIVATE/GDP	.007	.007	.006	.006	.006	.006	.013
	(.012)	(.013)	(.012)	(.012)	(.012)	(.012)	(.013)
CASH/BANK	–.018	–.019	–.020	–.020	–.021	–.020	–.022
	(.014)	(.014)	(.014)	(.014)	(.014)	(.014)	(.016)
CREDIT GRO $_{t-2}$	.023*	.022*	.023*	.023*	.023*	.023*	.013
	(.013)	(.013)	(.013)	(.013)	(.013)	(.013)	(.014)
GDP/CAP	–.108**	–.103**	–.078*	–.077*	–.079*	–.080*	–.101*
	(.051)	(.051)	(.051)	(.051)	(.051)	(.051)	(.057)
Financial liberalization							
FIN. LIB.	1.761***						1.449**
	(.634)						(.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)
Past crisis							
DURATION of last	.108**	.115**	.139***	.147***	.139***	.140***	.130**
period	(.051)	(.051)	(.051)	(.050)	(.050)	(.051)	(.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 χ^2	61.42***	58.79***	52.52***	54.49** *	57.32** *	56.48** *	55.95** *
AIC	217	219	218	224	219	221	177

* Significance level of 10 percent.
** Significance level of 5 percent.
*** Significance level of 1 percent.
Note: The columns correspond to different definitions of the financial 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. For columns 3–6, the liberalization dummy takes a value of one only in the first 3, 4, 5, or 6 years after liberalization. Column 7 introduces as an additional regressor an interaction term capturing the interaction between financial liberalization and the average real interest rate in the three years before liberalization.

Effects of Financial Liberalization and Control Variables

The baseline specification fits the data well and correctly classifies 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 and negatively correlated with the probability of a banking crisis, suggesting that, other things being equal, developing countries are more vulnerable.

The financial liberalization dummy variable is strongly and positively correlated with the probability of a banking crisis, a result that holds regardless of the treatment of reversals (see column two in table 2). These results suggest that financial liberalization is a significant factor leading to banking sector fragility; furthermore, this effect is at work even after variables capturing the state of the macroeconomy are controlled for (including the level of the risk-free short-term real interest rate). This suggests that financial liberalization increases financial fragility even if it is carried out after macroeconomic stabilization is achieved, as McKinnon recommends (1993).

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 in the years immediately following the change in policy. To test this hypothesis, we estimate the baseline regression using a liberalization dummy that takes the value of one only in the first 3, 4, 5, or 6 years after liberalization, as opposed to the entire period following the policy change (columns 3–6 in table 2). The redefined dummies are all less significant than in the baseline, 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 emerges only over time. This result may also be due to the fact that we chose the beginning of deregulation as the date of the policy change even though in a number of countries interest rate deregulation was gradual.

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 and in countries that were only financially restrained. To explore this issue, we interact the financial liberalization dummy variable with the average real interest rate in the three years before 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. The estimated coefficient is negative but it is not significantly different from zero (column 7 of table 2).

To illustrate the magnitude of the effect of financial liberalization on financial fragility according to our empirical model, we estimate the probability of a crisis using the baseline model for the 26 crisis episodes that took place in a liberalized regime (table 3). We also recalculated the probability of a crisis had the country not liberalized by setting the liberalization dummy to zero (column 4, table 3). For all countries the predicted probability of a banking crisis falls substantially. Of the 20 episodes that were correctly classified as crises, 11 would not have been crises in the absence of financial liberalization. Thus the effect of financial liberalization on the

probability of a banking crisis is not only statistically significant, but it is also of a nontrivial magnitude.

Table 3. Impact of Interest Liberalization on Crisis Probability

Country[a]	*Bank crisis start date*	*Probability of crisis predicted by baseline at crisis date*[b]	*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 New 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

a. 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.
b. 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.

The Role of the Institutional Environment

Theory suggests that the adverse effect of financial liberalization on banking sector fragility is stronger when the institutions needed for the correct functioning of financial markets are not well established. To test whether this effect is supported by the data, 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 (table 4). 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.

Table 4. Financial Liberalization and Banking Crises—Institutional Environment

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Control variables						
GROWTH	–.171***	–.214***	–.233***	–.238***	–.219***	–.223***
	(.040)	(.054)	(.072)	(.070)	(.054)	(.054)
TOT CHANGE	–.054**	–.040*	–.056*	–.060*	–.042*	–.040*
	(.023)	(.027)	(.034)	(.033)	(.026)	(.026)
REAL INTEREST	.045***	.052**	.053**	.050***	.049**	.049**
	(.015)	(.024)	(.021)	(.021)	(.024)	(.023)
INFLATION	.026***	.027*	.022*	.020*	.021	.022
	(.009)	(.015)	(.013)	(.013)	(.015)	(.015)
M2/RESERVES	.022***	.018*	.025**	.025**	.022**	.019**
	(.007)	(.010)	(.012)	(.012)	(.010)	(.010)
PRIVATE/GDP	.002	–.003	.005	.006	–.003	–.003
	(.011)	(.011)	(.012)	(.012)	(.011)	(.011)
CASH/BANK	–.018	–.030	.020	.015	–.030	–.027
	(.014)	(.023)	(.026)	(.026)	(.022)	(.021)
CREDIT GRO $_{t-2}$	.024*	.013	.045***	.043***	.011	.009
	(.013)	(.018)	(.017)	(.016)	(.018)	(.018)
Financial liberalization and institutions						
FIN. LIB.	1.956***	1.770*	4.053***	4.732***	1.803*	1.323*
	(.657)	(.986)	(1.542)	(1.557)	(1.082)	(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 QUALITY					–.380*	
					(.223)	
FIN. LIB. x CORRUPTION						–.403*(6%)
						(.215)
Past crisis						
DURATION of last period	.112**	.181**	.028	.131	.171**	.156**
	(.051)	(.081)	(.067)	(.067)	(.079)	(.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 χ^2	60.08***	35.69***	49.65***	51.34***	34.16***	34.77***
AIC	218	161	140	138	162	162

* Significance level of 10 percent.
** Significance level of 5 percent.
*** Significance level of 1 percent.

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 proxies are indexes of the respect for rule of law ("law and order"), bureaucratic delay, the quality of contract enforcement, the quality of the bureaucracy, and the degree of corruption.[11]

financial liberalization on the probability of crisis is 1.770, while for a country with an intermediate score of 3 the net impact falls to 0.555, and for a country with the maximum score of 6 the net impact becomes negative, suggesting that financial liberalization tends to make banking crises less likely. Similarly, improvement in the quality of contract enforcement (ranging in the index from zero to 4) reduces the impact of liberalization on the probability of crisis from 4.732 to 0.980.

These results suggest that improving the quality of the institutional environment, and especially reducing the degree of corruption and strengthening the rule of law, can curb the tendency of liberalized financial markets to harbor systemic banking crises.[12]

Sensitivity Analysis

A number of robustness tests were performed on the baseline regression. The first test concerns the treatment of years during which the crisis is under way. These years are omitted from the baseline specification, an approach that requires accurate information on the year in which a crisis ended. Since the actual 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 year) as zeroes. The results 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 (table 5).

Table 5. Sensitivity Analysis: Different Treatment of Crisis Years

	Baseline	*Number of years after first crisis*	*Years of crisis = 1*	*Years of crisis = 0*
Control variables				
GROWTH	–.168***	–.136***	–.067***	–.137***
	(.040)	(.041)	(.023)	(.036)
TOT CHANGE	–.052**	–.043**	–.014	–.047**
	(.023)	(.023)	(.014)	(.021)
RL. INTEREST	.047***	.046***	.016***	.013**
	(.015)	(.017)	(.007)	(.006)
INFLATION	.027***	.025***	.016***	.004
	(.009)	(.010)	(.005)	(.005)
M2/RESERVES	.022***	.017***	.017***	.008*
	(.007)	(.007)	(.004)	(.005)
PRIVATE/GDP	.007	.015	.011**	–.003
	(.012)	(.012)	(.005)	(.009)
CASH/BANK	–.018	–.007	–.016**	–.005
	(.014)	(.014)	(.008)	(.012)
CREDIT GRO $_{t-2}$	.023*	.018	.002	.019*
	(.013)	(.014)	(.008)	(.012)
GDP/CAP	–.108**	–.134***	–.091***	–.080**
	(.051)	(.052)	(.022)	(.041)
Financial liberalization				
FIN. LIB.	1.761***	2.154***	2.187***	1.178**
	(.634)	(.618)	(.343)	(.557)
Past crisis				
DURATION of last period	.108**		–.133***	.144***
	(.051)		(.030)	(.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 χ^2	61.42***	50.50***	141.82***	42.67***
AIC	217	197	562	245

* Significance level of 10 percent.
** Significance level of 5 percent.
*** Significance level of 1 percent.

A second set of sensitivity tests (table 6) uses a more stringent definition of a banking crisis relative to the baseline (with the ratio of nonperforming loans to total loans at least 15 percent or the cost of the crisis at least 3 percent of GDP), as well as a looser definition of crisis (ratio of nonperforming loans to total loans at least 5 percent or cost of the crisis at least 1 percent of GDP). Changes in the control variables are minor, and the liberalization dummy remains significant, although only at the 10 percent confidence level.

Table 6. Sensitivity Analysis: Different Crisis Definitions

	Baseline	*More stringent definition*	*Less stringent definition*
Control variables			
GROWTH	–.168***	–.126***	–.160***
	(.040)	(.044)	(.039)
TOT CHANGE	–.052**	–.054**	–.045**
	(.023)	(.023)	(.022)
RL. INTEREST	.047***	.067***	.044***
	(.015)	(.023)	(.014)
INFLATION	.027***	.032***	.025***
	(.009)	(.012)	(.009)
M2/RESERVES	.022***	.009	.020***
	(.007)	(.007)	(.007)
PRIVATE/GDP	.007	–.003	.001
	(.012)	(.017)	(.011)
CASH/BANK	–.018	–.017	–.021
	(.014)	(.018)	(.015)
CREDIT GRO $_{t-2}$	.023*	.022	.027**
	(.013)	(.015)	(.013)
GDP/CAP	–.108**	–.150**	–.069*
	(.051)	(.071)	(.044)
Financial liberalization			
FIN. LIB.	1.761***	1.098*	1.732***
	(.634)	(.692)	(.607)

Past crisis			
DURATION of last	.108**	.106*	.109**
period	(.051)	(.059)	(.047)
No. of Crisis	32	24	6
No. of Obs.	639	639	623
% correct	77	78	74
% crisis correct	63	58	61
model χ^2	61.42***	52.88***	59.73***
AIC	217	176	239

* Significance level of 10 percent.
** Significance level of 5 percent.
*** Significance level of 1 percent.

A third methodological issue, one that 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, the inclusion of fixed effects requires that countries (years) in which there was no crisis during the period under consideration be excluded from the panel (Greene 1997, p. 899). This also 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.

Table 7. Sensitivity Analysis: Country and Time Fixed Effects, and Lagged Explanatory Variables

	Baseline	*Country fixed effects*	*Time fixed effects*	*Lagged explanatory variables*
Control variables				
GROWTH	–.168***	–.246***	–.177***	.057
	(.040)	(.060)	(.047)	(.044)
TOT CHANGE	–.052**	–.054*	–.044*	–.004
	(.023)	(.031)	(.026)	(.022)
RL. INTEREST	.047***	.122***	.049***	.007*
	(.015)	(.042)	(.015)	(.004)
INFLATION	.027***	.064***	.028***	.004
	(.009)	(.027)	(.009)	(.003)
M2/RESERVES	.022***	.026**	.024***	.007**
	(.007)	(.012)	(.007)	(.003)
PRIVATE/GDP	.007	–.011	.012	–.001
	(.012)	(.039)	(.014)	(.012)
CASH/BANK	–.018	.002	–.016	–.002
	(.014)	(.024)	(.015)	(.009)
CREDIT GRO $_{t-2}$	.023*	.032*	.024*	.019*
	(.013)	(.021)	(.014)	(.012)
GDP/CAP	–.108**	–.402	–.138***	–.077*
	(.051)	(.423)	(.056)	(.046)
Financial liberalization				
FIN. LIB.	1.761***	1.962*	2.077***	1.113**
	(.634)	(1.196)	(.702)	(.555)
Past crisis				
DURATION of last period	.108**	.501***	.229**	.073
	(.051)	(.132)	(.113)	(.049)
No. of Crisis	32	32	32	31
No. of Obs.	639	33	565	605
% correct	77	75	76	67
% crisis correct	63	44	53	58
model χ^2	61.42***	81.85***	66.39***	22.44***
AIC	217	210	235	246

* Significance level of 10 percent.
** Significance level of 5 percent.
*** Significance level of 1 percent.
Note: The coefficients of the country and time dummy variables are not reported.

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 4). The drawback of using lagged values on the right-hand side is, of course, 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.

Financial Liberalization and Bank Franchise Values

The results of the previous sections suggest that liberalization increases the fragility of the financial system. One reason that financial liberalization may lead to increased fragility of the banking sector is that the removal of interest rate ceilings 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 that induces banks to become more stable institutions, with better incentives to monitor the firms they finance and to manage the risk of their loan portfolio. Thus when a reform such as financial liberalization leads to increased bank competition and lower

profits, franchise values are eroded, 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.[13]

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 1988–95 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 that 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.[14] We also 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, they can at

least tell us whether the hypothesis that financial liberalization leads to lower bank franchise values should 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 equal to zero otherwise. In the remaining columns the liberalization dummy is redefined to take a value of one during the transition to a liberalized system, with the transition taken to last three, four, five, or six years, and zero otherwise. By comparing these sets of correlations we can see the extent to which a fall in bank franchise value, if there is one, is a temporary or permanent effect of liberalization.

Table 8. Correlation Coefficient between Financial Liberalization and Bank Franchise Value Indicators

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

* Significance level of 10 percent.
** Significance level of 5 percent.
*** Significance level of 1 percent.
Note: Pearson correlation coefficients are reported. P-values are given in italics. 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 database in a country in a given year.
Source: IBCA Bank Scope database.

The results in the first column indicate that liberalization leads to permanently lower bank profits when 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 higher during the transition period. However, a comparison with the correlations in the first column suggests that most of these effects do not persist in the long run. During the transition there is no 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 this analysis, these results are broadly consistent with theories that liberalization leads 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 with increased bank fragility. Unfortunately we are unable to pursue this question because the number of banking crises taking place during the period covered by the BankScope data set is too small.

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 policymakers 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 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 body of 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, as a result, 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, accordingly, 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).[15] 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 figures are generally quite low, 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.

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

	Liquidity	*Private credit*	*Bank assets*	*Central bank*
Growth regressions[a]				
Financial development	–.407	.243	3.450**	–2.010*
	(.765)	(1.007)	(1.633)	(1.166)
Adjusted R^2	.11	.11	.14	.11
Number of observations	136	136	137	134

Financial development regressions[b]				
Constant	.466***	.252***	.682***	.187***
	(.044)	(.032)	(.028)	(.048)
Financial liberalization dummy	.108**	.202***	.152***	–.103**
	(.050)	(.044)	(.034)	(.043)
Banking crisis dummy	–.104*	–.085*	–.066*	.040
	(.055)	(.047)	(.037)	(.039)
Adjusted R^2	.03	.09	.10	.03
Number 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	.297	.127

* Significance level of 10 percent.
** Significance level of 5 percent.
*** Significance level of 1 percent.
a. 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 sysytem to GDP. Private credit is the ratio of bank credit to private sector to GDP. Bank assets are 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 parantheses.
b. The dependent variable is the financial development indicator listed in the column header. Regressions include a constant.

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.[16] 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, provided no liberalization has occurred. Finally, if the difference between the coefficients of the two dummies is significantly greater than zero, than a country/period with both financial liberalization and a banking crisis has, on average, a higher level of financial development than a country/period with no crisis and controlled financial markets.

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 that 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 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, which uses 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 clearly show that, at least in the

medium-term time frame, choosing financial liberalization at the cost of a banking crisis pays off in terms of higher growth through higher financial development, or vice versa.[17]

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.[18] Countries that maintained controlled financial markets during the entire sample period are omitted from this panel, since they cannot be included in either group.[19] When the sample is split in this fashion, the results for the restrained countries are quite similar to those for the sample as a whole (bank assets and central bank are significant), while for the repressed group private credit is also significant (tables 10 and 11).

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

	Liquidity	*Private credit*	*Bank assets*	*Central bank*
Growth regressions[a]				
Financial development	–.735	–.775	12.418***	–13.417*
	(.841)	(1.007)	(4.757)	(7.362)
Adjusted R^2	.09	.09	.25	.13
Number of observations	64	64	64	62
Financial development regressions[b]				
Constant	.518***	.363***	.788***	.094***
	(.075)	(.059)	(.030)	(.012)
Financial liberalization dummy	.157*	.173**	.112***	–.038***
	(.084)	(.074)	(.033)	(.014)
Banking crisis dummy	–.019	–.082	–.074*	.038**
	(.111)	(.082)	(.040)	(.019)
Adjusted R^2	.01	.04	.14	.10
Number 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

* Significance level of 10 percent.
** Significance level of 5 percent.
*** Significance level of 1 percent.

a. 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 sysytem to GDP. Private credit is the ratio of bank credit to private sector to GDP. Bank assets are 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 parantheses.

b. 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

	Liquidity	*Private credit*	*Bank assets*	*Central bank*
Growth regressions[a]				
Financial development	.421	5.189**	4.466**	–2.865**
	(2.217)	(2.266)	(2.018)	(1.453)
Adjusted R^2	.04	.12	.10	.08
Number of observations	57	57	58	57
Financial development regressions[b]				
Constant	.411***	.178***	.607***	.267***
	(.065)	(.024)	(.048)	(.100)
Financial liberalization dummy	.060	.163***	.183***	–.162*
	(.073)	(.048)	(.058)	(.097)
Banking crisis dummy	–.085	–.022	–.009	.026
	(.058)	(.061)	(.060)	(.079)
Adjusted R^2	.00	.08	.11	.02
Number 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	.732	.777	.390

* Significance level of 10 percent.
** Significance level of 5 percent.
*** Significance level of 1 percent.

a. 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 are 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.

b. The dependent variable is the financial development indicator listed in the column header. Regressions include a constant.

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 in restrained countries they do, at least in two out of four regressions (tables 10 and 11). In contrast, the positive impact of financial liberalization is evident 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 that of a country that did not liberalize and escaped banking sector problems. In contrast, countries that liberalized from a position of financial repression show a higher level of financial development with liberalization, even if they experience 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 0.7 to 0.9 percentage point per year (table 11).

To summarize, empirical evidence supports the hypothesis that financial liberalization is associated with higher financial development and, through it, with higher output growth, while banking crises have the opposite effect. 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 a banking crisis, while financially repressed countries the gains from financial liberalization are greater.

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, we are here 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 the fact 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.

Conclusion

Increased liberalization of financial markets in general and of the banking sector in particular have been major items on the economic policy agenda of many countries during the last 30 years. In this 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 during the sample period. Countries that experienced one or more banking crises are also represented, along with countries that had a stable banking system throughout the period. Thus the data set covers a wide 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 regulatory framework necessary for financial markets to operate efficiently may fail to check perverse behavior on the part of financial intermediaries, creating the foundation 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 step toward liberalization are carefully weighed against the risks. Another implication of our findings is that more research should be focused 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, accordingly, on growth. 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. However, 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 to interpret these findings is that, once financial sector reforms are carried out to secure positive interest rates, steps towards further liberalization may not necessarily yield gains that offset the negative impact of increased fragility.

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.
Total 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, N.Y.
Bureaucratic delay	Index ranging from 0 to 4	Business Environmental Risk Intelligence (BERI), Washington, D.C.
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

Notes

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1. 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 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).

2. 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 on corporate values (although if information revelation is too extensive, this may 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 resources of their own to finance investment and technology acquisition, and they screen and monitor loan applicants, thereby improving the allocation of resources. By exploiting economies of scale, intermediaries can also make savings mobilization more efficient (Levine 1997).

3. 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 Pazarbašioglu (1995), and Sheng (1995).

4. 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.

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

6. Due to lack of data, the observations for some countries included in the panel do not cover the entire 1980–95 period.

7. Leaving the outliers in the panel does not change the results very much, except that the estimated coefficient for inflation and the real interest rate become smaller. Peru also experienced hyperinflation during the sample period, but the hyperinflation years are excluded from the panel because of missing data.

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

9. To minimize potential endogeneity problems, in measuring 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.

10. The model χ^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 and the total percentage of observations that are correctly classified are reported to assess the predictive 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).

11. The indexes measuring law and order, the quality of the bureaucracy, and corruption range between 0 and 6, while the indexes of bureaucratic delay and contract enforcement range from 0 to 4.

12. 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.

13. 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 technological changes. Second, he shows that banks with larger charter value were less risky, as measured by the risk-premium on uninsured bank CDs.

14. Of course, for given francihis value, large capitalization and large liquidity should create fewer incentives to take on risk.

15. 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.

16. 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.

17. 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.

18. 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.

19. 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.

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