Decomposing the Effects of Financial Liberalization: Crises vs. Growth*

Romain Ranciere^
IMF Research Department

Aaron Tornell
UCLA and NBER

Frank Westermann
Universität Osnabrück and Ifo

March 2006

Keywords: Financial Crises, Growth, Financial Liberalization, Treatment Effects Models
JEL Classification No.F34, F36, F43, O41

Abstract

We present a new empirical decomposition of the effects of financial liberalization on economic growth and on the incidence of crises. Our empirical estimates show that the direct effect of financial liberalization on growth by far outweighs the indirect effect via a higher propensity to crisis. We also discuss several models of financial liberalization and growth whose predictions are consistent with our empirical findings.

*We thank Alessandra Bonfiglioli, Randy Filer, Asaf Razin, Yonna Rubinstein, James Stock, Tijs Van Ren, Paul Wachtel, Giorgio Szego and seminar participants at the Dubrovnik Economic Conference and the IMF for helpful comments ^corresponding author: Romain Ranciere, IMF Research Department, Washington DC 20431, rranciere@imf.org

1 Introduction

There are two contrasting views of financial liberalization. In one view, financial liberalization strengthens financial development and contributes to higher long-run growth. In another view, liberalization induces excessive risk-taking, increases macroeconomic volatility and leads to more frequent crises.

In this paper we propose an empirical framework that brings these two views together. We decompose the impact of international financial liberalization on growth into two effects: a positive direct effect and a negative indirect effect through a higher propensity to crisis. We find that the direct growth gain of financial liberalization significantly outweighs the growth loss associated with more frequent financial crises. On net, the effect of financial liberalization on growth is economically sizeable**:** around 1% increase in per-capita annual growth rate.

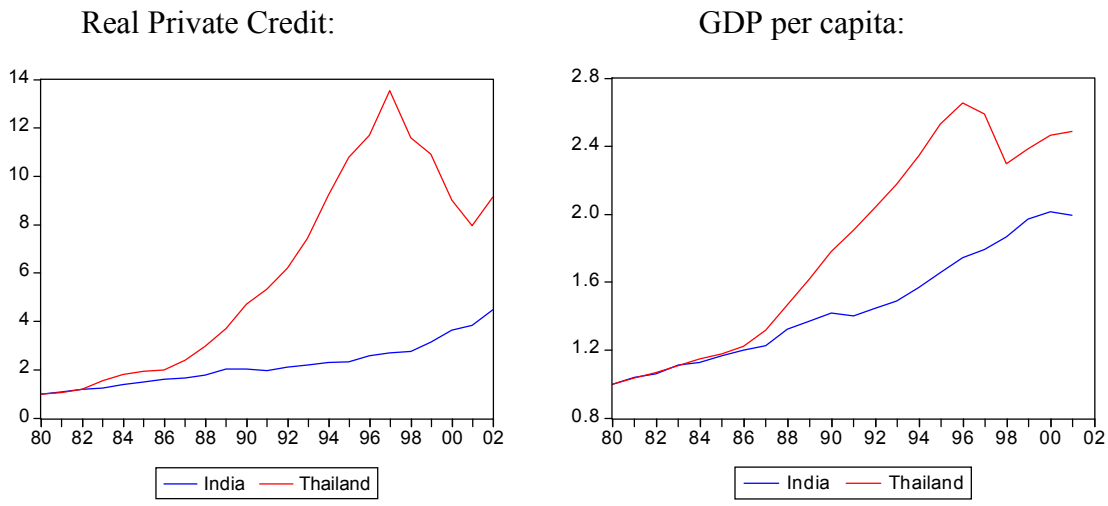
The effect of financial liberalization on growth and its impact on financial fragility and the propensity to crises have been largely studied in separate strands of the empirical literature. The financial crisis literature tests whether financial liberalization increase the risk of financial crises. Kaminsky and Reinhart (1998), Detragiache and Demirguc-Kunt (1998), Glick and Hutchinson (2001) find that the propensity to banking and currency crises increases in the aftermath of financial liberalization. In contrast, the literature on liberalization and growth focuses on identifying the effects of liberalization on average long-run growth. For instance, Bekaert, Harvey and Lundblad (2005) find that stock makert liberalization leads to an increase of one percentage point in average GDP growth.[1] Henry (2000) confirms this result at the firm level by showing that financial liberalization leads to an investment boom associated with a decline in the cost of capital.

The goal of this paper is not to perform another test of the effect of financial liberalization on growth. Instead, its main contribution is to develop an integrated framework to empirically quantify and contrast the *dual effects of financial liberalization*: on the one hand, financial liberalization tends to relax borrowing constraints, leading to higher investment and higher average growth; on the other hand, it encourages risk-taking, generates financial fragility and increases the probability of financial crises, which often have severe recessionary consequences.

The contrasting experiences of Thailand and India illustrate the dual effects of financial liberalization. Thailand, a financially liberalized economy, has experienced lending booms and crises, while India, a non-liberalized economy, has followed a slow but safe growth path (see Figure 1).

[1] They also identify a similar growth effect of capital account liberalization using a measure of the intensity of capital account openness proposed by Quinn (1997).

Figure 1: Thailand vs. India: Credit and Growth (1980-2002)



Note: The values for 1980 are normalized to one.
Source: Ranciere-Tornell and Westermann (2003)

In India GDP per capita grew by only 99% between 1980 and 2001, whereas Thailand's GDP per capita grew by 148%, despite having experienced a major crisis.

We believe that analyzing the effects of financial liberalization in a unified way is important. The division of the empirical literature on financial liberalization between the analysis of the crises and the growth effects has several disadvantages. First, each strand provides only a partial account on the effect of financial liberalization. The crisis view stresses the severity of the output costs of financial crises, but largely ignores its growth benefits during tranquil times. The growth view relies on the estimation of linear growth effects of financial liberalization. This linear approach captures only the "average" growth effect across the booms and busts generated by financial liberalization. The second disadvantage is that each strand has produced its own set of policy implications. Researchers emphasizing the long-run growth effect advocate financial liberalization policies, while researchers that concentrate on crises caution against excessive financial liberalization.

Section 2 contains our empirical findings. Section 3 discusses theoretical mechanisms consistent with our empirical results. Section 4 concludes.

2 Financial Liberalization, Crises and Growth: an empirical decomposition

We propose a methodology to decompose the effect of financial liberalization on growth into two channels: a direct growth channel and an indirect fragility channel. The latter effect captures a higher frequency of crises and the associated costs in terms of lower growth. The main advantage of this approach is that it allows us to quantitatively compare the expected growth benefits of financial liberalization in normal times with the growth costs stemming from a greater vulnerability to crises.

2.1 Empirical Methodology

Our empirical strategy consists of adding to a standard growth regression a financial liberalization dummy and a financial crisis dummy. Furthermore, we treat the financial crisis dummy as an endogenous variable that depends on several variables including financial liberalization. In this set-up, the impact of financial liberalization on growth is composed of two effects: (i) a direct effect on growth conditional on a standard set of control variables and on the absence of financial crisis, and (ii) an indirect effect reflecting the growth costs associated with a higher propensity to financial crises.

Formally, the empirical specification combines a *growth model* and a *crisis model*. The growth model has the following panel form with i indexing the country and t indexing the time period :

$$y_{i,t} = \alpha X_{i,t} + \beta FL_{i,t} + \gamma I_{i,t}^{crisis} + \varepsilon_{i,t}, \tag{1}$$

where $y_{i,t}$ is real per-capita GDP growth, $X_{i,t}$ is a set of control variables standard in the growth literature, $FL_{i,t}$ is a dummy for financial liberalization , and $I_{i,t}^{crisis}$ is a dummy variable taking on a value of one if country i experiences a financial crisis in period t and zero otherwise. Lastly, $\varepsilon_{i,t}$ is a random component.

The *crisis model* treats the crisis dummy $I_{i,t}^{crisis}$ as an endogenous variable which depends on the realization of an unobserved latent variable W_{jt}^{*} in the following way:

$$\begin{aligned} I_{i,t}^{crisis} &= \begin{cases} 1 & \text{if } W_{it}^{*} > 0 \\ 0 & \text{otherwise} \end{cases} \\ W_{jt}^{*} &= aZ_{i,t} + bFL_{i,t} + \eta_{it}. \end{aligned} \tag{2}$$

The latent variable I_{jt}^{*} is assumed to depend linearly on a set of control variables $Z_{i,t}$, on the

financial liberalization dummy$FL_{i,t}$ and on a random component η_{it}. Under the assumption that $\eta_{it} \backsim N(0,1)$, the crisis model can be rewritten as:

$$I_{i,t}^{crisis} = \begin{cases} 1 & \text{with probability} : \Pr(W_{it}^* > 0) = \Phi(aZ_{i,t} + bFL_{i,t}) \\ 0 & \text{with probability: } \Pr(W_{it}^* \leq 0) = 1 - \Phi(aZ_{i,t} + bFL_{i,t}) \end{cases}$$

where Φ is the cumulative distribution function of a standard normal. Thus, the parameters of the crisis model can be estimated using a *probit model.*

Notice that the mixed model described by (1)-(2) is equivalent to a *treatment effects model* for which standard estimation techniques have been developed (see Heckman (1978) and Maddala (1993)).

Estimation Procedure

In the treatment effects model representation, the crisis dummy captures the "treatment", the growth regression (1) is the "outcome" equation and regression (2) is the "treatment" equation representing the likelihood to receive the treatment.[2] As shown by Maddala (1983), the model can be consistently estimated using a two-step procedure under the assumption that the error terms $\varepsilon_{i,t}$ and η_{it} are bivariate normal but not independent. In the first step, one obtains probit estimates of the probability of crisis:

$$\Pr(I_{i,t}^{crisis} = 1) = \Pr(W_{it}^* > 0) = \Phi(az_{i,t} + bFL_{i,t}) \tag{3}$$

where Φ is the standard normal cumulative distribution function. Using the probit estimates $(\widehat{a}, \widehat{b})$, one computes a hazard $h_{i,t}$ for each observation.[3] In the second step, one obtains consistent estimates for the parameters (α, β, γ) of the growth model by augmenting regression (1) with the hazard $h_{i,t}$.[4]

The total effect of financial liberalization, the impact of a change in the financial liberalization dummy from zero to one, is the sum of a direct effect (γ) and an indirect effect due to a change in the probability of crisis:

[2] Edwards (2004) us a similar framework to assess the impact of a sudden stop on growth, as do Razin and Rubinstein (2004) to study the growth effect of exchange rate regimes in the presence of a currency crisis.

[3] The hazard is given by:

$$h_{i,j} = \begin{cases} \phi(\widehat{a}z_{i,t+}\widehat{b}FL_{i,t})/\Phi(\widehat{a}z_{i,t+}\widehat{b}FL_{i,t}) \text{ if } I_{i,t} = 1 \\ -\phi(\widehat{a}z_{i,t+}\widehat{b}FL_{i,t})/\left\{(1 - \Phi(\widehat{a}z_{i,t+}\widehat{b}FL_{i,t})\right\} \text{ if } I_{i,t} = 0 \end{cases}$$

where ϕ and Φ are the density and cumulative distribution of the standard normal density function

[4] An alternative is to use a maximum likelihood procedure to estimate the model (1)-(2) jointly. For details, see Maddala (1983) or Wooldridge (2002).

$$\underbrace{E(y_{i,t}|FL_{it}=1)-E(y_{i,t}|FL_{it}=0)}_{financial\ liberalization\ effect} = \underbrace{\widehat{\beta}}_{direct\ effect} + \underbrace{\widehat{\gamma}\cdot E\left\{\Phi(\widehat{a}z_{i,t}+\widehat{b})-\Phi(\widehat{a}z_{i,t})\right\}}_{indirect\ effect} \quad (4)$$

As discussed in the introduction, the existing empirical literature on financial liberalization has focused either on the estimation of variations of the growth model, using linear techniques, or on the estimation of the crisis model using a probit specification. In contrast, our procedure allows us to jointly estimate the linear growth regression model and the probit model of crisis.

Based on the literature, e.g. Bekaert and Harvey (2005) and Kaminsky and Reinhart (2000), our prior is that the direct effect of financial liberalization on growth is positive , while the indirect effect – via a greater likelihood of crisis – is negative.

The non-linearity of the probit specification is, in principle, sufficient to identify the model and, in particular, to distinguish the direct from the indirect effect of financial liberalization. However, Arellano (2006) shows that such an empirical strategy is likely to result in weak identification. Hence, we introduce in the probit regression some variables that are excluded from the growth regression.[5,6]

The selection of the probit model specification is done using the Aikaike information criterion. In the probit equation we initially include , along with the financial liberalization dummy, all the control variables from the growth regression and the excluded variables in their the first, second and third lags. We then select the specification that minimizes the Aikaike criterion. Finally, the standard errors in both the growth estimates and the probit estimates are clustered at the country level and are adjusted to be robust to heteroskedasticity.

The specification of the growth model and the crisis model at the same annual frequency is convenient for the estimation. A disadvantage is that the estimation of the growth equation using annual data does not allow us to filter out fluctuations at the business cycle frequency. To deal with this issue, we modify the model to combine a growth equation estimated using five-year averages with a probit crisis model estimated at an annual frequency. The first step of the estimation - the probit regression - is identical, but the second step is modified to take into account the possibility that a country is hit by a crisis in any given year during the five-year interval.

[5] The excluded regressors are chosen among variables that have been found to be robust determinants of crises, but do not seem to have a systematic independent linear effect on growth.

[6] As a robustness check, we also estimate the treatment effects model without any exclusion restrictions

2.2 Data

The sample consists of a set of sixty countries for which we have information on the dates of financial crises and financial liberalization over the period 1980-2002. The complete description of the sources and the construction of the variables used in the regression analysis are presented in Appendix A.

We use two sources for the dates of financial liberalization: a *de jure* binary indicator is constructed using the official dates of equity market liberalization described in Beckaert and Harvey (2005), and a *de facto* binary indicator is based on the identification of country-specific trend breaks in private capital flows.[7] We view these two indicators as providing complementary information on the process of financial liberalization. The de jure indicator identifies the timing of a formal regulatory change that allows foreign investors to invest in domestic equity securities. The de facto indicator detects the timing of an actual change in the pattern of foreign inflows and it covers portfolio flows, bank flows and foreign direct investments. Appendix C presents the dates of liberalization for the countries in the sample.

We chose to focus on financial crises that are characterized by the coincidence of a banking crisis and a currency crisis. The main reason for this is that these so-called "twin" crises are largely concentrated in financially liberalized economies. The Mexican and Asian crises are the most prominent examples of twin crises but, actually, the incidence of "twin" crises has been relatively widespread, occurring in such diverse parts of the world as in Latin America in the early and mid-1980s and in Scandinavia in the early 1990s. The twin crisis dummy variable is obtained by combining the systemic banking crises indicator of Caprio and Klingebiel (2003) and the currency crises indicator of Glick and Hutchinson (2001).[8] Caprio and Klingebiel (2003) define a systemic banking crisis as a situation where the aggregate value of the banking system liabilities exceeds the value of its assets. Glick and Hutchinson (2001) construct an indicator of currency crises based on "large" changes in an index of currency pressure, defined as a weighted average of real exchange rate changes and reserve losses.[9] Appendix C presents the dates of twin crises for the countries in the sample.

The dependent variable in the growth model is computed as the log difference in real per capita income. The set of controls for the growth equation is standard and includes initial per capita income, population growth, government size, trade openness and inflation. As discussed in section

[7] See Appendix B for a description of the construction of the de facto index.

[8] We extend the time coverage of the currency crisis indicator to include the period 2000-2002.

[9] Large changes in exchange rate pressure are defined as changes in the pressure index exceeding the mean by more than twice the country-specific standard deviation.

2.1, the list of potential explanatory variables in the probit equation includes the regressors of the growth equation. It also contains the two following variables that are excluded from the growth equation: a measure of real exchange rate overvaluation computed as deviation from a HP trend and the ratio of M2 to reserves. All the variables are introduced as their first, second and third lags. The minimization of the Aikaike criterion selects the final list of crises determinants and the optimal lag structure.

2.3 Estimation Results

The estimation results based on a growth and a crisis model estimated using annual data are presented in Table 1. The top panel shows the estimates of the growth equation, while the bottom panel presents the estimates of the probit equation. Specification [1] includes the de jure financial liberalization index, while specification [2] includes the de facto liberalization index.[10]

The main results can be summarized as follows. First, financial liberalization has a direct positive effect on per capita GDP growth ($\widehat{\beta} > 0$). This effect is significant at the 1 percent confidence level in both equations. Its point estimate is very similar for the two liberalization indices: 1 percentage point for the de jure index and 1.1 percentage points for the de facto index. Second, the incidence of twin crises, estimated through the probit equation, has a negative impact on growth ($\widehat{\gamma} < 0$). The point estimate of $\widehat{\gamma}$ –i.e. the reduction in growth conditional on experiencing a crisis– is in the range $(-0.099, -0.11)$. This range is consistent with findings in the crisis literature.

Third, financial liberalization significantly increases the probability of a twin crisis.[11] Real exchange rate overvaluation, inflation and openness to trade are also associated with a higher probability of crisis. As the probit model is non-linear, the partial effect of a change in one variable on the crisis probability depends on the value of the other variables. For our purpose, we are interested in the average partial effect of financial liberalization on the crisis probability: $E\left\{\Phi(\widehat{a}z_{i,t} + \widehat{b}) - \Phi(\widehat{a}z_{i,t})\right\}$. This measure indicates that financial liberalization is on average associated with an increase in the probability of a twin crisis by 1.45 percentage point for the de facto index and by 1.93 percentage point for the de jure index.[12]

[10] The selection of the probit model specification is done according to the Aikaike criterion which explains why the set of explanatory variables differs between [1] and [2]. Notice that the ratio of M2/Reserves has been included in the initial probit equation but has not been selected in the specification that minimizes the Aikaike criterion.

[11] The estimated difference in the probability of a twin crisis associated with a change from zero to one of the financial liberalization dummy is given by $\Phi(\widehat{a}z_{i,t} + \widehat{b}) - \Phi(\widehat{a}z_{i,t})$. Hence $\widehat{b} > 0$ means that financial liberalization increases *ceteris paribus* the probability of a crisis.

[12] In our sample the annual unconditional probability of a twin crisis is 2.3%

We compute the indirect growth cost of financial liberalization on annual per capita GDP growth by multiplying the estimate of the growth cost of a crisis ($\widehat{\gamma}$) by the average partial effect of financial liberalization on the crisis probability ($E\left\{\Phi(\widehat{a}z_{i,t}+\widehat{b})-\Phi(\widehat{a}z_{i,t})\right\}$). This indirect growth cost ranges from -0.14 to -0.19 percentage points of annual growth, meaning that it is five to seven times smaller than the direct growth effect.

Table 2 summarizes the decomposition of the effects of financial liberalization on growth. The total growth effect of financial liberalization is slightly below 1 percentage point of annual GDP growth, a magnitude in line with previous estimates in the literature.[13]

Table 2: Decomposition of the Effects of Financial Liberalization on Growth (I)

(Frequency of the Growth Equation: Annual)

	de Jure Index	*de Facto* Index
Direct Growth Effect	+1%	+1.1%
Indirect Growth Effect	−0.14%	−0.19%
Total Growth Effect	+0.86%	+0.91%
χ^2-test :Total Growth Effect $\neq 0$ P-value	0.00	0.00

As a first robustness test, we check whether our results survive if the growth equation is estimated using data averaged in five-year intervals. In Table 3, we present the results of the estimation of a modified version of the treatment effects model where the probit crisis model is estimated at an annual frequency while the growth model is estimated using a panel of data averaged over five-year non overlapping intervals.[14] The period of estimation covers 1981-2000 and contains four five-year intervals.

In the five-year average panel, the index of financial liberalization and the index of financial crises in the growth equation represent the fraction of years during which a country has been liberalized or has experienced a crisis within a five-year interval. Since the two-step estimates of the growth model in five-year averages are computed using the results of the probit model presented in Table 1, we only report the estimates for the growth equation in Table 3. The results are similar to the ones obtained using data at annual frequency. The direct effect of financial liberalization is almost identical while the growth costs of crises are slightly more pronounced. The growth effect of inflation is now insignificant while the effect of trade openness becomes stronger. The other regressors have more or less the same impact. Table 4 presents the decomposition of the effects of

[13] For instance, Bekaert, Harvey and Lundblad (2005), using a de facto index, find that financial liberalization leads to a one percentage point increase in annual growth.

[14] With the exception of the initial level of per capita income in 1980.

financial liberalization on growth. In comparison to the growth model estimated with annual data, both the direct growth benefit and the indirect growth cost are a little higher but the resulting total effect is very similar for both the de jure index and the de facto index.

Table 4: Decomposition of the Effects of Financial Liberalization on Growth (II)
(Frequency of the Growth Equation: Five-Year Average)

	de Jure Index	*de Facto* Index
Direct Growth Effect	+1.2%	+1.22%
Indirect Growth Effect	−0.25%	−0.35%
Total Growth Effect	+0.95%	+0.87%
$\chi^2 - test$:Total Growth Effect $\neq 0$ P-value	0.00	0.00

As a second robustness check, we introduce the measure of real exchange rate overvaluation in the growth equation in specification [1] in Table 3. As we suppress the only exclusion restriction, the non-linearity of the probit model becomes the only source of identification of the model. We find that the effect of real exchange rate overvaluation on growth is negative but very small and insignificant. Our main results survive in this specification although both the direct and the indirect effects of financial liberalization on growth are slightly weaker (+0.94% and −0.13%)

2.4 Country Estimates

To illustrate our results, we now turn to country specific estimates of the treatment effect model, restricting the analysis to the subset of countries that experienced financial liberalization within the sample period. First, we fit the model to the data in order to obtain the predicted growth rate and the predicted probability of crisis for each country and each year.[15] Second, for each country we compute the mean predicted growth rate and the mean probability of crisis before and after financial liberalization. Using these mean values, for each country we compute : (i) the predicted change in growth between the pre and post-liberalization period; and (ii) the predicted change in the indirect growth cost of crisis between the pre and post-liberalization periods.

The results are presented in Figure 2. For most of the countries, the predicted change in growth is between 1 and 1.5 percentage points. This change is slightly higher than the marginal total effect of financial liberalization, as it also reflects changes in the other regressors, such as an increase in

[15] The model is fitted using the estimation of the treatment model based on the de jure index of financial liberalization (see regression [1], Table 1).

trade openness. In comparison, the predicted change in the indirect growth cost of a crisis is much smaller, around -0.25 percentage points.[16]

Finally, Figure 3 contrasts the change in growth between the pre and post-liberalization period predicted by the treatment effect model with the change observed in the data. Although the empirical model is parsimonious, it does a reasonable job of describing the difference in growth patterns before and after liberalization. In 15 out of the 25 cases, the predicted change in growth is closer than one percentage point to the differential observed in the data, and in eight cases it is closer than half of a percentage point. However, there are six cases for which the model predicts an increase in growth while a decrease has been observed.[17]

Our key finding is that the direct positive effect of financial liberalization on growth by far outweighs its indirect effect through a higher propensity for twin crises. In order to understand this result, one should keep in mind that even in financially liberalized countries crises remain rare events. Therefore, even if crises can have large output consequences when they occur, their estimated growth effect remains modest. In contrast, since financial liberalization is likely to improve the access to external finance, it has a first order impact on growth.

3 Theoretical Discussion

What are the theoretical mechanisms that can account for the dual effects of financial liberalization observed in the data? In this section, we discuss three models of the effects of financial liberalization that deliver predictions consistent with the empirical findings presented in Section 2.

The interaction between financial liberalization policies and capital market imperfections is at the core of the three models. In Ranciere, Tornell, and Westermann (2003), financial liberalization relaxes borrowing constraints and increases growth, but also generates systemic risk which results in occasional crises. In Martin and Rey (2005), stock market liberalization and financial frictions in asset markets interact to generate either investment booms or financial crashes. In Dell'Arricia and Marquez (2004a, 2004b) financial liberalization leads to less screening by banks, which gives rise to boom-bust credit cycles.

[16] Interestingly, there are several countries, such as Argentina, Brazil, Mexico and Israel, where the predicted probability of a crisis, and thus the growth cost of crisis, has decreased after financial liberalization. This finding primarily reflects the decrease in the level of inflation has decreased in the post-liberalization period.

[17] In two cases, Israel and Colombia, the disappointing growth performance can be attributed to political factors. In the case of Japan, it can be attributed to the long lasting banking crisis of the 90s that is not counted as a twin crisis.

Ranciere,Tornell, and Westermann (2003) develop a model where asymmetries between the tradeable (T) and no-tradeable (N) sectors are key to understanding the link between liberalization and growth. Because liberalization has not been accompanied by judicial reform, severe contract enforceability problems have persisted in many developing economies. While many T-sector firms can overcome these problems in a liberalized economy by accessing international capital markets, most N-sector firms cannot. Thus N-sector firms are financially constrained and depend on domestic bank credit.

Financial liberalization induces higher growth by accelerating financial deepening and thus increasing the investment of financially constrained firms, most of which are in the N-sector. However, the easing of financial constraints is associated with the undertaking of insolvency risk, which often takes the form of foreign currency denominated debt backed by N-sector output. Insolvency risk arises because financial liberalization not only lifts restrictions that preclude risk-taking, but is also associated with explicit and implicit systemic bailout guarantees covering creditors against systemic crises. Not surprisingly, an important share of capital inflows takes the form of risky flows to the financial sector, and the economy as a whole experiences aggregate fragility and occasional crises.[18]

Rapid N-sector growth helps the T-sector grow faster by providing abundant and cheap inputs. Thus, as long as a crisis does not occur, growth in a risky economy is more rapid than it is in a safe one. Of course, financial fragility implies that a self-fulfilling crisis may occur. And, during a crisis, GDP growth falls and typically turns negative. Crises must be rare, however, in order to occur in equilibrium—otherwise agents would not find it profitable to take on credit risk in the first place. Thus**,** average long-run growth may be faster along a risky path than along a safe one.

Martin and Rey (2005) analyze the impact of stock market liberalization on capital flows, asset prices and investment. They show that when there are transaction costs in international assets, stock market liberalization can lead to two possible outcomes for an emerging market economy. Under normal circumstances, liberalization performs the positive role of generating capital inflows, expanding diversification opportunities and lowering the cost of capital, thus leading to higher investment and growth. However, under certain circumstances, "pessimistic" expectations about the state of the economy can be self-fulfilling, leading to a fall in the demand for assets, capital outflows and financial crashes associated with low investment and low growth. The key element for this mechanism to operate is that the decision to invest by one agent influences the cost of capital of other investors through the impact of that decision on income and the price of assets.

[18] For instance, the ratio of foreign liabilities to money in the banking sector, a measure often used to proxy for currency mismatches, increased in Thailand from 50 percent in 1990 to 240 percent in 1996.

Dell'Arricia and Marquez (2004a, 2004b) propose a framework where financial liberalization leads to rapid lending development driven by a reduction in banks' screening incentives. In their model, banks' incentives to screen potential borrowers come from adverse selection among banks –banks screen to avoid financing firms whose projects have been tested and rejected by other banks. When financial markets are liberalized and many new and untested projects request funding, banks do not have strong incentives to screen their pool of applicants and rapid credit expansion ensues. In this case, financial liberalization increases investment and growth but also leads to a deterioration in the quality of the average bank's portfolio that will result in financial fragility. At the macroeconomic level, as negative shocks occur, financial fragility will give way to financial crises and output losses.

In the models discussed above financial liberalization alleviates the consequences of capital market imperfections, but does so at the cost of increasing financial fragility. Hence, the overall effect of financial liberalization on growth is the result of a risk-return trade-off. A financially liberalized economy grows faster in normal times, but is exposed to severe output contractions during financial crises. The direct growth effect dominates under two conditions: First, financial liberalization must strongly reduce financial constraints and help firms increase investment through higher leverage. Second, the frequency of financial crises must be low enough for risk-taking to pay off. The regression analysis presented in section 2 suggests that these two conditions are consistent with the data.

4 Conclusions

Several observers have claimed that financial liberalization is not good for growth because of the crises associated with it. This is, however, the wrong lesson to draw. Our empirical analysis shows that financial liberalization leads to faster average long-run growth, even though it also leads to occasional crises.

We find that in a large sample of countries, financial liberalization typically leads to financial fragility and occasional financial crises. In net terms, however, financial liberalization has led to faster long-run growth. Although crises are costly and have severe recessionary effects, they are rare events. Therefore, over the long run, the pro-growth effects of greater financial deepening and more investment by far outweigh the detrimental growth effects of financial fragility and a greater incidence of crises.

References

[1] Arellano, M., 2006, "Evaluation of Currency Regimes: The Unique Role of Sudden Stops: Comments," *Economic Policy,* 45:119:152.

[2] Bekaert, G., C. Harvey, and R. Lundblad, 2005, "Does Financial Liberalization Spur Growth?" *Journal of Financial Economics,* 77: 3-56.

[3] Caprio G. and D. Klingebiel, 2003, "Episodes of systemic and borderline Banking Crises," mimeo The Worldbank.

[4] Demirguc-Kunt A and E. Detragiache, 1998, "Financial Liberalization and Financial Fragility," IMF Working Paper 98/83.

[5] Dell'Ariccia, G. and R. Marquez, 2004a, "Lending Booms and Lending Standards." Mimeo, IMF.

[6] Dell'Ariccia, G., and R. Marquez, 2004b, "Information and Bank Credit Allocation." *Journal of Financial Economics*, 72 (1), 185-214.

[7] Edwards, S. 2004, "Thirty Years of Current Account Imbalances", *IMF Staff Papers:*51:1-47.

[8] Gosh A., A-M Gulde and H. Wolfe, 2002, *Exchange Rate Regimes: Choices and Consequences,*MIT Press.

[9] Glick R. and M. Hutchinson, 2001, "Banking Crises and Currency Crises: How Common are the Twins," in *Financial Crises in Emerging Markets*, ed. by Glick, Moreno, and Spiegel: New York: Cambridge University Press.

[10] Henry P., 2000, "Stock market liberalization, economic reform, and emerging market equity prices," *Journal of Finance* 55, 529–564.

[11] Heckman, J.J.,1978, "Dummy Variables in a Simulateneous Equation System," *Econometrica,* 46:931-960.

[12] Kaminsky, G. and Kaminsky, G. and C. Reinhart, 1999, "The Twin Crises: The Causes of Banking and Balance of Payments Problems," *The American Economic Review*, 89(3): 473-500

[13] Maddala G.S., 1983, :"Limited-Dependent and Qualitative Variables in Econometrics," *Cambridge University Press*

[14] Martin, P. and H. Rey, 2005, "Globalization and Emerging Markets: With or without Crash", *American Economic Review,* forthcoming.

[15] Quinn,D.,1997,"The Correlates of Changes in International Financial Regulation," *American Political Science Review,*91:531–551.

[16] Ranciere R., Tornell A. and F. Westermann, 2003, "Crises and Growth: A Re-evaluation," NBER WP10073.

[17] Razin, A. and Y Rubinstein, 2006, "Evaluation of Currency Regimes: The Unique Role of Sudden Stops," *Economic Policy,* 45:119:152

[18] Wooldridge, 2002, *Econometric Analysis of Cross Section and Panel Data*, MIT Press.

Table 1: Financial Liberalization, Crisis and Growth (I)

Estimation Technique: Treatment Effects Model, Two-Step Estimation
Robust Standard Errors Clustered at Country-Level
Frequency: Annual
Period of Estimation: 1980-2002

	[1]	[2]
PANEL A: Growth Equation	Coef.	Coef.
Dependent Variable: Real Per Capita GDP Growth		
Financial Liberalization Index	0.010	0.011
(de Jure [1]; de Facto [2])	(3.93)***	(3.42)***
Population Growth	-0.64	-0.62
	(5.38)***	(4.44)***
Government Size	-0.012	-0.012
	(2.34)**	(2.18)**
Inflation	-0.0325	-0.0172
	(5.29)**	(2.64)**
Openness to Trade	0.011	0.0096
	(3.03)***	(2.47)***
Initial Real GDP per capita	-0.019	-0.013
log(Real GDP per capita) in 1980	(1.72)*	(0.95)
Twin Crisis Index	-0.099	-0.11
	(5.96)***	(3.42)***
First-Step Hazard	0.035	0.044
	(4.7)***	(5.7)***
PANEL B: Crisis Probit Equation	Coef.	Coef.
Dependent Variable: Twin Crisis Index		
Dummy Financial Liberalization	0.43	0.62
	(2.01)**	(2.88)***
Real Exchange Rate Overvaluation (lag)	1.82	3.67
(deviation from HP-trend)	(3.43)***	(3.57)***
Real Exchange Rate Overvaluation (second lag)	1.31	
(deviation from HP-trend)	(2.35)**	
Inflation (lag)	1.81	2.03
	(4.93)***	(4.18)***
Openess to Trade (second lag)	0.75	1.05
	(2.41)**	(3.54)***
Rho	0.38	0.41
Sigma	0.037	0.033
Lambda	0.02	0.014
Aikaike Information Criterion Statistics	177.25	105.42
Number of Observations	1214	908
Number of Countries	60	44

Absolute value of z-statistics in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Financial Liberalization, Crisis and Growth (II)

Estimation Technique: Treatment Effects Model, Two-Step Estimation
Robust Standard Errors Clustered at Country-Level
Frequency: non-overlapping five-year interval
Period of Estimation: 1981-2000

	[1]	[2]
Growth Equation	Coef.	Coef.
Dependent Variable: Real Per Capita GDP Growth		
Financial Liberalization Index	0.0120	0.0122
(de Jure [1]; de Facto [2])	(4.26)***	(2.22)**
Population Growth	-0.98	-0.748
	(4.03)***	(3.09)***
Government Size	-0.008	-0.013
	(1.51)	(1.68)*
Inflation	-0.009	-0.008
	(0.99)	(0.66)
Openness to Trade	0.018	0.015
	(2.86)***	(1.98)**
Initial Real GDP per capita	-0.003	-0.0017
log(Real GDP per capita) in 1980	(1.49)	(1.12)
Twin Crisis Index	-0.174	-0.184
	(4.82)***	(3.05)***
First Step Hazard	0.035	0.056
	(2.5)**	(2.08)**
Number of Observations	231	175
Number of Countries	60	44

Absolute value of z-statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Figure 2: Country Estimates of the Growth Effects of Financial Liberalization

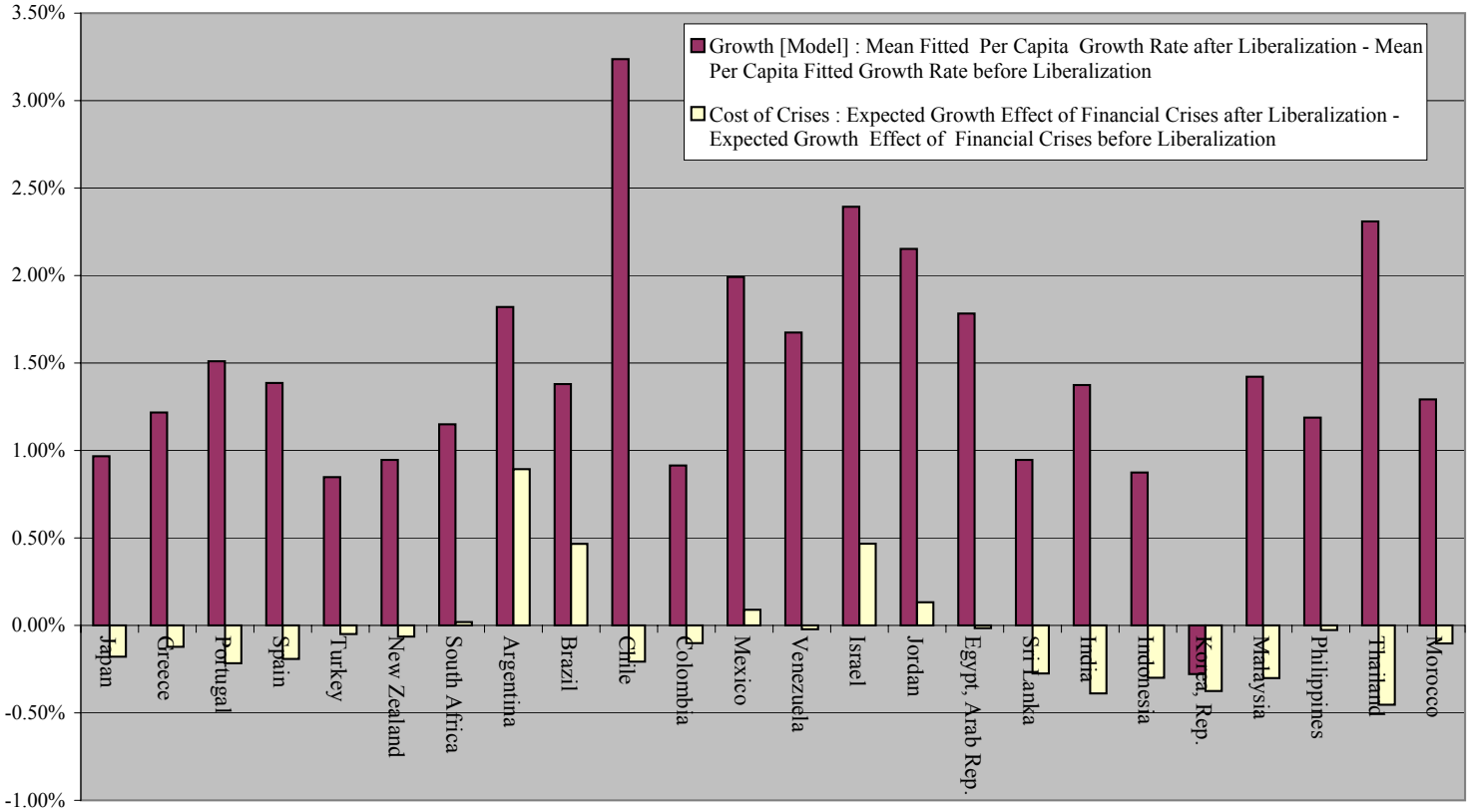
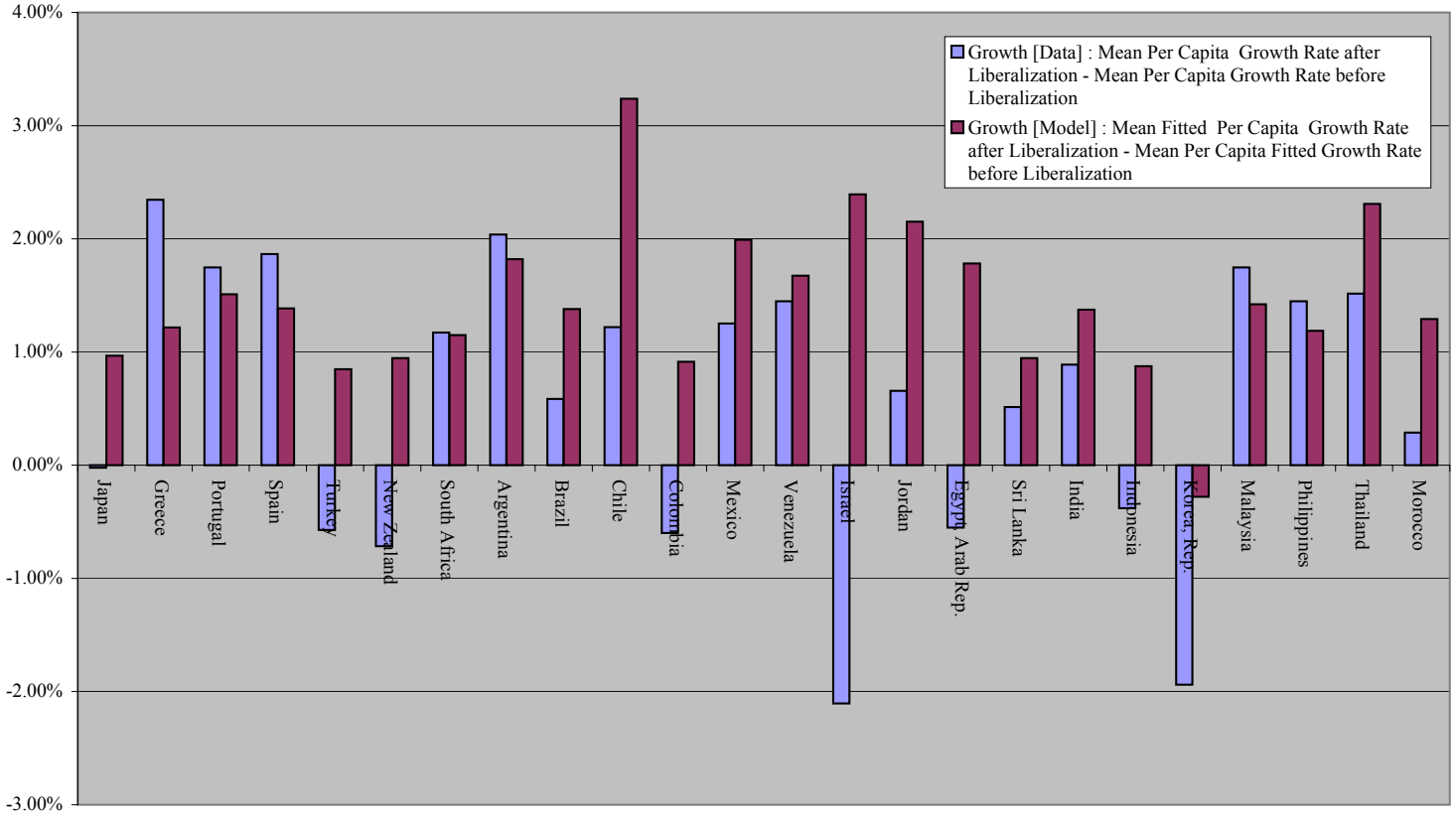


Figure 3: Growth before and after Financial Liberalization: Treatment Effects Model vs. Data



Appendix A: Definitions and Sources of Variables Used in Regression Analysis

Variable	Definition and Construction	Source
De Jure Index of Financial Liberalization	Dummy variable based on the dates of official equity market liberalization corresponding to formal regulatory changes after which foreign investors officially have the opportunity to invest in domestic equity securities.	Beckaert and Harvey (2005)
De Facto Index of Financial Liberalization	see Appendix B	Author's calculation using International Financial Statistics (2004)
Real GDP per capita	Ratio of real gross domestic product over total population. Real growth domestic product is in constant local currency units.	Author's calculation using International Financial Statistics (2004)
Real GDP per capita growth	Log difference of real GDP per capita.	Author's calculation using International Financial Statistics (2004)
Inital Real GDP per capita	Log of real GDP per capita in 1980	Author's calculation using International Financial Statistics (2004)
Twin Crisis Indicator	Dummy Variable indicating a banking crisis and a currency crisis.	Author's calculations using data from Caprio and Klingebiel (2003) and from Glick and Hutchison (2001)
Government Size	Ratio of government consumption to GDP.	World Development Indicator (2004).
Population Growth	Growth rate of total population	World Development Indicator (2004).
Inflation	log(100+annual percent change in consumer price index).	Author's calculations using data from International Financial Statistics (2004)
Real Effective Exchange Rate	Multilateral real exchange rate based on trade partner's weights	International Financial Statistics (2004)
Real Exchange Rate Overvaluation	Difference between real effective exchange rate and HP detrended real rffective rxchange rate (Hodrick and Prescott filtering parameter: lambda=10^4)	Author's calculations using data from International Financial Statistics (2004)
Openness to Trade	Residual of a regression of the log of the ratio of exports and imports (in 1995 US$) to GDP (in 1995 US$), on the logs of area and population, and dummies for oil exporting and for landlocked countries.	Author's calculations with data from World Development Network (2002) and The World Bank (2004).
M2/Reserves	Ratio of M2/total foreign reserves minus gold	Author's calculations using data from International Financial Statistics (2004)

Appendix B: Construction of the de facto Financial Liberalization Index

It is a de facto index that signals the year when a country has liberalized. We construct the index by looking for trend-breaks in financial flows. We identify trend-breaks by applying the CUSUM test of Brown et. al. (1975) to the time trend of the data. This method tests for parameter stability based on the cumulative sum of the recursive residuals. To determine the date of financial liberalization we consider net cumulative capital inflows (KI).[1] A country is financially liberalized (FL) at year *t* if: (i) KI has a trend break at or before *t* and there is at least one year with a KI-to-GDP ratio greater than 5% at or before *t,* or (ii) its KI-to-GDP ratio is greater than 10% at or before *t*. The 5% and 10% thresholds reduce the possibility of false liberalization and false non-liberalization signals, respectively.

When the cumulative sum of residuals starts to deviate from zero, it may take a few years until this deviation is statistically significant. In order to account for the delay problem, we choose the year where the cumulative sum of residuals deviates from zero, provided that it eventually crosses the 5% significance level. The FL index does not allow for policy reversals: once a country liberalizes it never becomes close thereafter. Since our sample period is 1980-2000, we consider that our approach is the correct one to analyse the effects of liberalization on long-run growth and financial fragility.[2]

[1] We compute cumulative net capital inflows of non-residents since 1980. Capital inflows include FDI, portfolio flows and bank flows. The data series are from the IFS: lines 78BUDZF, 78BGDZF and 78BEDZ. For some countries not all three series are available for all years. In this case, we use the inflows to the banking system only, which is available for all country-years.

[2] If after liberalization a country suffers a sharp reversal in capital flows (like in a financial crisis), it might exhibit a second breakpoint. In our sample, however, this possibility is not present: the trend breaks due to crises are never large enough to show up in significant CUSUM test statistics.

Appendix C : List of Countries and Dates of Financial Liberalization and Crises

	De Jure Dates of Financial Liberalization		De Facto Dates of Financial Liberalization	Dates of Twin Crisis
Algeria		*	*NA*	1990-1991
Argentina	1989		1991	1982;1990-1991;2001-2002
Australia	1980		1980	
Austria	1980		1980	
Bangladesh				
Belgium	1980		1980	
Brazil	1991		1992	1998
Canada	1980		1980	
Chile	1992		1984	1982;1985
Colombia	1991		1991	
Costa Rica				
Cote d'Ivoire		*	*NA*	
Denmark	1980		1980	
Dominican			1996	
Ecuador		*	*NA*	1999
Egypt,	1997	*	*NA*	
El Salvador		*	*NA*	
Finland	1980		1980	1991-1993
France	1980		1980	
Germany	1980		1980	
Ghana				
Greece	1987	*	*NA*	
Guatemala		*	*NA*	
Honduras				
India	1992			
Indonesia	1989		1989	1997-1998
Ireland	1980		1980	
Israel	1996		1990	1983
Italy	1980		1980	
Jamaica			1994	
Japan	1983		1980	
Jordan	1995		1996	
Kenya			1993	1995
Korea,	1992		1993	1997-1998
Malaysia	1988		1990	1997-1998
Mexico	1989		1989	1982;1994-1995
Morocco	1997			
Netherlands	1980		1980	
NewZealand	1987		1980	
Nigeria	1995	*	*NA*	
Norway	1980		1980	1992-1993
Pakistan	1991			
Paraguay				
Peru				1988
Philippines	1991	*	*NA*	1983;1997-1998
Portugal	1986		1986	
South Africa	1992	*	*NA*	
Spain	1985		1986	1982
Sri Lanka	1992	*	*NA*	
Sweden	1980		1980	1992-1993
Switzerland	1980		1980	
Thailand	1987		1988	1984 ;1997-1998;2000
Tunisia				
Turkey	1989		1990	1994 ;2001
United Kingdom	1980		1980	
United States	1980		1980	
Uruguay			1989	1982;2002
Venezuela	1990	*	*NA*	1994-1996

*denotes countries in regression [1] using the De Jure Index , but not in Regression [2] using De Facto Index
*1980 means financially liberalized **before or in** 1980. NA = not informed*