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# Financial Liberalization, Crises, and Economic Growth

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The paper empirically explores the effect of financial liberalization on economic growth by combining the results of a panel model with those of a probit model. It confirms the results of previous studies that show the positive net-effect of financial liberalization on growth. Surprisingly, we find that the net effect on growth is larger in the crisis-experienced country group than in the overall sample group. We guess this is because the crisis-experienced countries are mostly developing countries that enjoy higher growth rates than the developed countries. The paper also investigates the effect of financial liberalization on nominal interest rates. The results, contrary to expectations, show that the direct effect of liberalization is positive because of the overshooting in interest rates after crises.

*Keywords:* Financial liberalization; Crises; Economic growth; Panel; Probit Model

*JEL classification:* F30, C23, C25

## **1. Introduction**

Many economists have focused on the effect of financial liberalization on economic

variables, especially on economic growth. That financial liberalization has a positive effect on economic growth is a general consensus since financial liberalization removes many frictions in financial markets and reduces borrowing costs. However, financial liberalization may also cause financial crises in developing countries by inducing risk-taking behavior. Since financial crises have negative effects on economic growth, the main concern of economists lies on the net effect of financial liberalization on economic growth.

Financial liberalization has two channels through which the liberalization effect is transmitted to economic growth. The first channel investigates a direct effect of liberalization on economic growth. In general, we estimate this effect by regressing economic growth on explanatory variables including a financial liberalization dummy (index), like Rodrik (1998), Bekaert, Harvey, and Lundbald (2005), Henry (2000, 2006), etc. The second channel explores an indirect effect by combining the marginal effect of financial liberalization on the crisis (Kaminsky and Reinhart, 1999; Glick and Hutchinson, 2001) with the effect of the crisis on economic growth.

The net effect of financial liberalization on economic growth is the sum of these direct and indirect effects, and Ranciere, Tornell, and Westermann (2006) estimate this effect recently using a panel model with a probit model. The regression results of the

current paper are very similar to those of Ranciere, Tornell, and Westermann (2006) in a sense that the net effect of financial liberalization on economic growth is 0.92 percent in ours and 0.86-0.91 percent in theirs.

This paper also examines the net liberalization effect on economic growth for the sub-samples of data. We reorganize the country group along the criteria of crisis-experienced countries and Asian countries. Surprisingly, the net effect on economic growth is greater in the crisis-experienced group than in overall sample. We guess this unexpected result is based on the fact that most crisis-experienced countries are developing countries. Usually the developing countries enjoy higher growth rates than developed countries, so the liberalization effect can be greater in developing countries although these countries are more likely to experience financial crises. For the Asian countries, the net effect is relatively small, compared to other cases. Because the coefficient on financial liberalization is statistically insignificant, however, we have difficulty in measuring the exact net-effect in this case.

One more contribution of the paper arises from investigating the effect of financial liberalization on the nominal interest rate since most previous studies are silent on this topic. The results, contrary to expectations, show that the direct effect of financial liberalization on the nominal interest rate is positive. We conjecture that the

overshooting in interest rates after a crisis makes the average effect of financial liberalization on the nominal interest rate positive because almost all the crisis-experienced countries are already financially liberalized countries in the sample.

The remainder of the paper is organized as follows. In Section 2, we describe the regression models and explain sample data. Section 3 presents the regression results, and Section 4 concludes the paper.

## **2. The Empirical Model**

### **2.1 The Benchmark Regression Model**

We estimate the effect of financial liberalization on economic growth using a two-step approach. The first step makes use of a probit model to measure the marginal effect of financial liberalization on the twin crisis (banking and currency crises), and the second step runs a panel model to estimate the effect of financial liberalization and crises on economic growth. The first step calculates the probability that the twin crisis will occur after financial liberalization has been realized. Using this probability with the coefficient estimates in the second step, we can measure the net effect of financial liberalization on economic growth.

The probit model is written as:

$$(1) \text{Crisis}_{it} = aFL_{it} + Z_{it}A + \eta_{it}$$

where subscript  $i$  and  $t$  denote an individual country and a time period, respectively.

$\text{Crisis}_{it}$  represents a twin crisis dummy variable that is equal to one if the twin crisis occurs in country  $i$  at time  $t$ . Otherwise, it is zero. The financial liberalization dummy variable  $FL_{it}$  is defined by the same manner as the twin crisis dummy variable.

$Z_{it}$  is a set of explanatory variables, and  $\eta_{it}$  is an error term such that  $\eta_{it} \sim N(0,1)$ .

The set of explanatory variables  $Z_{it}$  consists of a financial liberalization dummy, real exchange rate appreciation<sup>1</sup>, a bank liquid reserve ratio, inflation, and a constant.  $a$  and  $A$  are coefficients on independent variables.

Running the probit model, we can identify the probability of the twin crisis conditional on financial liberalization. The marginal effect of financial liberalization can be found from the change in the predicted probability of crises occurrence that is conditional on the (discrete) explanatory dummy variable<sup>2</sup>:

$$(2) \text{Marginal Effect} = \Pr(\text{Crisis}_{it} = 1 | \bar{Z}_{it}, FL_{it} = 1) - E(\text{Crisis}_{it} = 1 | \bar{Z}_{it}, FL_{it} = 0)$$

In the second step, we run a panel regression model after testing the significance of the group effect. Actually the F-test cannot reject the null hypothesis that the constant terms are all equal, so we choose a random effects model as the benchmark regression

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<sup>1</sup> Real exchange rates are used instead of real effective exchange rates because of data availability.

<sup>2</sup> For computing marginal effects, one can evaluate the expressions at the sample means of the data.

model.

$$(3) \quad y_{it} = \alpha + \beta FL_{it} + \gamma Crisis_{it} + X_{it}\Delta + \varepsilon_{it}$$

where  $y_{it}$  is a dependent variable that is the real per capita GDP growth rate, and  $X_{it}$  is a set of explanatory variables that includes log(initial real GDP), inflation, openness<sup>3</sup>, and the investment/GDP ratio.  $\alpha$ ,  $\beta$ ,  $\gamma$ , and  $\Delta$  are coefficients on dependent variables, and  $\varepsilon_{it}$  is an innovation.

We can capture the effect of financial liberalization on economic growth by two channels. The first channel measures a direct effect of financial liberalization on economic growth. The coefficient estimate on the financial liberalization dummy in the panel regression represents this direct effect. The second channel catches an indirect effect of financial liberalization on economic growth by combining the results of the probit regression with those of the panel regression. The coefficient estimate on the twin crisis dummy in the panel regression multiplied by the marginal effect of financial liberalization in the probit regression generates the indirect effect of financial liberalization on economic growth.

$$(4) \quad E(y_{it} | FL_{it} = 1) - E(y_{it} | FL_{it} = 0) = \hat{\beta} + \hat{\gamma} * \text{Marginal Effect}$$

Equation (4) calculates the net effect of financial liberalization that is the sum of the

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<sup>3</sup> Openness is measured by (export+import)/GDP.

direct ( $\hat{\beta}$ ) and the indirect effect ( $\hat{\gamma} * \text{Marginal Effect}$ ) of financial liberalization on economic growth.

We use a sample of 58 countries over 1980~1999 in the benchmark regressions. And then we conduct the same regressions as the benchmark case to the sub-samples in which the number of the countries is 21 for the group of countries that experienced a twin crisis and the number of the countries is 11 for the Asian countries. Finally, to check the robustness of the regression results, we also use the financial liberalization index from Wyplosz (2001), instead of the financial liberalization dummy, as a dependent variable. In this regression, we exclude openness from the explanatory variables since this variable is statistically insignificant in most previous regressions.

## 2.2 The Alternative Model

When banking or currency crises hit an economy, the nominal interest rate is expected to increase because of the borrowing restriction in financial markets. On the other hand, the effect of financial liberalization on the nominal interest rate is likely to be negative since financial liberalization makes it easier to borrow money from the rest of the world. To test this hypothesis, we conduct a regression where the nominal interest rate is the dependent variable and financial liberalization is one of the independent

variables.

The probit regression does not change, compared with the benchmark case, except the number of sample countries due to data availability. In the meantime, the variables in the panel regression are somewhat different from those in the benchmark regression model. The dependent variable is the nominal interest rate, and the explanatory variables are composed of the financial liberalization dummy, the twin crisis dummy, the real GDP, inflation, and openness. We exclude the investment/GDP ratio and the initial real GDP from the independent variables because these variables are not statistically significant.

### **2.3 Data**

We collect data for 58 countries around the world. This country group includes major industrialized countries and most crisis-experienced countries. The sample period is from 1980 to 1999, and the frequency of the data is annual. Since most banking and currency crises have occurred during 1980s and 1990s, we believe that the sample period is not too short to catch on to the effects of financial liberalization and the crisis on economic variables.

The financial liberalization dummy is from Beckaert, Harvey, and Lundbald (2005).

This dummy variable is based on the dates of official equity-market liberalization in each country. We also use a financial liberalization index from Wyplosz (2001) who made this index by combining the results of Demigure-Kunt and Detriagache (1998), Mehrez and Kaufmann (2000), and Wyplosz (2000). We borrow the twin crisis dummy from Ranciere, Tornell, and Westermann (2006). They calculate this dummy using data from Caprio and Klingebiel (2003) and Glick and Hutchison (2001).

We use money market rates in *International Financial Statistics* as the nominal interest rates in the alternative regression. The investment/GDP ratio comes from *Penn World Table*. The other variables are based on data from *International Financial Statistics*, and then we calculate new variables like real exchange rate appreciation using this data set.

### **3. The Results**

This section evaluates three testable hypotheses about the relationships between financial liberalization, crises and economic growth using the qualitative choice framework and panel regressions outlined in Section 2.

#### **3.1 Financial Liberalization and Crises**

The first testable hypothesis is that - for given economic characteristics - a country will have a higher probability of crises, the more liberalized the country's financial market is. We examine this hypothesis in three exercises: (1) using the whole sample countries, (2) using the sub-sample countries (countries that experienced crises and Asian countries), and (3) using an alternative measure of financial liberalization for the selected sample countries. In the first and second exercises, we use a liberalization dummy (FL dummy) as a measure for financial liberalization, while we use a liberalization index (FL index) in the third case. The lower panel in Table 1 presents the results of probit regressions, of which main findings can be summarized as follows.

First, as a benchmark, column 2 demonstrates that the FL dummy variable is positively related to the probability of crises as expected, and the coefficient estimate is statistically significant at the 10 percent level. This result reflects the fact that financial liberalization is expected to increase the likelihood of crises by inducing excessive risk taking behavior. The real exchange rate overvaluation is also likely to increase the probability of crises, while other regressors including the bank liquid reserve ratio and inflation turn out to be less significant in the incidence of crises. As discussed in Section 2, the parameter estimates from discrete choice models such as a probit model must be transformed to yield estimates of the marginal effects. When the regressor is a discrete

variable, one can easily find the marginal effects by computing the change in the predicted probability that is conditional on the (discrete) explanatory dummy variable. Table 1 shows that the marginal effect of the FL dummy is 0.018 in the benchmark case, which implies that financial liberalization is expected to increase the probability of crises by 1.8 percent point.

In the sub-sample regressions, the estimation results are similar to the benchmark model, and the effects of the FL dummy and real exchange rate overvaluation become significantly larger. Column 2 and column 3 in the lower panel in Table 1 reveal that financial liberalization is expected to increase the probability of crises by 7.4 percent point and by 5.8 percent point for the crisis-experienced countries and Asian countries, respectively.

Finally, it is interesting to examine the effect of financial liberalization using an alternative measure. Column 5 reports estimates of the parameters when the FL index is used for a liberalization measure. Again, this FL index is positively related to the probability of crises with the marginal effect of 4.8 percent. It is worthwhile noting that the estimation results in column 5 are comparable to those in column 4 in which the regression uses the FL dummy as a dependent variable for the same sample countries as the regression in Column 5.

### 3.2 Financial Liberalization and Economic Growth

The next testable hypothesis is that financial liberalization enhances financial deepening and hence directly increases an economic growth. We examine this by employing a random effects regression for the same sample countries as in Section 3.1. The upper panel in Table 1 reports the coefficient estimates of equation (3) using the FL dummy as a measure of financial liberalization and the twin crisis dummy, the initial real GDP, inflation, openness, and the investment/GDP ratio as explanatory variables.<sup>4</sup>

Several features are worth noting. First, the sign and magnitude of the coefficients of explanatory variables are as expected, and the coefficients are statistically significant in most cases: financial liberalization, openness and the investment/GDP ratio are positively associated with economic growth, whereas the crisis dummy, the initial GDP, and inflation are negatively related to economic growth.

Second, the twin crisis is likely to decrease annual GDP growth rate by 4.2 percent point for the whole sample, 4.3 percent point for the crisis-experienced countries, and 6.1 percent point for Asian countries. The use of the FL index as a measure of financial liberalization does not change the results much, with the marginal effect of the twin

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<sup>4</sup> We don't include the government size as an explanatory variable because of its statistical insignificance.

crisis being 4.4 percent point. The coefficients for the crisis dummy are significant at the 1 percent level in all cases.

Third, and most importantly, the point estimates of the FL dummy and the FL index suggest a substantial impact of financial liberalization on output growth through the deepening of a country's financial system. For example, financial liberalization appears to increase the annual GDP growth rate by 1.0 percent point for the whole sample, 1.3 percent point for crisis-related countries, and 0.6 percent point for Asian countries. The coefficients are significant at the 1 percent level except Asian countries, and the estimated coefficients do not vary much with the use of the FL index as an alternative measure of financial liberalization. These effects are substantially large when we consider that the sample mean of output growth is 1.53 percent over the periods.

### **3.3 Financial Liberalization, Crises and Economic Growth**

We now turn to the final testable hypothesis that the liberalization effect dominates the crisis effect, and therefore financial liberalization contributes to economic growth. From Section 3.2, it is obvious that financial liberalization directly increases output growth through the deepening of a financial system. We call this the *liberalization effect*. However, it is also shown that financial liberalization is associated with a higher

probability of crises, which in turn reduces the output growth. We call this the *crisis effect*. Thus the overall impact of financial liberalization on output growth depends on the relative size of the liberalization effect and the crisis effect.

Table 2 reports the net effect of financial liberalization. Recall that the crisis effect can be computed by multiplying the coefficient estimate of the twin crisis dummy in the random effects regression by the marginal effect from the probit regression. The results in Table 2 show that the liberalization effect dominates the crisis effect in all cases. It leads to a positive net effect of financial liberalization on economic growth. The net effect ranges from a low of 0.25 percent point in Asia to a high of 0.98 percent point in crisis-related countries. Notice that the net effect in crisis-experienced countries is greater than that in the whole sample countries. We guess this is because the crisis-experienced countries are mostly developing countries, and the developing countries enjoy higher growth rates than developed countries. So the liberalization effect can be greater in developing countries although these countries experienced crises.

Overall, the results in this section confirm our view that financial liberalization contributes to economic growth through an increase in financial deepness, even after controlling for the probability of crisis occurrence.

### 3.4 Financial Liberalization, Crises and Interest Rates

In Section 2, we briefly discussed a link between financial liberalization and interest rates. On the one hand, one would expect that interest rates will increase due to the borrowing restriction in financial markets once crises have occurred. On the other hand, the effect of financial liberalization on the interest rates is likely to be negative because financial liberalization makes it easier to borrow money from abroad. We test this hypothesis by employing the same methodology used in the previous subsections.

The results in Table 3 show that the crisis dummy has a significantly positive relationship with nominal interest rates as expected, and the FL dummy is also positively related to nominal interest rates, contrary to our expectation. It turns out that financial liberalization directly increases the interest rate by 1.9 percent point, and the resulting net effect of financial liberalization amounts to 2.04 percent point.

The unexpected sign of the liberalization effect can be explained by the empirical ground and the conceptual ground. First, there exists a possibility that the interest rate overshoots after crises, which may reverse the true (negative) liberalization effect by scaling up the average interest rate over the sample period. Second, the removal of financial restraints may not improve allocation efficiency in credit markets because of imperfect information. Third, external factors such as the high and volatile world

interest rate may have been transmitted to the domestic country that has undergone financial liberalization. The degree of openness of the capital account is believed to play a crucial role in the determination of domestic interest rates. In this respect, one needs to separate the capital account liberalization from financial sector liberalization to assess its implications on interest rates.

#### **4. Conclusions**

It has been widely recognized that financial liberalization plays an important role in financial depth and economic development. Although an expanding body of literature has documented this effect across space and time, the channel through which financial liberalization affects the economic growth remains yet unclear. To address the economic significance of financial liberalization, this paper answers two questions: (1) To what extent does financial liberalization affect the crisis occurrence and economic growth? and (2) How much would the effects of financial liberalization be different across country groups?

To answer these questions, this paper employs probit and panel regressions and analyzes the resulting direct and indirect effects of financial liberalization from the empirical perspective. We show that financial liberalization is positively associated with

economic growth, with the (positive) direct effect dominating the (negative) indirect effect. The financial liberalization is expected to increase GDP growth by 0.92 percent point in the whole sample and by 0.98 percent point in crisis-experienced countries, respectively. A robustness check also supports our view that financial liberalization contributes to economic growth, even after controlling for the crisis occurrence.

In this paper, we also provide empirical evidence to test the effect of financial liberalization on the interest rates. The result is contrary to our expectation: financial liberalization increases the interest rates. We conjecture that the overshooting in interest rates after a crisis is the main reason of this phenomenon. That is, the overshooting makes the average effect of financial liberalization on the nominal interest rate positive.

Appendix

Table A1. The sample countries

Country	All	Crisis	Asia	FL index	Int. Rates
Algeria	○	○			
Argentina	○	○		○	
Australia	○			○	○
Austria	○			○	○
Bangladesh	○		○		
Belgium	○			○	○
Brazil	○	○		○	
Canada	○				○
Chile	○	○		○	
Colombia	○			○	
Costa Rica	○				
Cote d'Ivoire	○				○
Denmark	○				○
Dominican	○				
Ecuador	○	○		○	
Egypt	○			○	
El Salvador	○				
Finland	○	○			○
France	○			○	○
Germany	○				○
Ghana	○				
Greece	○				
Guatemala	○				
Honduras	○				
India	○		○	○	○
Indonesia	○	○	○	○	○
Ireland	○				○
Israel	○	○		○	
Italy	○			○	○

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Country	All	Crisis	Asia	FL index	Int. Rates
Jamaica	○				
Japan	○		○	○	○
Jordan	○		○		
Kenya	○	○			
Korea	○	○	○	○	○
Malaysia	○	○	○	○	○
Mexico	○	○		○	○
Morocco	○				
Netherlands	○				○
New Zealand	○			○	○
Nigeria	○				
Norway	○	○			○
Pakistan	○		○		○
Paraguay	○				
Peru	○	○		○	
Philippines	○	○	○	○	○
Portugal	○				○
South Africa	○			○	○
Spain	○	○			○
Sri Lanka	○		○	○	○
Sweden	○	○			○
Switzerland	○				○
Thailand	○	○	○	○	○
Tunisia	○				○
Turkey	○	○		○	
United Kingdom	○			○	○
United States	○				○
Uruguay	○	○			
Venezuela	○	○		○	

Notes: The regression in each column includes countries with “○” mark.

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Table 1. Financial Liberalization and Economic Growth

<b>Panel Regression</b>					
Dependent Variable: Per Capita Real GDP Growth					
	All	Crisis	Asia	FL(1)	FL(2)
FL Dummy	0.010 (3.67)***	0.013 (2.92)***	0.006 (1.36)	0.011 (3.30)***	
FL Index					0.008 (1.91)*
Twin Crisis Dummy	-0.042 (-7.68)***	-0.043 (-6.82)***	-0.061 (-6.63)***	-0.045 (-6.72)***	-0.044 (-6.51)***
Initial Real GDP	-0.055 (-5.23)***	-0.040 (-2.18)**	-0.150 (-7.05)***	-0.078 (-5.61)***	-0.070 (-5.06)***
Inflation	-0.002 (-4.74)***	-0.002 (-4.21)***	-0.208 (-7.33)***	-0.002 (-4.60)***	-0.002 (-4.44)***
Openness	0.008 (1.77)*	-0.001 (-0.07)	-0.000 (-0.03)		
Investment/GDP	0.176 (8.36)***	0.211 (6.47)***	0.311 (8.95)***	0.214 (7.87)***	0.222 (8.06)***
R-square	0.145	0.263	0.479	0.234	0.222
F-statistic	-1.324	-	-	-	-
<b>Probit Regression</b>					
Dependent Variable: Twin Crisis Dummy					
	All	Crisis	Asia	FL(1)	FL(2)
FL Dummy	0.281 (1.71)*	0.520 (2.62)***	1.117 (2.09)**	0.426 (1.89)*	0.670 (2.12)**
Real Exchange Rate Appreciation	1.091 (4.64)***	2.611 (5.20)***	14.659 (4.35)***	2.335 (4.70)***	2.339 (4.68)***
Bank Liquid Reserve Ratio	-0.677 (-0.93)	-0.259 (-0.25)	-1.606 (-0.37)	1.046 (1.02)	1.103 (1.07)
Inflation	0.020 (1.30)	0.005 (0.29)	-10.749 (-1.39)	0.016 (0.98)	0.020 (1.25)
Constant	-1.991 (-12.42)***	-1.711 (-8.48)**	-2.937 (-4.08)***	-2.149 (-8.93)***	-2.343 (-7.70)***
R-square	0.022	0.100	0.364	0.059	0.061
Number of Observations	1160	420	220	540	540
Number of countries	58	21	11	27	27
<i>Marginal Effect of Financial Liberalization</i>	0.018	0.074	0.058	0.033	0.048

Notes: t-statistics are in parentheses.

\*\*\*, \*\*, and \* indicate the significance at the 1%, 5 %, and 10 % level, respectively.

Table 2. Liberalization and Crisis Effects on Economic Growth

	All	Crisis	Asia	FL(1)	FL(2)
Liberalization effect	1.00%	1.30%	0.60%	1.10%	0.80%
Crisis effect	-0.08%	-0.32%	-0.35%	-0.15%	-0.21%
Net effect	0.92%	0.98%	0.25%	0.95%	0.59%

Table 3. Financial Liberalization and Interest Rates

<b>Panel Regression</b>	
Dependent Variable: Nominal Interest Rate	
FL Dummy	0.019 (3.76)***
Twin Crisis Dummy	0.056 (6.93)***
Real GDP	-0.009 (-3.90)***
Inflation	0.609 (34.45)***
Openness	-0.042 (-4.40)***
R-square	0.682
F-statistic	-7.513
<b>Probit Regression</b>	
Dependent Variable: Twin Crisis Dummy	
FL Dummy	0.546 (2.01)**
Real Exchange Rate Appreciation	3.137 (5.06)***
Bank Liquid Reserve Ratio	1.567 (1.00)
Inflation	0.039 (1.58)
Constant	-2.510 (-8.55)***
R-square	0.065
Number of Observations	680
Number of Countries	34
<i>Marginal Effect of Financial Liberalization</i>	<i>0.025</i>

Notes: t-statistics are in parentheses.

\*\*\*, \*\*, and \* indicate the significance at the 1%, 5 %, and 10 % level, respectively.

Table 4. Liberalization and Crisis Effects on Interest Rates

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Liberalization effect	1.90%
Crisis effect	0.14%
Net effect	2.04%

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