How Does Financial Liberalization affect Economic Growth?*

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Abstract

This paper assesses the effects of international financial liberalization and banking crises on investments and productivity in a sample of 93 countries (at its largest) observed between 1975 and 1999. I provide empirical evidence that financial liberalization spurs productivity growth and marginally affects capital accumulation. Banking crises depress both investments and TFP. Both levels and growth rates of productivity respond to financial liberalization and banking crises. The paper also presents evidence of conditional convergence in productivity across countries. However, the speed of convergence is unaffected by financial liberalization. These results are robust to a number of econometric specifications.

JEL Classification: G15, F43, O40, C23

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1 Introduction

Academic economists and practitioners have long debated over the effects of financial globalization on growth. The removal of restrictions on international capital transactions has on some occasions been welcome as a growth opportunity and in others blamed for triggering financial instability and banking crises. Yet, this debate has not addressed the impact of financial liberalization on the sources of growth.[1] Does it affect investments in physical capital or total factor productivity (TFP), or both? If so, in which ways? This paper is a first attempt at answering these questions. Moreover, it helps understand whether financial globalization has growth or level effects and whether it brings convergence or divergence in growth rates across countries.

A wide literature has investigated the effects of international financial liberalization on GDP growth. The theoretical predictions are ambiguous. Some works suggest that, by promoting cross-country risk-diversification, financial liberalization fosters specialization, efficiency in capital allocation and growth (see, for instance, Acemoglu and Zilibotti, 1997 and Obstfeld, 1994). By generating international competition, it may also improve the functioning of domestic financial systems, with beneficial effects on savings and allocation (see Klein and Olivei, 1999 and Levine, 2001). On the other hand, financial liberalization may be harmful for growth in the presence of distortions. It may trigger financial instability, as well as misallocation of capital (see Eichengreen, 2001, for a survey), which are detrimental for macroeconomic performance. The empirical literature has not been able to resolve this theoretical controversy. Some studies (see, for instance, Grilli and Milesi-Ferretti, 1995, Kraay, 2000 and Rodrick, 1998) found that financial liberalization does not affect growth, others that the effect is positive (Levine, 2001, Bekaert et al., 2003 and Bonfiglioli and Mendicino, 2004), yet others that it is negative (Eichengreen and Leblang, 2003). Many authors show the effects to be heterogeneous across countries at different stages of institutional and economic development (see Bekaert et al, 2003, Chinn and Ito, 2003 and Edwards, 2001) and countries with different macroeconomic frameworks (Arteta Eichengreen and Wyplosz, 2001). Perhaps surprisingly, very little evidence exists on the effects of financial globalization on the various sources of growth.

In this paper, I separately address the effects of international financial liberalization on capital accumulation and TFP levels and growth rates. Financial liberalization, i.e. the removal of restrictions on international financial transactions, may affect productivity both directly and indirectly. As a direct effect, it is expected to generate international competition for funds, thereby driving capital towards the most productive projects. In-

[1] The only evidence in this direction is provided by Levine and Zervos (1998), who estimate the relation between the sources of growth and measures of stock market integration based on asset pricing models.

directly, it may foster financial development which in turn positively affects productivity (see Beck et al., 2000).[2] The sign of the direct effect of financial liberalization on capital accumulation, through increased international competition, is ambiguous. For instance, Acemoglu et al. (2005) suggest that the effect of competition may vary depending on the distance of a country to the world technology frontier. Moreover, the overall effect of financial openness on the stock of capital may be ambiuguous, as capital reallocations may translate into net inflows for some countries and outflows for others.[3] Given the results in Beck et al. (2000), I expect the indirect effect through financial development to be weak.

As another indirect channel, however, financial liberalization may trigger financial instability and banking crises, as a wide literature points out (see Aizenmann, 2001 for a survey on the evidence on financial liberalization and crises). Whatever the mechanism generating banking crises, such events may harm the ability of a financial system to provide the economy with credit. As a consequence, both investments in physical capital and innovation can be expected to slow down. In the worst scenario, even TFP might drop, due to the need for shutting down productive projects. I account for the effects of financial instability by controlling all regressions for banking crises. In this way, any indirect effect of liberalization through crises is removed from the estimates for the index of financial liberalization. I also estimate the joint effect of crises and liberalization to assess whether open capital account eases or worsens the recovery from bank crashes. Before going through these estimations, I explicitely address endogeneity between financial liberalization and banking crises by means of multinomial logit regressions.

I follow three methodologies to assess the effects of financial liberalization and banking crises on investments and productivity, and a fourth to address the link between liberalization and crises. I perform difference in difference estimation of the impact of regime switches, between capital restrictions and openness, and between crises and normal times. I focus on investment and TFP levels, and I use a panel data with yearly observations from at most 93 countries over the period 1975-1999. Next, I estimate the same relationships using five-year averages. When studying the effects on TFP growth, I also investigate whether there is evidence of conditional convergence. I estimate an equation for TFP growth rates as a function of initial productivity and the other controls over a period of 25 year in a sample of 85 countries. To overcome problems of unobserved country-specific effects and endogeneity of regressors, I adopt the system GMM dynamic panel

[2] Financial development can be defined as the ability of a financial system to reduce information asymmetries between investors and borrowers, trade and diversify risk, mobilize and pool savings, and ease transactions. Removing restrictions on international financial transactions (financial liberalization) may affect the way a financial system carries over its functions, hence financial development.

[3] Alfaro et al. (2004) show that financial libralization does not significanly affect net capital flows, but did not examine the interaction between financial liberalization and productivity.

technique proposed by Arellano and Bover (1995) and Blundell and Bond (1998). To assess whether financial liberalization favors the occurrence of banking crises, I estimate logits and multinomial logits for an indicator distinguishing between systemic and borderline crises (see Caprio and Klingebiel, 2002). I use the annual 93-country panel spanning between 1975 and 1999.

The main results are the following. (1) The effect of financial liberalization on TFP is positive and large in magnitude, while it is weak and non-robust on investments. (2) The impact on TFP is both on levels and and growth rates, implying that financial liberalization is able to spur GDP growth in the short as well as in the long run. (3) Financial liberalization raises only the probability of minor banking crises in developed countries. (4) Banking crises harm both capital accumulation and productivity. (5) Institutional and economic development amplify the positive effects of financial liberalization on productivity and limit the damages from banking crises. (6) Neither financial liberalization nor banking crises affect the speed of convergence in TFP growth rates.

The contribution of this paper is mainly related to three strands of literature. The literature on growth and development accounting has shown that a large share of cross-country differences in economic performance is driven by total factor productivity (TFP) rather than factor accumulation (physical and human capital).[4] Hall and Jones (1999) point out that a substantial share of GDP per worker variation is explained by differences in TFP and provide evidence that productivity is to a large extent determined by institutional factors. Klenow and Rodriguez-Clare (1997) show that also GDP growth differentials are mainly accounted for by differences in the growth rates of TFP. These results suggest that financial globalization may affects the wealth of nations through its impact on TFP, rather than factor accumulation, and that it may be important to distinsuish between the two channels.

Several authors suggest that financial development spurs GDP growth by fostering productivity growth, not only by raising the funds available for accumulation. Theoretical papers by Acemoglu, Aghion and Zilibotti (2005), Acemoglu and Zilibotti (1997), Aghion, Howitt and Mayer (2005b) among others show that financial development may relieve risky innovators from credit constraints, thereby fostering growth through technological change. While earlier contributions (e.g., Greenwood and Jovanovic, 1990) suggest that financial development fosters growth simply by increasing participation in production and risk pooling, in the later works the relationship is also driven by advances in productivity. King and Levine (1993), and, in more detail, Beck Levine and Loayza (2000) show evidence

[4]See Caselli (2005) for a survey on the develpment accounting literature, and Easterly and Levine (2001) for the stylized facts on development and growth accounting.

of a strong effect of financial development on TFP growth, and only a tenuous effect on physical capital accumulation.

My analysis of the joint effects of financial liberalization and banking crises on the sources of growth is also related to the literature on financial fragility and confronts with some of its predictions. For instance, Martin and Rey (2003) propose a model with multiple equilibria where financial liberalization raises asset prices, investments and income in emerging market, though leaving the poorest more prone to financial crises. In Ranciere et al. (2004) and Tornell et al. (2004) banking crises may arise as a by-product of the higher growth generated by financial liberalization, in countries with credit market imperfections. Feijen and Perotti (2005) suggest that financial liberalization increases the likelyhood that the lobbying over the credit market accessibility generates financial fragility in equilibrium. Reinhart and Kaminsky (1999) provide evidence from a sample of 25 countries that financial liberalization has predictive power on banking crises. Kaminsky and Schmuckler (2002) show that this negative effect dominates in the three-four years immediately after liberalization, then positive growth effects tend to emerge.

The remainder of the paper is organized as follows. Section 2 gives a brief overview on growth and development accounting, which leads on to the discussion of my empirical strategy. In section 3, I describe the dataset, with particular attention to the indicators of financial liberalization and banking crises, as well as the construction of the data for physical capital and TFP. Section 4 presents the econometric methodologies, and section 5 reports the results from the estimation of the equations for investments. Section 6 shows the evidence on level and growth rates of TFP and section 7 concludes.

2 The empirical strategy

The literature on growth and developing accounting takes as starting poing the Cobb Douglas specification for the aggregate production function,

$$Y = AK^{\alpha}(HL)^{1-\alpha}, \tag{1}$$

where K is the aggregate capital stock, L the number of workers and H their average human capital. The term A represents the efficiency in the use of factors, and corresponds to the notion of total factor productivity (TFP). Several contributions on development accounting (see Caselli, 2005 for a survey and Hall and Jones, 1999) have shown that a large share of the cross-country variation in GDP per worker, $\frac{Y}{L}$, is explained by differences in A. The works on growth accounting (see Easterly and Levine, 2001 and Klenow and

Rodriguez-Clare, 1997), focusing on the following expression

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha\frac{\dot{K}}{K} + (1-\alpha)\left(\frac{\dot{H}}{H} + \frac{\dot{L}}{L}\right), \tag{2}$$

have shown that also cross-country differentials in GDP growth are to a large extent generated by differentials in productivity growth ($\frac{\dot{A}}{A}$).

All studies on the impact of financial liberalization and banking crises on growth have focused on $\frac{\dot{Y}}{Y}$, without assessing whether the effects are transmitted through factor accumulation or changes in productivity, or both. To grasp the relevance of the exercise proposed in this paper, consider the following growth regression:

$$dy_{it} = b_0 + b_1 y_{it-1} + b_2'\mathbf{Z}_{it} + b_3 FLIB_{it} + b_4 BC_{it} + u_{it}, \tag{3}$$

where $dy_{it} \equiv d\log(Y_{it})$ is the growth rate of GDP in country i, y_{it-1} is the logaritm of lagged GDP, $\mathbf{Z}_{it}$ is a vector of control variables, $FLIB_{it}$ and BC_{it} are indicators of financial liberalization and banking crises respectively, and u_{it} is the error term. Suppose the estimate for $\hat{b}_3$ is not significantly different from zero. This may reflect the absence of an effect of financial liberalization on any source of growth, as well as the presence of two countervailing effects on capital and TFP accumulation. Understanding what lies behind the effects on aggregate GDP growth may be crucial for policy purposes.

Various aspects of financial markets, such as volume, international liberalization and the occurrence of banking crises, may be expected to affect both physical capital accumulation and factor productivity. Beck et al. (2000) have shown evidence of a strong effect of financial depth on productivity, and a much weaker on capital accumulation.[5] Klein and Olivei (1999) and Levine (2001) find that financial liberalization fosters financial development. Should financial liberalization and banking crises affect investment and productivity only through the effect on the volume of credits, their impact on TFP and capital accumulation would thus be expected to be strong and weak respectively. However, there may be other, more direct effects as well.

Opening up the economy to capital inflows and outflows increases the degree of competition among international financial markets, which may lead to improvements in the allocative efficiency of the financial system. This implies that, holding financial depth constant, the average productivity of the financed projects might be higher than under autarky. Financial liberalization also allows for international risk-diversification, which

[5] Financial depth is often used in the empirical literature as a measure of financial development, since it accounts for the weight of financial intermediation in the economy.

may channel more resourses to risky innovation. Both effects may in turn shift resources away from physical capital accumulation towards TFP growth. As pointed out by Obstfeld (1994), financial globalization promotes specialization, just like trade, raising TFP where productivity is already high, and physical investments in countries far from the technology frontier.

Banking crises may hit industrial sectors to different extents. Financial instability may induce the investors to take less risk, thereby shifting resources from innovation, which is typically riskier, to capital accumulation. However, the opposite might happen if a country deliberately invested in innovation to more quickly recover from the crisis.

3 The data

I perform the analysis on three datasets: a cross-section of 85 countries with data averaged over the period 1975 and 1999, and two unbalanced panels comprising up to 93 countries with annual and five-year observations over the period 1975-1999. As Table A shows, the largest sample includes twenty-two developed and seventy-one developing countries from all continents. The following subsections describe the main variables I include in the regressions.

3.1 Control variables

When assessing the effects of financial liberalization and banking crises on capital accumulation and productivity, I also control for a number of variables.

- Initial real per capita GDP (**rgdpch** from the PWT 6.1) accounts for different stages of economic development. It is often claimed that richer countries are more likely to have open financial markets, hence the effect of financial liberalization might seem spurious if initial GDP is not controlled for. If adding this variable to the regressions does not take away significance from the coefficient for financial liberalization, the suspects of spuriousness are less sound.

- I include government expenditure as a ratio of GDP (**kg** from the PWT 6.1) in the regressions for capital accumulation. Several theories predict that government expenditure crowds out private investments. If this is the case, I should expect a negative coefficient in the equation for capital accumulation.

- Financial depth, as proxied by the ratio of total credit to the private sector over GDP (**privo** from Beck and Demirguc-Kunt, 2001) and its growth rate give a measure of the external finance available to firms. Klein and Olivei (1999) and Levine (2001)

show that financial liberalization promotes financial development, which may be expected to foster productivity more than capital accumulation, according to Beck et al. (2000). Bonfiglioli and Mendicino (2004) also find that banking crises have a negative effect on privo, mainly where institutions are weak. Controlling for financial depth in the equations for both investments and productivity helps disentangle the direct effects of liberalization and crises from the indirect ones through financial development.

A recent literature on financial fragility points out that crises may come along as by-products of sustained growth of the financial system (see Ranciere et al., 2004 and Tornell et al., 2004). Feijen and Perotti (2005) suggest that equilibria with financial fragility and high participation in the financial market may arise where political accountability is not very high and wealth inequality is high. Including privo and its growth rate in the logit regressions for banking crises allows me to test a reduced form of these theoretical predictions.

- I also control for openness to trade, proxied by import plus export as a ratio of GDP (**openk** from the PWT 6.1). Trade may affect the efficiency of an economy through several channels, such as specialization according to comparative advantage, access to larger markets with more product variety and increased competition. These effects may in turn stimulate both capital accumulation and productivity growth. However, the impact of trade may also depend on the distance of a country to the world technology frontier, as suggested by Acemoglu et al. (2005) and Aghion, Burgess, Redding and Zilibotti (2005).

- Intellectual property right protection is expected to enhance productivity by giving incentives for innovation. This is controlled for by using the measure (**ipr**) by Ginarte and Park (1997), which is available for five-year periods from 1960 to 1990.

- Demirguc-Kunt and Detragiache (1997) show that the existence of explicit deposit insurance increases the likelihood of bank runs and thus crises of the banking sector. Hence, I include a measure of deposit insurance (**depins**) from Demirguc-Kunt and Sobaci (2000) in the logit analysis for banking crises.

- I also control for **inflation** (from the World Development Indicators) in the logit for banking crises. I take this variable as an indicator of bad macroeconomic policies, which are likely to make a country prone to crises.

- Finally, I use indicators of economic and institutional development to check for heterogeneity in the effects of financial liberalization and banking crises on both

investments and productivity. In the cross-sectional estimates for TFP growth I explicitely control for institutional quality using the Government Anti-Diversion Policy index (**gadp**, from Hall and Jones, 1999) as a proxy. As an indicator of economic development, I construct a dummy (**developing**) that takes value 1 if the country is defined as low or middle-low income in the World Development Indicators, and 0 otherwise. In the panel regressions, I use these indicators to split the sample and construct interactive terms.

3.2 Financial liberalization

I use two 0-1 indicators of financial liberalization, which rely on de iure criteria. The first one, CAL, is a dummy variable that takes value 0 if a country has held restrictions on capital account transactions during the year, and 1 otherwise. The existence of restrictions is classified on a 0-1 base by the IMF in its Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), which is available for a maximum of 212 countries over the period 1967- 1996.[6] This is the most commonly used indicator of international financial liberalization.

The second indicator relies on the chronology of official equity market liberalization, which is available in Bekaert et al. (2003) for 95 countries from 1980 onwards. It takes value 1 if international equity trading is allowed in a given country-year, and 0 otherwise. This dummy variable, EML, differs from CAL because it only accounts for equity market liberalization and not, for instance, credit market liberalization. As opposed to CAL, it does not allow for policy reversals: it labels a country as open ever since its first year of liberalization.

Factors affecting capital accumulation and productivity may also influence the decision of a country to liberalize financial markets. Moreover, there may be countries adopting such reforms either after reaching certain levels of investments and productivity, or with the purpose to attain them. This may raise concerns of omitted variables bias or even endogeneity, when estimating the effect of financial liberalization on capital accumulation and TFP. I tackle the issue by estimating the following logit on the annual panel dataset:

$$\Pr\left(FLIB\_r_{it}=1\right)=\frac{e^{\beta_o+\boldsymbol{\beta}_1\mathbf{X}_{it}}}{1+e^{\beta_o+\boldsymbol{\beta}_1\mathbf{X}_{it}}},$$

where $FLIB\_r_{it}\in\{CAL\_r,\, EML\_r\}$ is an indicator of the reforms observed in country

[6] Classification methods have changed in 1996, so that there are now 13 separate indexes that can hardly be compared to the previous single indicator. Miniane (2000) harmonized the classifications, though for a limited number of countries, and over a short time span.

i at time t, and $\mathbf{X}_{it}$ is a set of covariates. CAL_r equals 0 if there are no reforms, 1 if a switch into capital account liberalization occurs, -1 if the switch is out of it. EML_r does not admit reversals, thus it equals 1 in case of equity market liberalization reforms, and 0 otherwise. When the dependent variable is CAL_r, the estimation is performed with a multinomial logit.[7] All standard errors are robust and clustered by country. Following Bekaert et al. (2003), I include among the covariates a measure of institutional quality (gadp), lagged real GDP (rgdpch), government expenditure (kg), openness to trade (openk), financial depth (privo), inflation and GDP growth. I also control for economic development (developing) and continental dummies.

The results in Table B show the geographical component to capture reforms the most.[8] Perhaps surprisingly, the coefficient for gadp, not significantly different from zero, tells that financial liberalization is not more frequent in countries with good institutions than in the others.

3.3 Banking crises

Banking crises are subject to various classifications. I adopt a zero-one anecdotal indicator of bank crises, proposed by Caprio and Klingebiel (2003), who keep record of 117 systemic and 51 non-systemic crises occurring in 93 and 45 countries respectively, from the late 1970's and onwards. On a yearly base, the variable BC takes value 2 or 1 if the country has experienced a systemic or borderline banking crisis, respectively, and 0 otherwise. Caprio and Kilingebiel label a crisis as systemic if a great deal or all of a bank's capital has been exhausted and borderline if the losses were less severe. To make this definition criterion clearer, I refer to a few episodes. The 1991 crisis in Sweden as well as the 1998-99 crisis in Russia were systemic, since they involved insolvency or serious difficulties for 90 and 45 per cent of the banking system, respectively. The isolated failures of three UK banks between the eighties and the nineties, as well as the solvency problems of Credit Lyonnais in France in 1994-95, are instead labled as borderline crises.

Before going through the analysis of the effects of financial liberalization on the sources of growth, I address endogeneity between banking crises and financial liberalization, by estimating the following logit on the annual panel dataset:

$$\Pr\left(BC\_type_{it}=1\right)=\frac{e^{\beta_o+\boldsymbol{\beta}_1\mathbf{X}_{it}+\gamma FLIB_{it}}}{1+e^{\beta_o+\boldsymbol{\beta}_1\mathbf{X}_{it}+\gamma FLIB_{it}}}.$$

[7] All results are robust to the use of logit and probit on separate indicators: CAL_in (1 for switches into capital account liberalization, and 0 otherwise) and CAL_out (1 for switches out of capital account liberalization, and 0 otherwise).

[8] Note that, if I remove any of the continental dummies, the coefficients for the others remain significant.

The variable BC_type_{it} takes value one if a banking crisis of a given *type* (systemic, borderline, or either one) has occurred in country i at time t. The vector $\mathbf{X}_{it}$ includes a series of covariates, and $FLIB_{it}$ is the binary indicator of financial liberalization. To appreciate the effects of all covariates, I also estimate a multinomial logit for BC_{it}, which takes values 1 and 2 in case of borderline and systemic crises respectively, and zero when no crises occur.[9] I cluster the standard errors by country.

Table C reports the results for BC_all, which equals 1 if any type of crisis has occurred, and 0 otherwise. Neither indicator of $FLIB$ has significant coefficient estimates. The variables raising the likelihood of crises the most are high inflation and the existence of explicit deposit insurance, as already shown by Demirguc-Kunt and Detragiache (1997). High real GDP per capita and growth rate of financial depth significantly reduce the probability of crisis. The first result is in line with the predictions in Martin and Rey (2004), while the second seems to contraddict the "bumpy path" hypothesis proposed by Ranciere et al. (2004) and Tornell et al. (2004). Splitting the sample between developed and developing countries (columns 3-4 and 7-8), I find that CAL has a positive effect on the likelihood of banking crises in developed countries, while the growth rate of private credit is a more important factor in developing countries.

Finally, I exploit the classification in Caprio and Klingebiel (2002) and estimate with a multinomial logit the effects of all covariates on systemic versus borderline banking crises. Table D shows that CAL only has a positive effect on the likelihood of borderline banking crises in developed countries. The positive coefficient in column 3 of Table C is explained by the fact that most banking crises in developed countries are borderline. Deposit insurance, high real per capita GDP and the growth rate of financial depth mainly affect the probability of systemic crises. High inflation has opposite effects on the likelihood of the two types of crises: negative for borderline and positive for systemic crises. Equity market liberalization has no effect at all.

3.4 Capital accumulation

I construct the series of the log-difference of physical capital stocks (dk) following the perpetual inventory method as in Hall and Jones (1999), using data from the Penn World Tables 6.1. I estimate the initial stock of capital, K_{t_0} as $\frac{I_{t_0}}{g+\delta}$, where g is the average geometric growth rate of total investments between t_0 and t_0+ 10.[10] In the paper t_0 is

[9] I estimated the same model with pooled probit and fixed effects probit. Since the results are not sensitive to the estimation technique, I just report coefficients from the multinomial logit estimates.

[10] Investments are defined as I = ki*rgdpch*pop from the PWT 6.1.

1960, since I have data on investments dating back to that year for most countries.[11] A depreciation rate δ of 6 per cent in ten years is assumed. The later values of the capital stock are easily computed as $K_t = (1- \delta)K_{t-1}+ I_t$.

3.5 Productivity

I construct the series of total factor productivity following the Hall and Jones (1999) approach to the decomposition of output. I assume the production function in country i to be

$$Y_i = K_i^{\alpha} \left(A_i H_i L_i\right)^{1-\alpha},$$

where Y_i is the output produced in country i, K_i is the stock of physical capital in use, A_i is labor-augenting productivity, L_i is the labor in use (rgdpch* pop/ rgdpwok from the PWT 6.1), and H_i is a measure of the average human capital of workers ($H_i L_i$ is therefore human capital-augmented labor).[12] The factor share α is assumed constant across countries and equal to 1/3, which matches national account data for developed countries. I adopt the following specification for labor-augmenting human capital as a function of the years of schooling, s_i:

$$H_i = e^{\phi(s_i)}.$$

I rely on the results of Psacharopulos' (1994) survey and specify $\phi(s_i)$ as a piecewise linear function with coefficients 0.134 for the first four years of education, 0.101 for the next four years, and 0.068 for any value of $s_i > 8$.

Equipped with data on capital, output per worker, population and schooling (from Barro and Lee, 2001), I can compute the series of total factor productivity as

$$A_i = \frac{Y_i}{L_i} \frac{1}{H_i} \left(\frac{K_i}{Y_i}\right)^{-\frac{\alpha}{1-\alpha}}.$$

4 Econometric specifications and methodologies

In the next sections, I follow various methodologies to estimate the effects of financial liberalization and banking crises on the sources of growth. First, I fully exploit the cross-sectional and time-series information in the annual dataset and estimate

$$P_{it} = \beta_0 + \boldsymbol{\beta}_1' \mathbf{X}_{it-1} + \gamma FLIB_{it-1} + \delta BC_{it-1} + \eta_i + \nu_t + \varepsilon_{it}, \tag{4}$$

[11] In the countries which have no data for 1960 t_0 is the first year followed by at least 15 observations.

[12] In Hall and Jones (1999) Y_i is rgdpch*pop from the PWT, net of the value-added of the mining industry. Following Caselli (2005), I simplify and take rgdpch*pop.

where P_{it} is a proxy for the outcome variable (either $\frac{\dot{K}}{K}$, $\frac{\dot{A}}{A}$ or $log(A)$ in the variuos specifications) observed in country i at year t, $\mathbf{X}$ are control variables, $FLIB$ is a dummy for financial liberalization and BC an indicator of banking crises. To reduce problems with simultaneity bias, all regressors enter as lagged values. η_i is a country-specific fixed effect capturing heterogeneity in the determinants of P that are specific to i. Its inclusion in (4) implies that γ is only estimated from the within-country variation around the liberalization date. The fixed year effects (ν_t) allow me to compare the change in P between the pre and post-reform periods in countries that have liberalized with the change in the countries that maintained the restrictions. This means that equation (4) is a "difference in difference" specification, since it implies differencing out the time-mean for each i, and the common trend for all i's at any t.

Two main problems may undermine the ability of γ to identify a causal link from financial liberalization to the sources of growth. First, there may be concerns about the selection of the countries that liberalized. As the results in Table B suggest, geographical location is a good predictor for reforms on international capital transactions. Suppose there are fewer liberalization episodes among countries of a certain area which also experiences particularly low productivity growth. This area-specific productivity trend may bias the effect of financial liberalization upwards. To control for this bias, I check if there are such differences across areas (Asia, Latin America, Africa, Europe+North America) and, if so, I include interacted time-area dummies. Table E reports the percentage of observations with capital account and equity market liberalization reforms (rows 1-2 and 4, respectively), the share of country-years with open capital and equity markets (rows 3 and 5), and the means of TPF (levels and growth) and capital accumulation across continents. Note from rows 1 and 2 that Africa, accounting for almost half of the sample, has the least number of capital account reforms and a very bad performance in terms of productivity growth. On the other hand, Europe and North America have the highest incidence of unreverted capital account liberalizations, the best performance in terms of productivity and the worst in capital accumulation. Moreover, in row 4, Asia has the highest number of equity market reforms and the highest average TFP growth. This suggest to control the difference in difference regressions for continental trends in both productivity and capital accumulation.

A problem of endogeneity of policy changes may also arise. Suppose a country opens up when experiencing an economic crisis to help the recovery or alternatively when it is already on a sustained growth path. This may attribute a negative or positive effect to financial liberalization which is actually due to a trend, thereby producing biased estimates. As a solution to this problem, I control for a dummy taking value 1 during the

three or five years prior to the liberalization and zero otherwise. This allows me to verify whether the change in P was part of a previous trend or caused by liberalization.

To assess the effects of policy changes and banking crises in the medium-run, I also perform difference in difference estimates on a five-year panel dataset. In this case, the dependent variable is observed at the end of the period, while the regressors are expressed as beginning-of-period values.

When investingating TFP growth, I am also interested in the effects of liberalization along the transition. Therefore, I estimate the following productivity growth regression:

$$da_{i(t-\tau,t)} = \beta_0 + \lambda a_{it-\tau} + \boldsymbol{\beta}_1' \mathbf{X}_{i(t-\tau,t)} + \gamma FLIB_{i(t-\tau,t)} + \delta BC_{i(t-\tau,t)} + u_{it}, \qquad (5)$$

where $da_{i(t-\tau,t)} = 100\frac{\log(A_{it})-\log(A_{it-\tau})}{\tau}$ and the regressors indexed by $(t-\tau,\, t)$ are τ-year period averages. A coefficient estimate $\hat{\lambda} < 0$ indicates that there is conditional convergence in productivity. The speed of convergence b can be obtained from the definition of $\lambda = -100\frac{1-e^{b\tau}}{\tau}$. I first estimate equation (5) on a 25-year cross section (τ= 25). As enphasized by the empirical growth literature (see Temple, 1999 for a survey), cross-sectional estimates have several limits. They do not allow me to exploit the time-series variation in the data, which is important to assess the effects of reforms, such as financial iberalization; nor to control for omitted variables, country-specific effects and endogeneity of the regressors. In this case, addressing endogeneity with an instrumental variable strategy looks rather difficult. Legal origins may be a good instrument for financial development (see La Porta et al, 1997), but do not look particularly suitable to instrument a variable as $FLIB$, which involves policy changes and perhaps reversals over the sample. Bekaert et al. (2003) address the issue by separately estimating a probit for $FLIB$, and find that the quality of institutions is crucial in determining the choice of liberalization. But as the institutional framework is known to be an important determinant of TFP (see, among others, Hall and Jones, 1999), it does not seem a valid instrument for $FLIB$, in a regression for TFP.

I address the first problem by turning to panel data. Note that the specification of equation (5) with $u_{it} = \eta_i + \nu_t + \varepsilon_{it}$ includes the lagged dependent variable. It follows that, even if ε_{it} is not correlated with $a_{it-\tau}$, the estimates are not consistent with a finite time span. Moreover, consistency may be undermined by the endogeneity of other explanatory variables, as in the cross-sectional estimates. To correct for the bias created by lagged endogenous variables, and the simultaneity of some regressors, I follow the approach proposed by Arellano and Bover (1995) and Blundell and Bond (1998). I estimate the

following system with GMM

$$
\begin{aligned}
da_{it} &= \beta_0 + \theta da_{it-5} + \boldsymbol{\beta}_1' d\mathbf{X}_{it} + \gamma dFLIB_{it} + \delta dBC_{it} + d\nu_t + d\varepsilon_{it} \quad (6)\\
a_{it} &= \beta_0 + \theta a_{it-5} + \boldsymbol{\beta}_1' \mathbf{X}_{i(t-5,t)} + \gamma FLIB_{i(t-5,t)} + \delta BC_{i(t-5,t)} + \eta_i + \nu_t + \varepsilon_{it}, \quad (7)
\end{aligned}
$$

where da_{it} equals $\log(\frac{A_{it}}{A_{it-5}})$, and the other regressors are the same as in the previous equations. Levels indexed by $(t-5,\ t)$ are five-year averages. η_i, ν_t and ε_{it} are respectively the unobservable country- and time-specific effects, and the error term, respectively. The presence of country effect in equation (7) corrects the omitted variable bias. The differences in equation (6) and the instrumental variables estimation of the system are aimed at amending inconsistency problems. I instrument differences of the endogenous and predetermined variables with lagged levels in equation (6) and levels with differenced variables in equation (7). For instance, I take a_{it-15} as an instrument for da_{it-5} and $Flib_{it-10}$ for $dFLIB_{it}$ in (6) and da_{it-10} as an instrument for a_{it-5} and $dFLIB_{it-5}$ for $FLIB_{it}$ in (7). I estimate the system by two-step Generalized Method of Moments with moment conditions $E[da_{it-5s}\ (\varepsilon_{it} - \varepsilon_{it-5})] = 0$ for $s \geq 2$, and $E[dz_{it-5s}\ (\varepsilon_{it} - \varepsilon_{it-5})] = 0$ for $s \geq 2$ on the predetermined variables z, for equation (6); $E[da_{i,t-5s}\ (\eta_i + \varepsilon_{i,t})] = 0$ and $E[dz_{i,t-5s}\ (\eta_i + \varepsilon_{i,t})] = 0$ for $s = 1$ for equation (7). I treat all regressors as predetermined. The validity of the instruments is guaranteed under the hypothesis that ε_{it} are not second order serially correlated. Coefficient estimates are consistent and efficient if both the moment conditions and the no-serial correlation are satisfied. To validate the estimated model, I apply a Sargan test of overidentifying restrictions, and a test of second-order serial correlation of the residuals. As pointed out by Arellano and Bond (1991), the estimates from the first step are more efficient, while the test statistics from the second step are more robust. Therefore, I will report coefficients and statistics from the first and second step respectively. Note that in this case the speed of convergence (divergence) is given by $\theta = e^{5b}$.

5 Financial liberalization, banking crises and capital accumulation

In this section, I estimate the following equation for investments

$$dk_{it} = \beta_0 + \boldsymbol{\beta}_1' \mathbf{X}_{it-\tau} + \gamma FLIB_{it-\tau} + \delta BC_{it-\tau} + \eta_i + \nu_t + \varepsilon_{it},$$

where $dk_{it} = 100\frac{\log(K_{it})-\log(K_{it-\tau})}{\tau}$ proxies physical capital accumulation observed in country i at time t.[13] I take different frequencies, with τ equal to one and five years respectively, to assess the impact on the short and medium run. When I use the five-year panel, the dependent variable is observed at the end of the period and the regressors at the beginning. Since $FLIB$ is a binary indicator variable both in the annual and five-year panel, the coefficients will be difference in difference estimates.

Table 1a reports the results from the difference in difference regessions of dk on yearly data. The specification in coulumn 1 only includes the indicators of capital account liberalization (CAL) and banking crises (BC), whose effects on investments are nil and negative, respectively. These coefficients are robust to controlling for trends in investments up to three years prior to capital account liberalization (CAL_switch3) and for time-continent effects, as reported in column 2.[14] Column 3 shows that banking crises have no different effect across financially open and restricted countries. When I control for real per capita GDP, government expenditure as a ratio of GDP and credit to the private sector as a ratio of GDP (column 4), CAL remains insignificant, while the negative coefficient for BC becomes only marginally significant (it is different from zero at the ten per cent level). Note however that its significance is fully restored when any of the additional controls is removed from the regression (result not reported). The coefficients in column 4 show that richer countries accumulate more capital, while government expenditure tends to crowd out investments. The growth rate of physical capital is lower where financial intermediation (as proxied by *privo*) is higher and has grown less (the latter is not reported, but available upon request). This suggests that countries invest more in physical capital when their financial systems are at early stages of development and growing rapidly. Columns 5 and 6 report the estimates for the subsamples of developed and developing countries, as defined by the World Bank.[15] Interestingly, capital account liberalization has a positive effect on investments in the developed countries, and no impact in the others. As in column 4, removing any of the additional controls restores the negative coefficient for BC, without affecting the positive estimate for CAL in the developed countries. Finally, the results are robust to the inclusion of openness to trade, whose coefficient always turns out to be insignificant and is thus omitted.

In Table 1b I replicate the estimations of Table 1a replacing the capital account indicator with the indicator of equity market liberalization. All columns suggest that EML

[13] The evidence is robust to the use of investments as a ratio of GDP as a proxy of the dependent variable. The results are availablie upon request.

[14] The results do not change if I use CAL_switch5, which equals 1 for the five years prior to the reform.

[15] Heterogeneity in the effects of financial liberalization could also be addressed by including an interacted dummy $FLIB*$ *developing* in the full-sample regression. This method, however, may deliver biased estimates if there is heterogeneity in other coefficients, as shown in Tables 1a-1b.

has a positive effect on capital accumulation, while the other regressors behave as in Table 1a.[16]

The difference in difference estimates from the five-year panel, reported in Tables 2a-2b, do not show any significant differences from the results obtained on the annual dataset. Capital account liberalization has almost no effect on investments, while equity market liberalization is generally investment-enhancing. Holding the other factors and TFP constant, these results would support the evidence in Bekaert et al (2003) that open equity markets promote GDP growth, while open capital account, as such, is not as effective.

6 Financial liberalization, banking crises and productivity

In this section I estimate the effects of FLIB both on the level of TFP and its growth rate, which both contribute GDP growth. As pointed out by Klenow and Rodriguez-Clare (1997), any increase in productivity does not only raise output holding constant factor employment, but also fosters factor accumulation, which translates into higher GDP growth along the transition.

6.1 Level TFP: difference in difference estimates

I estimate the following equation for the logaritm of the level of TFP (a),

$$a_{it} = \beta_0 + \boldsymbol{\beta}_1' \mathbf{X}_{it-\tau} + \gamma FLIB_{it-\tau} + \delta BC_{it-\tau} + \eta_i + \nu_t + \varepsilon_{it},$$

in the panel datasets with annual and five-year data. When I use the five-year panel, the dependent variable is observed at the end of the period and the regressors at the beginning. As already mentioned in sections 4 and 5, this is a difference in difference specification.

Tables 3a and 3b report results from the yearly panel. The coefficients for CAL and EML are positive and significant across all specifications in columns 1-4. While equity market liberalization has a stronger effect in developing countries, the removal of capital account restrictions is beneficial in all countries, as shown by columns 5-6 of both tables. Banking crises have a negative and significant effect on TFP under all specifications. Note that when I add intellectual property rights protection among the regressors, twenty countries drop out of the sample due to missing observations. Nevertheless, the estimates for CAL, EML and BC in the equations of columns 1-3 do not change if I restrict

[16] The estimation sample of Table 1b is a subset of the sample in Table1a. However, the coefficients for CAL are not sensitive to the sample. Results from re-estimating Table 1a on the sample of Table 1b are available upon request.

the sample. Interestingly, the coefficients for *privo* in columns 4-6 suggest that financial development on average tends to have a positive effect on productivity. However, its effect is positive in the developing countries and negative in the developed ones. This result may support the hypothesis that financial development favors convergence in productivity. Notice that the coefficients for financial liberalization and banking crises remain significant, even after controlling for financial development. This suggest that both have a direct effect on productivity. The coefficient estimates for *ipr* confirm the expectations of a positive effect on TFP, mainly in the developed countries where R&D capacity is probably higher.

In Tables 4a and 4b I report the results from the difference in difference estimates on the five-year panel. Here, the dependent variable is observed at the end of the five-year period, the dummy for financial liberalizaiton takes value 1 if a country has experienced no restrictions for at least one year and BC equals one if there has been at least one year of banking crisis. The positive coefficients for CAL is significant in the basic specification of column 1 and remains significant when I include pre-reform trends, continent-time effects and the full set of control variables. BC has a negative effect on TFP under every specification. The positive coefficient for equity market liberalization is more robust than that for CAL, and survives in most columns of Table 4b. Among the other control variables, the most significant is financial depth, which affects productivity positively in the developing countries, as in Tables 3a and 3b.

6.2 TFP GROWTH AND CONVERGENCE

To evaluate the effects on productivity growth, I perform cross-sectional estimations of the following equation:

$$da_{i(t-25,t)} = \beta_0 + \lambda a_{it-25} + \boldsymbol{\beta}_1' \mathbf{X}_{i(t-25,t)} + \gamma FLIB_{i(t-25,t)} + \delta BC_{i(t-25,t)} + \varepsilon_{it}.$$

The regressors indexed by $(t-25,\, t)$ are expressed in twenty-five-year averages. It follows that the estimates for γ and δ capture the effects of the occurrence and length of financial liberalization and banking crises on productivity growth. Period averages cannot, though, discriminate between liberalizations and crises happening early and late in the sample, nor between inerrupted and uninterrupted episodes amounting to the same mean.

The results in Tables 5a and 5b support the hypothesis of conditional convergence in productivity in robust way, with an implied speed of convergence b between 1 and 2 per cent per year.[17] The effect of banking crises on TFP growth is negative and significant under all specifications. In Table 5a, capital account liberalization has a positive and significant

[17] Remember that the speed of convergence is computed from $\lambda = -100\frac{1-e^{25b}}{25}$.

coefficient only under the basic specification (column1), and has no different effect across countries that experienced banking crises or and those that did not (column 2). The coefficient for $a_{t-25} * CAL$, aimed at assessing whether financial liberalization affects the pace of convergence, is nil in column 3. EML in Table 5b holds a positive and significant coefficient throughout columns 1-3. Like CAL, it does not interact with banking crises nor with the initial level of productivity. It loses its significance once I control for GADP in columns 4 and 5. Both Table 5a and 5b suggest that the institutional factors captured by GADP, together with initial productivity, are the most important determinant of TFP growth. None of the other control variables seem to affect productivity growth.

The dynamic panel data estimates in Tables 6 and 7 confirm the cross sectional evidence in favor of conditional convergence in productivity. The implied speed of convergence is now higher and lies between 1.2 and 4.4 per cent per year. Both measures of $FLIB$ spur productivity growth in a robust way, while the negative effect of banking crises is now weaker. The coefficients for both CAL and EML lose significance only when I control for *privo* in columns 3 and 6. This suggests that the growth rate of TFP, as opposed to its level, is mostly affected by financial liberalization through financial development rather than directly. This evidence is consistent with the results obtained for GDP growth in Bonfiglioli and Mendicino (2004). Trade does not seem to have a significant effect on TFP growth.

Table 7 reports the results for the interactions of financial liberalization with banking crises, and the interaction of both $FLIB$ and BC with the level of economic development. Columns 1 and 2 show that banking crises and capital account liberalization do not affect the speed of convergence, while EML slows it down. Equity market liberalization has a larger benefit on the countries with higher initial productivity levels, which recalls the predictions in Aghion et al. (2005b) for financial development and Aghion et al. (2005a) for product market liberalization. The coefficients in columns 3 and 4 suggest that the joint effect of financial liberalization and banking crises harms productivity growth. Columns 5 and 6 show that BC lowers TFP growth everywhere, while $FLIB$ has positive effects in developed and negative effects in the developing countries. The same holds in columns 7 and 8, where I distinguish between countries with high and low institutional quality, as measured by GADP. These results support the existence of a robust positive effect of financial liberalization on productivity. Arguably, the threat of an increase in competition for funds from abroad favors the channeling of resources towards innovative projects raising aggregate TFP.

7 Conclusions

A wide literature has focused on the effect of financial liberalization on GDP growth, often finding mixed results. To better understand the effect of financial liberalization, however, it is important to know the channels through which it operates. This paper has attempted to probe deeper into the relationship by separately studying the impact of financial openness on two sources of income growth: capital accumulation and productivity. Contrary to the existing literature, I find fairly robust results. In particular, financial liberalization has little effect on capital accumulation, while it has a strong positive effect on productivity. Financial liberalization appears to spur TFP growth through financial development, while it has a direct impact on the productivity level.

The paper has also studied the impact of financial instability on economic performance and the relationship between financial openness and crisis. As expected, crises are found to be detrimental, both for productivity and capital accumulation. However, there is no evidence that financial openness increases the likelihood of crisis, except for borderline crisis in developing countries. Thus, the concern that the removal of barriers to capital mobility may expose an economy to higher financial risk seems unwarranted.

References

[1] Acemoglu, Daron, Philippe Aghion and Fabrizio Zilibotti, 2005 "Distance to Frontier, Selection and Economic Growth", *Journal of the European Economic Association*, forthcoming

[2] Acemoglu, Daron and Simon Johnson, 2003 "Unbundling institutions," *Journal of Political Economy*, forthcoming

[3] Acemoglu, Daron and Fabrizio Zilibotti, 1997 "Was Prometeus Unbound by Chance? Risk, Diversification and Growth", *Journal of Political Economy*, 105, 709-752.

[4] Acemoglu, Daron and Fabrizio Zilibotti, 2001 "Productivity Differences", *Quarterly Journal of Economics* 116(2), 563-606.

[5] Aghion, Philippe, Robin Burgess, Stephen Redding and Fabrizio Zilibotti, 2005a "The Unequal Effects Of Liberalization: Theory and Evidence From India", *Journal of the European Economic Association*, forthcoming

[6] Aghion, Philippe, Peter Howitt and David Mayer-Foulkes, 2005b "The Effect of Financial Development on Convergence: Theory and Evidence", *Quarterly Journal of Economics* 120, forthcoming

[7] Aizenmann, Joshua, 2002 "Financial Opening: Evidence and Policy Options", NBER, wp 8900.

[8] Arellano, Manuel and Stephen Bond, 1991 "Some Test of Specification of Panel Data: Monte-Carlo Evidence and Application to Employment Equations", *Review of Economic Studies*, 58(2), 277-297.

[9] Arellano, Manuel and Olivia Bover, 1995 "Another Look at The Instrumental Variable Estimation of Error-Component Models", *Journal of Econometrics*, 68, 29-52.

[10] Arteta, Carlos, Barry Eichengreen and Charles Wyplosz, 2001 "When Does Capital Account Liberalization Help More than Hurts?", Mimeo.

[11] Bacchetta, Philippe and Eric Van Wincoop, 1998 "Capital Flow to Emerging Markets: Liberalization, Overshooting, and Volatility." NBER wp 6530.

[12] Barro, Robert J., 2001. "Determinants of Economic Growth: A Cross-Country Empirical Study", Harvard Institute for International Development, Development Discussion Paper No. 579.

[13] Barro, Robert and Xavier Sala-i-Martin, 1995 *Economic Growth*. MIT Press.

[14] Beck, Thorsten, Asli Demirgüç-Kunt and Ross Levine, 2000 "A new database on financial development and structure", World Bank Economic Review, September 2000, 597-605.

[15] Beck, Thorsten, Ross Levine and Norman Loayza, 2000 "Finance and the Sources of Growth." *Journal of Financial Economics* 58.

[16] Beck, Thorsten and Ross Levine, 2001 "Stock Markets, Banks, and Growth: Correlation and Causality." Mimeo.

[17] Bekaert, Geert, Campbell R. Harvey and Christian Lundblad, 2003 "Does Financial Liberalization Spur Growth?" *Journal of Financial Economics*, forthcoming.

[18] Blundell, Richard and Stephen Bond, 1998 "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models". *Journal of Econometrics*, 87, 115-143.

[19] Bond, Stephen, Clive Bowsher and Frank Windmeijer, 2001 "Criterion-based inference for GMM in autoregressive panel data models", *Economics Letters*, 73, 379-388

[20] Bonfiglioli, Alessandra and Caterina Mendicino, 2004 "Financial Liberalization, Banking Crises and Growth: Assessing the Links", SSE/EFI Working Paper No 567

[21] Caprio, Gerard and Daniela Klingebiel, 2003 "Episodes of Systemic and Borderline Financial Crises", Mimeo

[22] Caselli, Francesco, 2004 "Accounting For Cross Country Income Differences" forthcoming on the *Handbook of Economic Growth* (Eds. Philippe Aghion and Steven Durlauf).

[23] Caselli, Francesco, Gerardo Esquivel and Fernando Lefort, 1996 "Reopening the Convergence Debate: a New Look at Cross-Country Growth Empirics", *Journal of Economic Growth*, 1, 363-389.

[24] Demirguc-Kunt, Asli and Erica Detragiache, 1998 "The Determinants of Banking Crises in Developing and Developed Countries." IMF Staff Papers 45.

[25] Demirguc-Kunt, Asli and Erica Detragiache, 2000 "Does Deposit Insurance Increase Banking System Stability?." World Bank, Mimeo.

[26] Demirguc-Kunt, Asli and Ross Levine, 1999 "Bank-Based and Market-Based Financial Systems: Cross-Country Comparisons." World Bank, Mimeo.

[27] Easterly, William and Ross Levine, 2001 "It's Not Factor Accumulation: Stylized Facts on Growth Models" World Bank Economic Review 15(2), 177-219.

[28] Edison, Hali J., Michael W. Klein, Luca Ricci and Torsten Sloek, 2002 "Capital account liberalization and economic performance: survey and synthesis", *Journal of International Money and Finance* 21, 749-776.

[29] Edwards, Sebastian, 1993 "Openness, Trade Liberalization, and Growth in Developing Countries." *Journal of Economic Literature* 31.

[30] Edwards, Sebastian, 1999 "The Length and Cost of Banking Crises", IMF Working Paper 99/30.

[31] Edwards, Sebastian, 2001 "Capital Mobility and Economic Performance: Are Emerging Economies Different?" NBER wp 8076.

[32] Eichengreen, Barry and David Leblang, 2003 "Capital Account Liberalization and Growth: Was Mr. Mahathir Right?" International Journal of Finance and Economics, 8: 205-224.

[33] Feijen, Erik and Enrico Perotti, 2005 "The Political Economy of Financial Fragility"

[34] Ginarte, Juan C. and Walter G. Park, 1997 "Determinants of Patent Rights: A Cross-Sectional Study", *Research Policy* 26, 283-301.

[35] Greenwood, Jeremy and Boyan Jovanovic, 1990 "Financial Development, Growth, and the Distribution Income." *Journal of Political Economy* 98, 1076-1107.

[36] Grilli, Vittorio and Gian Maria Milesi-Ferretti, 1995 "Economic Effect and Structural Determinants of Capital Controls", IMF Staff Papers, Vol. 42, No. 3.

[37] Hall, R. and C. Jones, 1999 "Why Do Some Countries Produce So Much More Output per Worke Than Others?", *Quarterly Journal of Economics*, 114, 83-116.

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

[39] Kaminsky, Graciela and Sergio Schmukler, 2002 "Short-Run Pain, Long-Run Gain: The Effects of Financial Liberalization", Mimeo.

[40] King, Robert G. and Ross Levine, 1993 "Finance and Growth: Schumpeter Might be Right." *Quarterly Journal of Economics* 108.

[41] Klein,Michael and Giovanni Olivei, 1999 "Capital Account Liberalization, Financial Depth, and Economic Growth." NBER wp 7384.

[42] Klenow, Peter J. and Andrés Rodriguez-Clare, 1997 "The Neoclassical Revival in Growth Economics: Has it Gone Too Far?" NBER Macroeconomics Annual 1997, Volume 12, 73-103.

[43] Kraay, Aart, 1998 "In Search of the Macroeconomic Effects of Capital Account Liberalization" World Bank, Mimeo.

[44] La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert W. Vishny, 1998 "Law and finance", *Journal of Political Economy* 106, 1113-1155.

[45] Levine, Ross, 1997 "Financial Development and Economic Growth: Views and Agenda." *Journal of Economic Literature* 35.

[46] Levine, Ross, 2001 "International Financial Liberalization and Economic Growth." *Review of International Economics* 9, 688-702

[47] Levine, Ross, 2005 "Finance and Growth: Theory and Evidence", NBER Warking Paper 10766, forthcoming in the *Handbook of Economic Growth* (Eds. Philippe Aghion and Steven Durlauf).

[48] Levine, Ross, Norman Loayza and Thorsten Beck, 2000 "Financial Intermediation and Growth: Causality and Causes." *Journal of Monetary Economics* 46, 31-77.

[49] Levine, Ross and Sara Zervos, 1998 "Stock Markets, Banks and Economic Growth" American Economic Review 88, 537-558.

[50] Lucas, Robert E., 1990 "Why Doesn't Capital Flow Poor To Rich Countries?", *American Economic Review* 80(2), 92-96.

[51] Martin, Philippe and Helene Rey, 2002 "Financial Globalization and Emerging Markets: With or Without Crash?," NBER Working Papers 9288.

[52] Miniane, Jacques, 2000 "A New Set of Measures on Capital Account Restrictions", Johns Hopkins University, Mimeo.

[53] Obstfeld, Maurice, 1994 "Risk-Taking, Global Diversification, and Growth," American Economic Review 84(5), 1310-1329.

[54] Psacharopulos, 1994 "Returns to investment in education: a global update", World Development 22(9), 1325-1343.

[55] Quinn, Dennis, 1997 "The Correlates of Change in International Financial Regulation", *The American Political Science Review* 91.

[56] Ranciere, Romain, Aaron Tornell and Frank Westermann, 2004 "Systemic Crises and Growth," Mimeo.

[57] Rodrik, Dani, 1998 "Who Needs Capital-Account Convertibility?" Harvard University, Mimeo.

[58] Temple, Jonathan, 1999 "The New Growth Evidence", *Journal of Economic Literature* 37, 112-156.

[59] Tornell, Aaron, and Lorenza Martinez, 2004 "The Positive Link Between Financial Liberalization Growth and Crises", NBER wp 10293

Table A

Countries, samples and financial liberalization dates

Country	Panel	Cross	CAL_on	CAL_off	EML_on	Country	Panel	Cross	CAL_on	CAL_off	EML_on
Algeria	x					Denmark	x	x	1988		
Angola	x					Ecuador	x	x	1971-1988-1995	1970-1986-1993	1994
Argentina	x	x	1967-1993	1970	1989	Egypt	x	x			1992
Australia	x	x	1984			El Salvador	x	x			
Austria	x	x	1991			Equatorial Guinea	x				
Bangladesh	x	x			1991	Ethiopia	x	x			
Benin	x	x	1967	1968		Finland	x	x	1991		
Bolivia	x	x	1986	1981		France	x	x	1990	1968	
Botswana	x	x			1990	Gabon	x	x	1967	1968	
Brasil	x	x			1991	Gambia	x	x	1991		
Burkina Faso	x	x	1967	1969		Germany	x				
Burundi	x	x				Ghana	x	x			1993
Cameroon	x	x	1967	1968		Greece	x	x			1987
Canada	x	x				Guatemala	x	x	1973-1989	1980	
Cape Verde	x	x				Guinea	x	x			
Central Africa	x	x	1967	1968		Guinea Bissau	x	x			
Chad	x	x	1967	1968		Hong Kong	x	x			
Chile	x	x			1992	Iceland	x	x			1991
Colombia	x	x			1991	India	x	x			1992
Congo	x	x	1967	1968		Indonesia	x	x	1969		1989
Costa Rica	x	x	1980-1995	1974-1982		Israel	x	x			1993
Cote d'Ivoire	x	x	1967	1968	1995	Italy	x	x	1990		

Note. CAL_on and CAL_off report the dates of removal and adoption, respectively, of restrictions on capital account transactions. EML_on reports the dates of official liberalization of the equity market.

Table A

Countries, samples and financial liberalization dates

Country	Panel	Cross	CAL_on	CAL_off	EML_on	Country	Panel	Cross	CAL_on	CAL_off	EML_on
Jamaica	x	x			1991	Philippines	x	x		1969	1991
Japan	x	x	1979	1995	1983	Portugal	x	x	1993		1986
Jordan	x	x			1995	Rwanda	x	x			
Kenia	x	x			1995	Senegal	x	x	1967	1968	
Korea	x	x			1992	Sierra Leone	x				
Lesotho	x	x				Singapore	x		1978		
Madagascar	x	x	1967	1968		South Africa	x	x			1996
Malaysia	x	x	1973		1988	Spain	x	x	1994		1985
Mali	x	x				Sri Lanka	x	x			1991
Mauritania	x	x	1967	1968		Sweden	x	x	1993		
Mauritius	x				1994	Switzerland	x	x			
Mexico	x	x		1982	1989	Tanzania	x	x			
Morocco	x	x			1988	Thailand	x	x			1987
Mozambique	x	x				Togo	x	x	1967	1968	
Nepal	x	x				Trinidad and Tobago	x	x	1994		1997
Netherlands	x	x				Tunisia	x	x			1995
New Zealand	x	x	1984		1987	Turkey	x	x			1989
Nicaragua	x	x		1978		Uganda	x	x			
Niger	x	x	1967-1995	1968		United Kingdom	x	x	1979		
Nigeria	x	x			1995	United States	x	x			
Norway	x	x	1995			Uruguay	x	x	1978	1968-1993	
Panama	x	x				Venezuela	x	x		1984	1990
Papua New Guinea	x	x				Zambia	x	x			
Paraguay	x	x	1982	1984		Zimbabwe	x	x			1993
Peru	x	x	1978-1993	1970-1984	1992						

Note. CAL_on and CAL_off report the dates of removal and adoption, respectively, of restrictions on capital account transactions. EML_on reports the dates of official liberalization of the equity market.

Table B

Financial liberalization - yearly panel - logit and multinomial logit

	CAL_in	CAL_out	EML_in
Africa	15.426 ***	-15.299 **	-0.759 **
	4.508	7.287	0.318
Asia	15.653 ***	19.469 ***	-0.713
	4.534	7.177	0.452
Latin America	17.326 ***	22.334 ***	-0.980 ***
	4.585	7.308	0.344
Europe & N. America	15.592 ***	-17.587 **	-3.379 ***
	4.644	7.884	1.073
developing	0.304	-0.198	0.072
	0.394	1.002	0.291
gadp	3.333	0.317	1.226
	2.223	3.419	1.219
growth	1.041	-7.302	2.546
	5.418	4.758	3.582
inflation	-0.013 *	-0.004	0.000
	0.007	0.003	0.000
kg	0.148	-0.576	-0.265
	0.397	0.481	0.310
openk	0.237	0.721	0.149
	0.277	0.532	0.239
privo	-0.533 **	0.085	-0.049
	0.261	0.507	0.235
rgdpch	0.518	1.051	0.077
	0.601	0.936	0.260

Note. CAL_in and CAL_out indicate switches on and off capital account liberalization, respectively. The coefficients in theese columns are estimated with multinomial logit. EML_in indicates reforms of equity market liberalization. The coefficients in this column are estimated with logit. Africa, Asia, Latin America and Europe & N. America are continental dummies. Developing is a dummy for developing countries as defined by the World Bank. The variables growth, inflation, gov, open, privo and rgdp enter as lagged values. A constant is included in all regressions. The robust standard errors are clustered by country. *, ** and *** indicate that a coefficiant is significant at 10, 5 and 1 per cent level, respectively.

Table C

Financial liberalization and banking crises - yearly panel - logit

	1	2	3	4	5	6	7	8
			Developed	Developing			Developed	Developing
CAL	0.213	0.202	1.587 ***	-0.125				
	0.269	0.266	0.365	0.308				
EML					-0.030	0.047	0.465	-0.012
					0.339	0.322	0.799	0.362
depins	0.640 **	0.577 *	0.732	0.807 **	0.419	0.413	0.666	0.513
	0.307	0.305	0.523	0.415	0.295	0.301	0.435	0.399
rgdpch	-0.410	-0.659 **	-0.907 *	-0.941 **	-0.913 ***	-0.853 ***	-0.626 *	-1.063 **
	0.304	0.283	0.524	0.451	0.331	0.295	0.334	0.487
inflation	0.000 *	0.001 *	0.007 ***	0.000 **	0.000 *	0.000 *	0.006 ***	0.000
	0.000	0.000	0.003	0.000	0.000	0.000	0.002	0.000
openk	0.001	0.002	0.016 *	0.000	0.001	0.001	0.003	0.001
	0.003	0.003	0.009	0.004	0.004	0.004	0.010	0.004
privo	-0.737				0.111			
	0.699				0.693			
dprivo		-1.817 ***	0.970	-2.926 ***		-1.237 **	0.809	-2.033 ***
		0.515	1.647	0.717		0.505	1.762	0.767
Obs	1117	283	961	830	961	952	240	712

Note. The dependent variable is a binary indicator of banking crises (*BC_all*), that equals 1 if a crisis occurs and 0 otherwise. All regressors are in lagged values. Standard errors are clustered by country. *, ** and *** indicate that a coefficient is significant at 10, 5 and 1 per cent, respectively.

Table D

Financial liberalization and banking crises - yearly panel - mlogit

	1	2	3	4	5	6	7	8	9	10	11	12
			Developed		Developing				Developed		Developing	
	BL	SYS	BL	SYS	BL	SYS	BL	SYS	BL	SYS	BL	SYS
CAL	0.716 *	-0.187	1.921 **	0.641	0.335	-0.330						
	0.406	0.366	0.804	0.791	0.577	0.399						
EML							0.429	-0.159	0.579	0.406	0.942	-0.258
							0.702	0.405	1.121	1.086	0.748	0.437
depins	-0.200	0.767 *	2.397 ***	-0.844	-1.151	1.216 ***	-0.061	0.603	2.015 ***	-0.204	-1.307	0.872 **
	0.495	0.428	0.674	1.630	1.025	0.447	0.507	0.402	0.595	0.757	1.048	0.419
rrgdpch	0.204	-1.168 **	0.033	-2.442 **	0.013	-1.143 **	-0.204	-1.241 ***	-0.015	-2.565 ***	-0.894	-1.092 **
	0.410	0.496	0.446	1.029	0.752	0.575	0.623	0.443	0.515	0.648	1.145	0.512
inflation	-0.025 *	0.001 **	-0.015	0.009 ***	-0.018	0.000 **	-0.015 *	0.001 *	-0.004	0.010 ***	-0.010	0.000
	0.013	0.000	0.029	0.003	0.012	0.000	0.008	0.000	0.011	0.004	0.008	0.000
openk	0.007	0.000	0.040 ***	0.014	0.008	-0.001	0.005	0.000	0.023 *	-0.015	0.010	0.000
	0.005	0.005	0.013	0.016	0.006	0.005	0.006	0.005	0.012	0.012	0.008	0.005
grprivo	-1.423	-2.013 ***	3.642 **	0.925	-2.118 **	-3.261 ***	-0.133	-1.510 ***	2.556	0.641	-0.869	-2.294 ***
	1.126	0.538	1.769	2.166	1.074	0.788	1.117	0.512	2.186	1.850	1.348	0.791

Note. The dependent variable is an indicator of banking crises (*BC*), that equals 2 if a systemic crisis (SYS) occurs, 1 if the crisis is borderline (BL), and 0 otherwise. All regressors are in lagged values. The estimation is performed with multinomial logit. Standard errors are clustered by country. *, ** and *** indicate that a coefficient is significant at 10, 5 and 1 per cent, respectively.

Table E
Reforms and financial liberalization across continents

	Asia	Africa	Latin America	Europe & N. America
CAL_in	1.37	0.43	3.22	2.95
CAL_out	0.34	0	2.89	0
CAL	41.16	1.29	28.94	43.51
EML_in	5	3.41	3.81	1.14
EML	50	53	17.41	74.19
Level TFP	1.116	1.547	1.864	2.084
TFP growth	-0.114	-2.286	-2.559	-0.207
Capital accumulation	6.884	4.223	3.182	3.167
Observations	294	699	311	239

Note. The table reports the share (%) of observations with capital account and equity market liberalization (CAL and EML, respectively), switches into and out of capital account liberalization (CAL_in and CAL_out), and into equity market liberalization (EML_in). For the other variables, means are reported.

Table 1a

Capital account liberalization and capital accumulation - yearly panel - difference in difference

	1	2	3	4	5	6
					Developed	Developing
CAL	0.700	0.412	0.273	0.528	1.956 **	0.099
	0.623	0.761	0.802	0.955	0.779	1.340
BC	-0.782 ***	-0.702 ***	-0.754 ***	-0.500 *	-0.473	-0.496
	0.217	0.224	0.243	0.305	0.304	0.403
CAL_BC			0.326			
			0.599			
lkg				-2.528 ***	-1.673 **	-3.700 ***
				0.840	0.744	1.227
lprivo				-1.021 *	-1.239 **	-1.343 *
				0.610	0.566	0.831
lrgdpch				5.036 ***	2.573	5.426 **
				1.668	1.691	2.189
CAL_switch3		-0.319	-0.314	0.043	-0.060	-0.113
		0.707	0.707	0.891	0.874	1.174
Time-continent	No	Yes	Yes	Yes	Yes	Yes
Obs	1900	1900	1900	1385	361	1024
Countries	93	93	93	79	20	59

Table 1b

Equity market liberalization and capital accumulation - yearly panel - difference in difference

	1	2	3	4	5	6
					Developed	Developing
EML	0.995 ***	0.965 ***	1.066 ***	0.629 *	1.446 **	0.687 *
	0.242	0.315	0.336	0.339	0.631	0.420
BC	-0.664 ***	-0.483 ***	-0.436 ***	-0.341 ***	-0.263	-0.150
	0.092	0.100	0.114	0.107	0.220	0.131
EML_BC			-0.204			
			0.237			
lkg				-1.007 ***	-2.517 ***	0.191
				0.338	0.520	0.485
lprivo				-0.501 **	-0.223	-1.192 ***
				0.254	0.432	0.345
lrgdpch				3.511 ***	3.890 **	3.858 ***
				0.777	1.523	0.963
EML_switch3		0.449	0.457	0.422	1.209 **	0.328
		0.284	0.284	0.298	0.548	0.361
Time-continent	No	Yes	Yes	Yes	Yes	Yes
Obs	1482	1248	1248	1026	286	740
Countries	78	78	78	69	18	51

Note. The dependent variable is the annual growth rate of physical capital stock (dk). All regressors are in lagged values. The variables CAL_switch3 and EML_switch3 equal 1 in the 3 years prior to capital account and equity market reforms, respectively. The sample spans between 1975 and 1999. All regressions include a constant. Standard errors are clustered by country. *, ** and *** indicate that a coefficient is significant at 10, 5 and 1 per cent, respectively.

Table 2a

Capital account liberalization and capital accumulation - yearly panel - difference in difference

	1	2	3	4	5	6
					Developed	Developing
CAL	0.266	0.425	-0.438	0.658	0.703	0.846
	0.497	0.559	0.637	0.503	0.447	0.755
BC	-0.005 ***	-0.899 ***	-0.207 ***	-0.640 **	-0.381	-0.608 *
	0.281	0.289	0.340	0.266	0.266	0.364
CAL_BC			0.383 *			
			0.608			
lkg				-0.684	-0.054 **	-0.364
				0.496	0.503	0.662
lprivo				0.793	0.608	0.050
				0.377	0.758	0.449
lrgdpch				-0.589	-2.697 *	-0.676
				0.850	0.584	0.046
CAL_switch5		-0.540	-0.550	-0.744 *	-0.469	-0.033
		0.477	0.475	0.425	0.398	0.630
Time-continent	No	Yes	Yes	Yes	Yes	Yes
Obs	457	457	457	353	98	255
Countries	93	93	93	85	22	63

Table 2b

Equity market liberalization and capital accumulation - yearly panel - difference in difference

	1	2	3	4	5	6
					Developed	Developing
EML	0.604	0.786 *	0.583	0.830	-0.168	0.401
	0.395	0.470	0.581	0.591	0.877	0.801
BC	-0.722 ***	-0.589 **	-0.724 **	-0.471 *	-0.149	-0.550
	0.249	0.249	0.337	0.264	0.283	0.364
EML_BC			0.318			
			0.535			
lkg				-1.271 **	-0.910	-1.214
				0.548	0.558	0.790
lprivo				-0.150	1.360	-0.157
				0.449	0.956	0.551
lrgdpch				-0.759	-2.199	-0.867
				1.118	2.197	1.413
EML_switch5		-1.345	-1.262	-2.392	-1.626	0.281
		2.295	2.303	2.661	3.327	3.689
Time-continent	No	Yes	Yes	Yes	Yes	Yes
Obs	312	312	312	268	80	188
Countries	78	78	78	73	21	52

Note. The dependent variable is the 5-year average annual growth rate of physical capital stock (dk). All control variables are observed at the beginning of the period. CAL and EML equal 1 if liberalization is observed for at least one year in the period. The variables CAL_switch5 and EML_switch5 equal 1 in the 5-year period prior to capital account and equity market reforms, respectively. The sample spans between 1975 and 1999. All regressions include a constant. Standard errors are clustereded by country. *, ** and *** indicate that a coefficient is significant at 10, 5 and 1 per cent, respectively.

Table 3a

Capital account liberalization and level TFP - yearly panel - difference in difference

	1	2	3	4	5	6
					Developed	Developing
CAL	0.140 ***	0.054 **	0.048 **	0.104 ***	0.104 **	0.123 ***
	0.020	0.022	0.023	0.023	0.047	0.030
BC	-0.063 ***	-0.053 ***	-0.055 ***	-0.057 ***	-0.108 ***	-0.049 ***
	0.007	0.007	0.007	0.007	0.018	0.008
CAL_BC			0.016			
			0.017			
lprivo				0.031 **	-0.069 **	0.068 ***
				0.015	0.032	0.018
lopenk				-0.013	0.078	-0.023
				0.022	0.102	0.023
ipr				0.016 *	0.042 **	0.005
				0.009	0.019	0.011
CAL_switch3		-0.003	-0.003	0.026	-0.022	0.040 *
		0.020	0.020	0.019	0.047	0.022
Time-continent	No	Yes	Yes	Yes	Yes	Yes
Obs	1844	1844	1844	1119	309	810
Countries	93	93	93	73	18	55

Table 3b

Equity market liberalization and level TFP - yearly panel - difference in difference

	1	2	3	4	5	6
					Developed	Developing
EML	0.112 ***	0.111 ***	0.096 ***	0.071 ***	0.015	0.080 ***
	0.016	0.019	0.020	0.023	0.060	0.026
BC	-0.047 ***	-0.042 ***	-0.050 ***	-0.050 ***	-0.091 ***	-0.041 ***
	0.006	0.006	0.007	0.007	0.019	0.008
EML_BC			0.031 *			
			0.014			
lprivo				0.009	-0.061 *	0.046 **
				0.017	0.034	0.023
lopenk				-0.008	0.028	-0.015
				0.027	0.134	0.028
ipr				0.014	0.063 ***	-0.009
				0.009	0.019	0.011
EML_switch3		0.024	0.023	0.001	-0.025	0.011
		0.017	0.017	0.017	0.043	0.020
Time-continent	No	Yes	Yes	Yes	Yes	Yes
Obs	1451	1224	1224	814	239	575
Countries	78	78	78	67	18	49

Note. The dependent variable is the logaritm of TFP level (a). All regressors are in lagged values. The variables CAL_switch3 and EML_switch3 equal 1 in the 3 years prior to capital account and equity market reforms, respectively. The sample spans between 1975 and 1999. All regressions include a constant. Standard errors are clustered by country. *, ** and *** indicate that a coefficient is significant at 10, 5 and 1 per cent, respectively.

Table 4

Capital account liberalization and level TFP - 5-year panel - difference in difference

	1	2	3	4	5	6
					Developed	Developing
CAL	0.132 ***	0.070	0.073	0.121 **	0.032	0.063
	0.047	0.048	0.056	0.058	0.064	0.085
BC	-0.093 ***	-0.075 ***	-0.073 **	-0.112 ***	-0.032	-0.112 ***
	0.027	0.026	0.030	0.029	0.030	0.039
CAL_BC			-0.007			
			0.054			
lprivo				0.080 **	-0.069	0.103 **
				0.035	0.059	0.041
lopenk				0.002	-0.011	0.046
				0.055	0.042	0.082
ipr				-0.013	0.193 **	-0.044
				0.089	0.085	0.119
CAL_switch5		-0.046	-0.046	-0.036	-0.030	-0.045
		0.041	0.041	0.041	0.041	0.061
Time-continent	No	Yes	Yes	Yes	Yes	Yes
Obs	443	443	443	238	71	167
Countries	93	93	93	78	20	48

Table 4b

Equity market liberalization and level TFP - 5-year panel - difference in difference

	1	2	3	4	5	6
					Developed	Developing
EML	0.086 **	0.120 ***	0.070	0.175 ***	-0.013	0.094
	0.040	0.045	0.054	0.066	0.096	0.090
BC	-0.091 ***	-0.073 ***	-0.107 ***	-0.099 ***	-0.015	-0.123 ***
	0.025	0.023	0.032	0.031	0.028	0.043
EML_BC			0.080			
			0.050			
lprivo				0.121 ***	0.067	0.149 ***
				0.046	0.083	0.055
lopenk				0.004	0.006	0.039
				0.067	0.053	0.100
ipr				0.078	0.494 ***	-0.032
				0.139	0.158	0.173
EML_switch5		-0.289	-0.270	-0.573 *	-0.062	-0.232
		0.216	0.215	0.304	0.358	0.416
Time-continent	No	Yes	Yes	Yes	Yes	Yes
Obs	304	304	304	178	56	122
Countries	78	78	78	64	20	44

Note. The dependent variable is the 5-year average logaritm of TFP level (a). All control variables are observed at the beginning of the period. CAL and EML equal 1 if liberalization is observed for at least one year in the period. The variables CAL_switch5 and EML_switch5 equal 1 in the 5-year period prior to capital account and equity market reforms, respectively. The sample spans between 1975 and 1999. All regressions include a constant. Standard errors are clustereded by country. *, ** and *** indicate that a coefficient is significant at 10, 5 and 1 per cent, respectively.

Table 5a
Capital account liberalization and TFP Growth - cross-section

	1	2	3	4	5
a_25	-1.109 **	-1.102 **	-1.097 **	-1.374 ***	-1.563 ***
	0.448	0.446	0.480	0.433	0.416
CAL	1.326 *	0.577	1.523	0.236	-0.214
	0.713	1.059	1.876	0.590	0.654
BC	-4.134 ***	-4.464 ***	-4.144 ***	-3.587 ***	-3.961 ***
	1.384	1.517	1.387	1.202	1.277
CAL_BC		2.098			
		2.712			
a_CAL			-0.112		
			0.932		
gadp				7.074 ***	7.697 ***
				1.372	1.884
lprivo					0.302
					0.514
lopenk					-0.073
					0.508
ipr					-0.430
					0.576
R2	0.186	0.190	0.186	0.340	0.485
Obs	85	85	85	85	73

Table 5b
Equity market liberalization and TFP Growth - cross-section

	1	2	3	4	5
a_25	-0.871 *	-0.868 *	-0.928 *	-1.299 ***	-1.215 ***
	0.463	0.474	0.520	0.411	0.439
EML	2.380 ***	2.797 ***	1.869	0.117	-0.040
	0.641	1.016	1.464	0.710	0.665
BC	-2.501 *	-2.063	-2.435 *	-2.448 **	-2.801 **
	1.353	1.898	1.356	1.125	1.337
EML_BC		-1.073			
		2.118			
a_EML			0.298		
			0.829		
gadp				8.320 ***	8.361 ***
				1.603	2.351
lprivo					0.083
					0.625
lopenk					-0.064
					0.492
ipr					-0.508
					0.550
R2	0.236	0.238	0.237	0.409	0.432
Obs	72	72	72	72	65

Note. The dependent variable is the 25-year average annual growth rate of TFP (*da*). All regressors are expressed as period average, except for the logaritm of the initial TFP level. The sample spans between 1975 and 1999. All regressions include a constant. Robust standard errors are reported below the coefficients. *, ** and *** indicate that a coefficient is significant at 10, 5 and 1 per cent, respectively.

Table 6

TFP Growth - Dynamic Pane Data - System GMM

	1	2	3	4	5	6
da_1	0.834 ***	0.899 ***	0.893 ***	0.911 ***	0.890 ***	0.936 ***
	0.089	0.069	0.050	0.083	0.072	0.038
dCAL	0.133 ***	0.136 ***	0.073			
	0.050	0.052	0.053			
dEML				0.027	0.021	-0.038
				0.054	0.057	0.072
dBC	-0.064	-0.048	-0.079 **	-0.035	-0.075 **	-0.082 **
	0.040	0.035	0.036	0.045	0.036	0.039
dlopenk		-0.038	0.031		0.051	-0.048
		0.084	0.085		0.112	0.056
dlprivo			0.068 **			0.046
			0.028			0.032
Sargan (pvalue)	0.670	0.727	0.472	0.352	0.642	0.559
m2 (pvalue)	0.843	0.757	0.487	0.490	0.822	0.885
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	433	371	329	301	263	253
Countries	89	78	75	76	67	67

Note. The dependent variable is the 5-year log-difference of TFP level (*da*). All regressors are 5-year period averages. The sample spans between 1975 and 1999. All regressions include a constant. The estimation is performed with the two-step system-GMM procedure. Coefficients and standard errors are reported from the first step. *, ** and *** indicate that a coefficient is significant at 10, 5 and 1 per cent, respectively. The p-values for the Sargan overidentification test and the second order serial correlation (m2) test are reported from the second step.

Table 7

TFP Growth - Dynamic Panel Data - System GMM

	1	2	3	4	5	6	7	8
da_1	0.917 ***	0.866 ***	0.853 ***	0.879 ***	0.800 ***	0.853 ***	0.835 ***	0.858 ***
	0.054	0.063	0.090	0.082	0.096	0.093	0.091	0.096
dCAL	-0.078		0.155 ***		0.310 ***		0.405 ***	
	0.133		0.049		0.098		0.122	
dEML		-0.153 *		0.249 *		0.192		0.378 **
		0.088		0.104		0.138		0.172
dBC	-0.051	-0.095	-0.044	0.036	-0.071	-0.040	0.029	0.118
	0.061	0.067	0.039	0.071	0.046	0.062	0.188	0.263
da_CAL	0.073							
	0.068							
da_EML		0.132 **						
		0.052						
da_BC	0.003	0.026						
	0.038	0.043						
dCAL_BC			-0.197 **					
			0.080					
dEML_BC				-0.326 ***				
				0.125				
dCAL_dev'ing					-0.491 **			
					0.208			
dEML_dev'ing						-0.239 *		
						0.140		
dBC_dev'ed					0.041	0.101		
					0.119	0.133		
dCAL_(1-gadp)							-1.220 **	
							0.498	
dEML_(1-gadp)								-0.914 **
								0.361
dBC_gadp							-0.163	-0.226
							0.319	0.405
Sargan (p-val)	0.918	0.877	0.856	0.72	0.635	0.635	0.808	0.696
m2 (p-val)	0.827	0.439	0.749	0.363	0.765	0.378	0.813	0.239
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	433	301	433	301	433	301	433	301
Countries	89	76	89	76	89	76	89	76

Note. The dependent variable is the 5-year log-difference of TFP level (da). All regressors are 5-year period averages. The sample spans between 1975 and 1999. All regressions include a constant. The estimation is performed with the two-step system-GMM procedure. Coefficients and standard errors are reported from the first step. *, ** and *** indicate that a coefficient is significant at 10, 5 and 1 per cent, respectively. The p-values for the Sargan overidentification test and the second order serial correlation (m2) test are reported from the second step.