New evidence of the impact of capital account liberalization on economic growth

Fernando Garcia & José Ricardo Santana[1]

Abstract

This article analyzes the effects of financial liberalization on economic growth, focusing mainly the empirical aspects of this line of research. The text aims to answer fundamental questions put forward by recent literature: What effects has capital account liberalization had on economic growth? Has liberalization affected equally both developed and developing countries? What sort of private capital flow has had the greatest impact on growth? To answer these questions, the most relevant recent empirical studies are reviewed, analyzing not only their econometric results but also their methodologies. Then, econometric estimates are performed, bringing to light new evidence on the issue. They are more conclusive than previous results found in the literature, showing that liberalization has a positive and uniform effect on growth: evidence shows that an increase in the capital flow, both FDI and other forms of private capital, has benefited global economic growth, even in developing nations. This result can be attributed mainly to the use of better-suited estimation methods. This estimation was possible thanks to the availability of a capital account liberalization indicator for a relatively large sample of countries and an extensive period of time.

Key-words: *Liberalization, Capital flows, FDI, Growth, Dynamic panel data*

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[1] Professor of the São Paulo School of Economics at Fundação Getulio Vargas, Brazil. Professor of the Universidade Federal de Sergipe, Brazil.

1 Introduction

The recent process of economic liberalization came with a rise in the private capital flows which, particularly during the 90s, changed the manner in which developing countries secured foreign financing. During this period, in especial in the second half of the decade, international financial crises became increasingly common, such as those of Mexico (1995), Asia (1997), Russia (1998), Brazil (1999) and Argentina (2001). As mentioned in Klein (2003), this triggered a considerable debate which led even the IMF, an agency that normally espouses the benefits of capital account liberalization, to pay particular attention to the liberalization issue.

The debate on economic liberalization can be divided into controversies surrounding the current account and those around the capital account. In regard to current account liberalization, opinions seem to generally converge around its positive effects on growth and welfare. Concerning capital account liberalization, studies have approached the impacts of financial liberalization under a number of variables, such as economic growth, total factor productivity, income distribution, domestic investment, and inflation. In this line of research, the different opinions are quite far from reaching a consensus, mainly in regard to the impacts of financial liberalization on economic growth.

Soto (2003) points out four theoretical reasons for capital account liberalization promoting economic growth: i) the possibility of separating investment decisions, which seek the most profitable opportunities, from saving decisions[2]; ii) greater interaction with foreign countries and technology acquisition; iii) reducing risks through portfolio diversification[3]; and iv) enhancing domestic financial market, through greater competition in the banking system and higher liquidity in the equity market[4].

On the other hand, the problems of vulnerability and contagion are generally considered the main negative effects of financial liberalization. Stiglitz (2000) criticizes short-term speculative capital flows and argues that, regardless of the type of macroeconomic policy applied by developing countries, liberalization could make these flows even more unstable, aggravating financial crises and rendering these economies even more vulnerable, something which would discourage investments. Rodrik (1998) follows this same line, arguing that financial liberalization

[2] This argument is pointed out by Blanchard and Fischer (1989).
[3] As stated by Obtsfeld (1994).
[4] Pointed out, for example, by Levine (2001).

would tend to raise the systemic risk, because a given market would be affected by another's crisis. In his empirical research, the author identifies fragile, or even nonexistent, effects of financial liberalization on growth, contrary to the findings of other authors, such as Quinn (1997).

Arteta, Eichengreen and Wyplosz (2001) argue that empirical studies on the effects of foreign direct investment (FDI) on growth reached more determining conclusions than those that considered portfolio-capital flows. Indeed, studies on portfolio-capital flows, perhaps because they are a more recent phenomenon, have shown more controversial results. Nonetheless, in regard to the positive effects of FDI on growth, important studies have reached different conclusions, such as those of Feldstein and Horioka (1980) and Soto (2003).

This article analyzes the effects of financial liberalization on economic growth, tackling mainly the empirical aspects of this line of research. This works aims to answer fundamental questions asked in recent literature. What effects has capital account liberalization had on economic growth of a broad set of countries in the last 30 years? Has liberalization affected equally both developed and developing nations? What sort of private-capital flow has had the greatest impact on growth? Has the effect of foreign direct investment on growth been higher or lower than that of domestic savings?

Initially, the most relevant recent empirical studies are reviewed; not only their econometric results but also their methodologies are analyzed – samples, independent and control variables, and estimation methods. Then, an econometric analysis of these relations is conducted. Section 3 brings the econometric model employed and the data used. The fourth section shows estimates of the liberalization indicator and of the capital flows on growth. Section 5 focuses the last of the above questions and presents a proper econometric model to evaluate the matter. The last section presents the conclusions of this paper. The evidence shown here differs from the results found in the literature, mainly because of the use of better-suited estimation methods. They were possible thanks to the availability of a liberalization indicator developed by Santana (2004), for a relatively large group of countries and an extensive period of time.

2 Empirical research on the effects of liberalization on growth

Recent empirical research on the economic effects of financial liberalization and capital flow is still a long ways from reaching consensus. This section, which reviews recent literature on this subject, deals not only with the issues and the results presented by the authors, but mainly investigates the problems that lead to the differences in the conclusions. These differences are mainly related to the liberalization indicators and to the econometric estimation methods employed.

Arteta, Eichengreen and Wyplosz (2001) argue that theoretical and empirical reasons fuel the controversy. From the theoretical perspective, the problem rests in the existence of asymmetric information, which jeopardizes the analysis of the effects of financial transactions. In their view, the difficulty lies in characterizing the information asymmetry and consequently the occurrence of distortions that can lead to a reduction of productivity and welfare.

Regarding the empirical aspect, these authors defend that, unlike the effects of portfolio investments, those of foreign direct investment (FDI) have sounder conclusions, which show a positive correlation in regard to growth in a large share of the studies. Yet, this idea is not supported by Soto's (2003) study, which states that the evidence of the positive effects of FDI on growth is not robust. And in regard to the effects of the other flows of capital, an issue surrounded by even more controversy, Arteta, Eichengreen and Wyplosz (2001) defend that in part this mirrors the difficulty of measuring financial liberalization. This aspect is also emphasized by Edwards (2001), who compares the different indicators and shows that one cannot reject the hypothesis that they have independent distributions and consequently are measuring the phenomenon in different ways.

In fact, the measure error in quantifying the degree of liberalization of an economy is one of the key factors to understand the discrepancy between the results arrived at by a number of studies on this issue. For example, in comparing the works of Quinn (1997) and Rodrik (1998), which use different liberalization indicators, this aspect is fundamental in explaining the difference in results: the first shows a positive and significant effect of liberalization on growth, and the second, in contrast, argues that no such effect exists.

Later studies found diverging results. On the one hand, the problem relative to the liberalization measure used remains. On the other hand, differences exist in regard to the estimation methods employed. In part, the use of more robust estimation methods, in itself, is subject to the availability of data, essentially the liberalization indicator. In addition to these two fundamental problems, other aspects deserving attention are the econometric modeling strategy, based on the choice of variables available from literature results, and the samples used in the studies.

2.1 Remarks on the measures of financial liberalization and their effects on economic growth

The measures of financial liberalization most used in recent studies are the policy indicators, based on the qualitative observation of legal measures of policy. There are also studies employing result indicators, which use economic variables as the liberalization proxy – e.g., trade flow. Following Edwards' (2001) denomination, the most used indicators are NUYCO, CAPOPEN and OPENESS. The first comes directly from the summary tables listed in the Annual Report on Exchange Arrangements, Exchange Restrictions (AREAER), published by the International Monetary Fund, which allow us to draw a dummy representing the existence or the absence of restrictions. The index is the ratio between the number of years during which the country had no control over the flow of capitals and the total number of years of the sample. The other indicators, in a methodology originally suggested by Quinn (1997), come from the same primary source of information and build liberalization scales, with intervals of 0.5 point. In the case of the CAPOPEN indicator, the measure assumes values between 0 and 4. For OPENNESS, which considers general financial restrictions, including current transactions, the measure is set in the interval from 0 to 14 points.[5]

In his study that employs a sample of 64 countries, from 1960 to 1989, Quinn (1997) investigates the effects of liberalization on variables such as economic growth, unequal income distribution, government expenditures, and taxation of businesses. The author uses the variation of CAPOPEN and the variation of OPENNESS as measures of liberalization. He concludes that liberalization has a positive effect on growth.

Using a sample of close to 100 countries and a period spanning from 1975 to 1989, Rodrik (1998) investigates if liberalization has a significant effect on economic growth, invest-

[5] On the methodology suggested by Quinn (1997), please see also Santana (2004).

ments and inflation rate. The liberalization measure used is the NUYCO index. The author stresses, in contrast with trade liberalization, the problems arising from financial liberalization – the lifting of financial restrictions would aggravate foreign vulnerability and take contagion effects over other economies. Rodrik gives examples, recent at the time, of the Mexican (1995) and Asian (1997) crisis. He argues against the ideas that financial markets can make sound risk assessments and that the reversion of the capital flows was attributable to changes in the fundamentals of the economies. The author also challenges the notion that domestic institutional measures could successfully address the vulnerability problem.

Underpinned by his empirical results, Rodrik argues that no evidence exists of a positive correlation between financial liberalization and economic growth. He further argues that such positive correlation vanishes when other variables, such as the quality of the government, are used. Moreover, he states that no positive correlation exists even for countries with mature financial systems. In his conclusions, the author does not defend control of capital, especially for the difficulty presented in actually implementing such a measure, but he argues that although one has to live with the volatile nature of the financial system, it would not make any sense to accelerate the capital account liberalization.

The Asian crisis mentioned by Rodrik fostered the idea, in the opinion of Arteta, Eichengreen and Wyplosz (2001), that countries would benefit from removing controls on capital only after they had strengthened their domestic markets and their institutions, generally speaking. Studies following the works of Quinn (1997) and Rodrik (1998) – namely, Klein and Olivei (1999), Edwards (2001), Arteta, Eichengreen and Wyplosz (2001), Klein (2003) and Soto (2003) – sought to investigate the role performed by institutions and emphasized the difference between the effects of financial liberalization according to groups of countries. All these studies put up with the problem of financial liberalization measurement. Most of them try to overcome this hurdle using the CAPOPEN indicator, which, unlike the binary classification of the NUYCO index, has within each year a greater number of ratings to classify each country, as put forth by Edwards (2001).

Klein and Olivei (1999) include the development of the financial system in the investigation of the effects of capital account liberalization on economic growth. The authors propose two questions: Does capital account liberalization bring the development of the financial system? Does this development have a positive influence on economic growth? The sample used is a cross

section of about 100 countries, during a period spanning from 1986 to 1995. As a financial liberalization measure they still use the NUYCO index. The authors conclude that a positive correlation exists between capital account liberalization and the development of the domestic financial system, but these findings are restricted to developed countries. For these countries, a positive effect would exist on economic growth. Klein and Olivei (1999) defend that in developing countries the reforms should include capital account liberalization only in the last stage, when proper financial institutions are in place, with compatible macroeconomic policies.

Edwards (2001) investigates the effect of capital account liberalization on per-capita GDP and productivity growth. This study tries to analyze if emerging nations have a different behavior in regard to these issues. It uses a cross section sample of 65 countries, with data collected from 1975 to 1997. For the liberalization measure, the author uses the CAPOPEN indicator for the years of 1973 and 1988, as supplied by Quinn. The conclusion points to a positive effect of capital account liberalization on economic growth in countries where the financial system is more sophisticated. Without this condition, the effect is negative. That is, similarly to the conclusions drawn by Klein and Olivei (1999), the existence of a developed domestic financial system is an important factor in determining the effects of liberalization on growth. Edwards recommends that special care should be taken in the sequence of the liberalization.

Arteta, Eichengreen and Wyplosz (2001) also investigate the positive relation between financial liberalization and economic growth. The authors analyze if such relation is robust, if it is influenced by the financial and institutional development stage of the countries, and if the effects of financial liberalization are related to the sequence of the reforms. The sample extends over 61 countries, from 1973 to 1992. The liberalization measures used included the NUYCO index and the CAPOPEN index, this last provided by Quinn for the years of 1973, 1982 and 1988. Although the authors conclude that a positive relation between financial liberalization and economic growth exists, they also argue that this influence is fragile, because the effects change along time and depend on the liberalization measure and the estimation method used. Even for developed countries, the authors that the positive effects are not robust. The authors' main result is related to the sequence of the reforms, which leads them to suggest that financial liberalization should take place only after the implementation of reforms that reduce trade barriers and allow the control of macroeconomic unbalances.

In regard to the countries that could benefit from a financial liberalization process, an interesting study is presented by Klein (2003), who uses a sample of 85 countries, for a period covering from 1976 to 1995, and who considers the NUYCO index and the CAPOPEN indicator as liberalization measures. The latter is provided by Quinn for the years of 1973, 1982 and 1988. The results show that countries with intermediate income level are those that most benefit from liberalization, because rich countries achieve little additional gain from liberalization and poor countries do not have the appropriate institutions that allow them to properly benefit from the financial liberalization process. The author's policy suggestion also highlights careful sequencing of reforms and the previous existence of macroeconomic and regulatory apparatus that ensure a safe implementation of the financial liberalization.

Another interesting study, but which does not use liberalization policy indicators, is that presented by Soto (2003). The author analyzes if liberalization affects economic growth and if the taxation of capital flows would be beneficial to the country. Using a panel of 72 countries and a period covering from 1985 to 1996, he divides the capital flows into foreign direct investment (FDI), portfolio equity flows, portfolio debt flows and banks inflows. The results show that FDI and banks inflows have a positive and significant effect on economic growth. However, only banks inflows maintain this effect after being submitted to sensibility analysis. Another important result is that the estimated FDI parameter is below that found for domestic savings, suggesting, in the author's opinion, that foreign capital is not more productive than domestic capital.

Two are the conclusions derived from this study as concerns policies. On the one hand, policies aimed at luring FDI are not justifiable, because the influence of such investment on growth is not significant and the fact that foreign capital is not more productive than domestic capital. On the other hand, it would also not make much sense to selectively tax incoming capital, since no robust evidence exists that certain capital flows can obstruct economic growth.

2.2 Remarks on econometric methodology

The estimation methods used in the above studies are quite different. Soto (2003) is the only author to employ data and panel methodology – techniques that mitigate problems related to the omission bias and to measure errors, long present in the economic-growth literature – but not all authors give a full treatment to the other econometric problems that could arise from this context, such as simultaneity bias and endogeneity.

The simultaneity bias appears in models where the explanatory variable is simultaneously determined with the dependent variable, which generally renders the latter correlated with the error term . This leads to a bias and inconsistency in the estimation through ordinary least squares (OLS)[6], one of the techniques employed in just about all of the above studies. In Klein and Olivei (1999), this bias appears because, in the words of the authors, capital account liberalization could be dependent on the degree of financial development, while the liberalization could also be conditioned by this element. Therefore, the variables can be estimated simultaneously. Although Rodrik (1998) does not deal with the problem, he stresses this point when arguing that choices in regard to capital account liberalization are determined by the country's very economic performance.

Klein and Olivei (1999) deal with the simultaneity bias using the two stages least square method, using instrumental variable for the financial liberalization measure. In their opinion, there is an additional benefit in adopting this procedure: it also helps in dealing with a possible measure error in regard to the liberalization indicator of the capital account. Regarding the bias introduced by the measure error of the liberalization indicator, the problem is specifically pointed out in the work of other authors, such as Rodrik (1998), Arteta, Eichengreen and Wyplosz (2001) and Edwards (2001). Rodrik (1998) highlights that the measure used (NUYICO) does not differentiate certain types of capital control, e.g., the requirement of a deposit for short-term loans, something which limits the interpretation of the results. The treatment given by the author consists of interacting the liberalization indicator with the government-quality indicator, without using other estimation methods.

Edwards (2001) also tackles the problem of the measure error and tries to get around it using two different ways. In the first, he uses the CAPOPEN indicator, which has a more accurate grading scale, thus reducing the measure error in regard to the NUYCO index. In the second, he uses instrumental variables. The estimation is based on a database in cross section, because there are only two points in time for the liberalization indicator. The author uses weighted least squares and weighted least squares in two and three stages. Edwards (2001) measures his liberalization measure using economic, financial and geographic variables, current and lagged as instruments, namely, whether the capital account was open or not in 1973, the ratio between the proxy and the demand for currency in relation to the GDP, in 1970 and 1975, the distance in relation to the

[6] Regarding the simultaneity bias, please see, for example, Wooldridge (2003).

equator and a dummy for OECD countries. This procedure is criticized by Arteta, Eichengreen and Wyplosz (2001): the authors doubt the correlation of the geographic variables with liberalization, a necessary condition for instrumental variable. They also question the exogeneity of the economic and financial variables in regard to the liberalization policy.

In addition to the two above problems, another one addressed in the studies above is that of endogeneity, which consequence is the non-convergence in probability of the estimated coefficients for the population parameters. This is a recurring problem in the cases of omitted variables, where the basic hypothesis of error term expectation conditioned to the dependent variable being null is not valid. This brings inconsistency to the estimation, because the effect of the error term is incorporated in the estimation of the dependent variable. One way of circumventing this problem is to include instrumental variables capable of capturing the correlation between the regressor of interest and the random error term. That is, this control variable should add an explanatory element to the model, which, when omitted, ends up being incorporated into the error term. The basic identification hypothesis imposes that the control variable be the only reason for which the regressor of interest and the error be correlated[7].

Endogeneity is an intrinsic characteristic of the economic-growth models, because the dependent variable, lagged in one period, appears as the regressor in the specific country effects context. As observed by Forbes (2000), it is easy to understand this point: the per capita income rate of growth (y_{it}), dependent variable on econometric models, is defined as the difference in time of the logarithms of the per-capita product (y_{it} - y_{it-1}) and, at the same time, it is present as one of the explanatory variables of the model, because of the conditioned convergence hypothesis.

The endogeneity problems surfaces in Klein and Olivei (1999), leading to a bias in the estimation, by using the OLS. In their opinion, there would be a trend to find a positive relation between capital account liberalization and the financial development, even if the countries undergoing liberalization are also developing their financial system for other reasons not related to capital account liberalization. That is, financial liberalization and financial development are increasing simultaneously, but without a well-established causal relation, which opens the way to a spurious regression. To overcome this problem, the authors suggest using instrumental variables for the financial liberalization measure. The suggested instrumental variables are the initial level

[7] On the problem of endogeneity, please see, for example, Greene (2000).

of liberalization and some regional dummies. The idea is that such instruments are good predictors of capital account liberalization for the following years. The estimation is conducted using the two stages ordinary least square method.

The endogeneity problem is also presented by Soto (2003). This particular work is different from the others because it uses panel data and the capital flows directly, rather than liberalization indicators. The strategy of Soto (2003) is to use the generalized method of moments (GMM), which employs lagging levels of the dependent variable as an instrument of the lagged endogenous variable – Arellano and Bond (1991). Soto (2003) calls attention to the care in the selection of the instruments, criticizing the article of Arteta, Eichengreen and Wyplosz (2001). In this type of estimation, the consistency problems arising from the simultaneous presence of the fixed effect and of the lagging dependent variable, or other regressor correlated with this effect, are neglected.

Nonetheless, Soto (2003) pays little attention to the simultaneity problems. The premise that a greater product growth could lead to an increase in the capital flow, causing this variable to surrender its exogenous character in the model, does not seem unreasonable. Indeed, as argued by many authors, there seems to be ample evidence that foreign direct investment is lured by economic growth.

3 Empirical model and data

The influence of financial liberalization on economic growth is analyzed based on the econometric model described by equation (1). In this expression, also called conditional convergence equation[8], $y_{i,t}$ represents the product per worker, of the economy i at the moment t, which implies that the dependent variable is the rate of economic growth. The explanatory variables are the lagged product per worker during a period, the domestic savings rate ($s^D_{i,t}$), the break-even investment ($n_{i,t} + g + d$) – comprised of the rates of the labor force growth, technical progress and depreciation – and of the education of the work force ($u_{i,t}$). The error term of the equation has two components that show the part that corresponds to the specific effect of country α_i and the random error $\varepsilon_{i,t}$, whose distribution is supposedly normal, with zero average and finite and constant variance σ^2.

$$\ln y_{i,t} - \ln y_{i,t-1} = \Delta \ln y_{i,t} = \beta_1 . \ln y_{i,t-1} + \beta_1 . \ln s^D{}_{i,t} + \beta_2 . \ln\left(n_{i,t} + g + d\right) + \beta_3 . u_{i,t} + \alpha_i + \varepsilon_{it} \quad (1)$$

[8] Mankiw, Romer and Weil (1992) and Islam (1995).

Variables to evaluate the influence of financial liberalization on growth, taking into consideration either policy or results indicators, were alternatively added to this basic equation. In a first approach, the indicator of financial liberalization (CEPOPEN) was employed as the explanatory variable of economic growth, named $I_{i,t}$, in equation (2.a), as done in the works of Quinn (1997), Klein and Oliviei (1999), Arteta, Eichengreen and Wyplosz (2001), Edwards (2001) and Klein (2003). This alternative follows the formulation suggested by Jones (1998) and Bandeira and Garcia (2002), it being the most suitable to evaluate the influence of the liberalization on the productivity of the economy. After that, measures of the flow of capital per worker were employed, named $c_{i,t}$, in equation (2.b), following the methodology alternative of Soto (2003).

$$\Delta \ln y_{i,t} = \beta_1 . \ln y_{i,t-1} + \beta_1 . \ln s^D{}_{i,t} + \beta_2 . \ln\left(n_{i,t} + g + d\right) + \beta_3 . u_{i,t} + \beta_4 . I_{i,t} + \alpha_i + \varepsilon_{it} \qquad (2.a)$$

$$\Delta \ln y_{i,t} = \beta_1 . \ln y_{i,t-1} + \beta_1 . \ln s^D{}_{i,t} + \beta_2 . \ln\left(n_{i,t} + g + d\right) + \beta_3 . u_{i,t} + \beta_4 . \ln c_{i,t} + \alpha_i + \varepsilon_{it} \qquad (2.b)$$

The estimation of equations (2.a) and (2.b) applied the panel methodology. As argued by Forbes (2000), the panel estimation is a better method for capturing the relation between the dependent variable and the explanatory variable within a country. Moreover, as the author stresses, at the same time that panel data estimation allows to capture specific regional factors that affect economic growth, which are not captured by the explanatory variables, it also lessens possible problems arising from the omitted variable bias or measure error.

The standard panel estimation uses the fixed-effects model and the random-effects model alternatively. In the fixed-effects model, estimation is performed based on the differences found within each country along time. On the random-effects model, which produces more efficient estimators when the country-specific effects are not correlated with the other explanatory variables of the model, estimations are performed based on the differences between the countries and between the periods. The Hausman test evaluates whether there is a systematic difference or not between the coefficients calculated by these models and allows choosing the most suitable estimator. The non-rejection of the test's null hypothesis, that the difference between the coefficients is not systematic, implies in using the random-effects model[9].

[9] In spite of having some advantages in relation to the minimum square indicators, the panel estimation requires observations along a period of time, for each unit. This was only possible after the building of the CAPOPEN indicator, as stated above. This indicator not only allows the possibility of the use of panel estimation, but it also contributed to the reduction of measure error. The measure error in the degree of liberalization of an economy can create a bias in the relation analyzed. An example of this can be seen in the case of the NUYCO policy indicator, built on the

However, the panel estimation cannot eliminate the simultaneity bias. In this work, this bias appears when estimating equation (2.b). This bias occurs because, as argued above, the greater the economic growth, the higher the incentive to capital flows, regardless of the degree of liberalization of the economy. The standard manner to solve this problem is to make the estimation using the two-stage method, applying instrumental variables. In this study, the indicator of liberalization (CAPOPEN), the inflation rate, and an indicator of the development of infrastructure (IDI) were used as instruments of the capital flows. As discussed in the literature, these variables are important in determining the capital flows, which potentially renders them valid instruments.

However, estimation using the two-stage method does not solve the problem of endogeneity. According to Soto (2003), this problem occurs when the error term expectation, conditioned by the explanatory variable, is no longer null. That is, a correlation between the term of error and the explanatory variable exists. As argued by Greenaway, Morgan and Wright (2002) and Forbes (2000), in this type of estimation the problem surfaces with the introduction of the lagged dependent variable, which appears on both sides of the growth equation. The correlation of the endogeneity problem can be done using the estimation technique suggested by Arellano and Bond (1991). The estimation, based on the generalized method of moments (GMM), uses the first differences in variables, so as to eliminate the fixed country effect and uses lagged variables as instruments. Consequently, equations (2.a) and (2.b) can be rewritten in the following way:

$$\Delta\left(\Delta \ln y_{i,t}\right) = \beta_0 . \Delta \ln y_{i,t-1} + \Delta X_{i,t}' . B + \Delta\varepsilon_{i,t} \qquad (3)$$

In order to generate consistent and efficient estimators, this estimation technique must satisfy two hypotheses. The first is that the explanatory variables must be predetermined in at least one period, so that $E(X_{i,t}' . \varepsilon_{i,s}) = 0$, for all $s > t$. The second hypothesis is that the terms of error cannot be correlated, so that $E(\varepsilon_{i,t} . \varepsilon_{i,t-s}) = 0$, for all $s \geq 1$. In the case of the first hypothesis, it is assumed that the lagged explanatory variables are not correlated with contemporary shocks. And, to evaluate the second hypothesis, the Sargan overidentification test is employed. Following the

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number of years during which the country had capital account restrictions over the total number of years in the sample. The problem of this measure of policy lies in the fact that the restriction is a dummy. Thus, even if the restrictions are different, since there is no grading, two countries could be classified with the same degree of liberalization. The CAPOPEN indicator significantly reduces this problem because it gives a grade according to the types of restrictions.

suggestions of this test, in the present study, the Arellano and Bond procedure was implemented as follows:

(i) Two lags of the dependent variable are employed as instruments (the rate of growth in the previous moment);

(ii) The break-even investment rate was considered exogenous in all models, but the domestic savings rate and the average education were considered predetermined variables;

(iii) In the case of the regressions with liberalization indicator, this variable was considered exogenous;

(iv) In the case of regressions with the capital flow, this variable was considered endogenous and the degree of liberalization, the rate of inflation, and the infrastructure development indicator were employed as additional instruments.

The sample used comprises 51 countries, in a period that spanned from 1970 to 2000. The countries were chosen based on a larger sample provided by Quinn (64 countries), which included reference data for building a liberalization indicator. From this sample, a total of 19 developed nations and 32 developing nations were chosen, of which 19 came from Latin America, and for which temporal series are available for the building of the CAPOPEN indicator. The fact that the period starts in 1970 is owed to a greater availability of data, mainly regarding the flow of capital. For each of these countries, seven observations were used, with a five-year interval, namely 1970, 1975, 1980, 1985, 1990, 1995 and 2000. The sample used is listed in Table 1.

Table 1. Countries sample

Groups	Countries
Developed countries (19)	Austria, Australia, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Japan, Netherlands, New Zeeland, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States
Developing countries (32)	Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela. South Africa, South Korea, Egypt, Philippines, Ghana, Hong-Kong, India, Indonesia, Malaysia, Pakistan, Syria, Thailand, Tunisia.

The data came from the World Development Indicators 2002, World Bank (2003), except education figures, which were extracted from the database supplied by Barro and Lee (1996), and the capital account liberalization indicator was CAPOPEN, developed by Santana (2004), also presented in Santana and Garcia (2004). The averages, deviations and extreme values of these variables are shown in Table 2.

Table 2. Summary Statistics

Variables	Mean	Std. Dev.	Min	Max	N.
Average Annual Growth of GDP per worker (%)	0,014	0,022	-0,076	0,081	357
5-years lag of GDP per worker, (ln, US$ 1995) — $ln\ (y_{-1})$	8,771	1,323	5,849	11,110	357
Savings rate (ln) — $ln\ (s)$	2,997	0,355	1,260	3,597	344
Break even rate (ln de %) — $ln\ (n + g + d)$	-2,732	0,148	-3,061	-2,444	357
Averaged years of schooling — (u)	6,275	2,490	1,480	12,050	356
Openness indicator — (*CAPOPEN)*	0,616	0,233	0,175	1,000	357
Total private flows per worker (ln, US$ 1995)	6,530	2,059	-0,844	11,733	283
FDI per worker (ln, US$ 1995)	4,912	2,111	-3,190	10,295	270
Other private capital flows per worker (ln, US$ 1995)	6,342	1,975	-0,945	11,554	270
External savings rate (S^F)-Domestic savings rate ratio (S^D) — $ln\ (1+\theta)$	0,090	0,108	2,3E-5	0,768	294
Infrastructure developing indicator (ln) – *IDI*	-2,385	1,462	-7,713	-0,108	322
Inflation rate - average (ln) – *Infl*	2,240	1,195	-1,084	7,742	353

Source: *World Development Indicators 2002*.

The product per worker was obtained by dividing the GDP values, in 1995 US dollars, by the total population aged 15 to 64. In order not to lose 1970 information, the series starts in 1965. The GDP data used are in natural logarithms. The economic-growth rate is the geometric average of the five previous years, including the observation period.

The domestic savings rate was obtained from a simple arithmetic average of the last 20 years, to *t*. Considering that World Bank (2003) data are available only for years after 1960, the average was of 10 years for 1970, and of 15 years for 1975. To arrive at the break-even investment rate, this study took into consideration the geometric population growth for those aged 15 to 64 – of each country and each time interval – and the premise of constant values, and equal for all countries, for the depreciation and technical progress rates: 3% p.a. and 2% p.a., respectively. The data are expressed in logarithms of the rates. The data are also expressed in natural logarithms. The average education of the workforce corresponds to the average number of years of study of individuals aged 15 and over.

The data related to liberalization are the capital account liberalization indicator and the private flows of capital. Regarding the first, the liberalization indicator is, as of 1975, the arith-

metic average of the five previous years, including the period observed. Regarding the capital flows, the data were converted to constant 1995 US dollars and divided by the population aged between 15 and 64. The other private capital flows was obtained by subtracting the flow of FDI from the total private capital flow. The variables are also expressed in natural logarithms.

The data used as instrumental variables for the flows of capital were, in addition to the indicator of liberalization itself, the infrastructure development indicator[10] and the inflation rate employed as explanatory variable.

4 The influence of liberalization on growth

The estimations relative to the growth equation are shown in two sub-sections. The first brings estimations of equation (2.a), which uses the CAPOPEN indicator ($I_{i,t}$) as the explanatory variable, while the second brings estimations of equation (2.b), in which measures of capital flow per worker ($c_{i,t}$) are employed for this purpose. This analysis seeks the answer to three questions: (i) what effects has capital account liberalization had on growth? (ii) has liberalization affected equally different groups of countries? (iii) what sort of private capital flow has had the greatest impact on growth?

In the case of the second question, emphasis is given to developing nations, for which the different studies bring more discrepant results. Latin America was subject to special attention, and this region has in the sample the same number of observations of developing nations, 19 countries each. Regarding the third question, as already mentioned, the private capital flows was subdivided into foreign direct investment (FDI) and other private capital flows.

4.1 The effects of liberalization

This section analyzes the relation between capital account liberalization and economic growth, in which the CAPOPEN indicator was incorporated in a convergence equation. This analysis follows closely most of the recent studies on this issue. Econometric estimations follow the protocol suggested in Section 3, without the two-stage equations, because there isn't, by construction, simultaneous determination between the rule indicator (CAPOPEN) and economic

[10] Regarding this indicator, please see Santana (2004).

growth. Consequently, the result tables show four estimators: that of ordinary least squares of pooled data, that of fixed effects, that of random effects and those obtained through the Arellano and Bond procedure.

The results for the total sample of countries are shown in Table 3. Initial estimation did not present significant effects of capital account liberalization on economic growth. Panel estimates, whether by fixed effects or random effects, show that liberalization had a positive and significant effect (1%) on economic growth. The Hausman test suggests that the fixed effects model is the most suitable for inference, because there are significant differences between the fixed and the random effects. The GMM estimation confirms the positive and significant effect, at 1%, of liberalization on economic growth, in addition to considerably correcting the coefficients associated to the lagged product per worker, to the savings rate and to education, the three non-exogenous variables of the model.

Table 1. Econometric Results: CAPOPEN, All Countries, 1970-2000

	Pooled	Fixed effects	Random effects	Arellano-Bond
	(1)	(2)	(3)	(4)
GDP per worker (-1) - *ln (y_{-1})*	-0,0032	-0,0506***	-0,0046*	-0,1009***
	(0,0020)	(0,0063)	(0,0026)	(0,0162)
Break-even rate - *ln (n + g + d)*	-0,0413***	-0,0441**	-0,0487***	-0,0219
	(0,0119)	(0,0178)	(0,0148)	(0,0234)
Savings rate - *ln (s)*	0,0077**	0,0217***	0,0068	0,0427***
	(0,0041)	(0,0068)	(0,0052)	(0,0136)
Average Schooling - *u*	-0,0002	-0,0006	-0,0014	-0,0101**
	(0,0008)	(0,0015)	(0,0011)	(0,0051)
CAPOPEN	0,0072	0,0438***	0,0153**	0,0643***
	(0,0059)	(0,0074)	(0,0066)	(0,0098)
N	343	343	343	251
Adjusted R^2	0,041	0,264	0,035	
Hausman test			106,59	
Sargan (*prob.*)				0,386
AB – 2nd. order (*prob.*)				0,763

Notes: Numbers in parentheses are the standard deviations of coefficients. Significant at 1% (***), at 5% (**) and at 10% (*). In the fixed effects models the Adjusted R^2 is the within R^2, and in the random effects model, the overall R^2.

Table 4. Econometric Results: CAPOPEN, Groups of Countries, 1970-2000

	Pooled	Fixed effects	Random effects	Arellano-Bond
	(1)	(2)	(3)	(4)
Developed countries				
GDP per worker (-1) - *ln* (y_{-1})	-0,0204***	-0,0520***	-0,0308***	-0,1398***
	(0,0046)	(0,0078)	(0,0052)	(0,0156)
Break-even rate - *ln (n + g + d)*	-0,0280*	-0,0436**	-0,0375**	-0,0069
	(0,0168)	(0,0196)	(0,0177)	(0,0164)
Savings rate - *ln (s)*	0,0332***	0,0414***	0,0456***	0,1045***
	(0,0080)	(0,0134)	(0,0089)	(0,0131)
Average Schooling - *u*	0,0005	0,0021	0,0011	0,0005
	(0,0009)	(0,0020)	(0,0011)	(0,0024)
CAPOPEN	0,0169**	0,0437***	0,0284***	0,0102
	(0,0076)	(0,0089)	(0,0078)	(0,0093)
N	127	127	127	95
Adjusted R^2	0,184	0,453	0,212	
Hausman test			74,38	
Sargan (*prob.*)				0,999
AB – 2nd. order (*prob.*)				0,973
Developing countries				
GDP per worker (-1) - *ln* (y_{-1})	-0,0057**	-0,0509***	-0,0092**	-0,0893***
	(0,0028)	(0,0096)	(0,0041)	(0,0195)
Break-even rate - *ln (n + g + d)*	-0,0215	-0,0489*	-0,0306	-0,0223
	(0,0189)	(0,0258)	(0,0222)	(0,0359)
Savings rate - *ln (s)*	0,0067	0,0216**	0,0059	0,0372**
	(0,0054)	(0,0100)	(0,0069)	(0,0180)
Average Schooling - *u*	0,0003	-0,0014	-0,0016	0,0032
	(0,0013)	(0,0021)	(0,0016)	(0,0088)
CAPOPEN	0,0124	0,0422***	0,0238***	0,0634***
	(0,0082)	(0,0102)	(0,0092)	(0,0135)
N	216	216	216	156
Adjusted R^2	0,007	0,233	0,020	
Hausman test			45,72	
Sargan (*prob.*)				0,995
AB – 2nd. order (*prob.*)				0,173
Latin America				
GDP per worker (-1) - *ln* (y_{-1})	0,0005	-0,0795***	-0,0060	-0,1052***
	(0,0053)	(0,0142)	(0,0069)	(0,0264)
Break-even rate - *ln (n + g + d)*	-0,0283	-0,0374	-0,0454	0,0121
	(0,0233)	(0,0347)	(0,0278)	(0,0536)
Savings rate - *ln (s)*	-0,0039	0,0243**	-0,0009	0,0173
	(0,0079)	(0,0122)	(0,0092)	(0,0189)
Average Schooling - *u*	-0,0024	-0,0059**	-0,0038*	0,0004
	(0,0019)	(0,0026)	(0,0022)	(0,0082)
CAPOPEN	0,0200**	0,0562***	0,0293***	0,0744***
	(0,0100)	(0,0117)	(0,0111)	(0,0160)
N	130	130	130	93
Adjusted R^2	0,012	0,365	0,044	
Hausman test			70,01	
Sargan (*prob.*)				0,999
AB – 2nd. order (*prob.*)				0,198

Notes: Numbers in parentheses are the standard deviations of coefficients. Significant at 1% (***), at 5% (**) and at 10% (*). In the fixed effects models the Adjusted R^2 is the within R^2, and in the random effects model, the overall R^2.

The analysis according to groups of countries is shown in Table 4. Initial estimations, using ordinary least squares, show results similar to those found in various studies that use the cross section methodology, i.e., a positive and significant effect of liberalization in developed nations and non-significant effect in developing nations[11]. These results however considerably change in the other estimations. In the case of developed nations, estimation by fixed effects, the most suitable according to the Hausman test, identifies the positive effect of capital account liberalization, significant at 1%. Yet, in the Arellano-Bond procedure, the effect is positive but it is not significant.

In the case of developing nations, the effect of capital account liberalization is positive and significant at 1%, both in the estimation using the fixed-effects model and that using the Arellano-Bond procedure. In the case of Latin America, in a result similar to that arrived at for the group of developing nations, it is found that liberalization had a positive and significant effect, at 1%, on economic growth. This is true for the fixed-effects estimation as well as the Arellano-Bond estimation.

The results shown above indicate that the omission of variables or the ignoring of the endogeneity problem in the regressions of conditioned convergence – as done in estimations available in the literature, whether in cross section methodology or using pooled data – lead to results not very robust, which could direct the observer to mistaken inferences. Once these problems are properly dealt with, estimations show, contrary to the findings of most studies, that the effects of liberalization on economic growth, while not significant for developed nations, are positive and significant for developing nations and for Latin America, the great recipients of international capital.

4.2 Effects of the capital movements

Another way to analyze the effects of liberalization on economic growth is to consider the capital flows as an explanatory variable, something which come overcome a limitation of the previous analysis, namely the fact that liberalization cannot bring growth if no increase in the capital flows is seen. Nonetheless, it is necessary to consider the fact that the capital flows can

[11] The most common explanation found in the literature, as discussed in Section 2, is that developed nations would have proper institutions to take advantage of the liberalization process, something which reminds us of the importance of the sequence in the liberalization process in developing nations.

increase by reason of other factors, and liberalization does not necessarily have to be present. Therefore, in the two-stage estimations, the capital flows were instrumentalized through the liberalization indicator (CAPOPEN) and other variables that influence the flow of capital, i.e., inflation and availability of infrastructure. These variables also worked as additional instruments in the Arellano-Bond procedure.

Estimations follow a similar pattern to that of the previous sub-section. However, the fact of considering capital flows opens the possibility of having simultaneity in the estimation, because economic growth encourages a greater flow of capitals, in the same token that a bigger flow of capital brings higher growth. Therefore, two-stage estimations were included, and for this reason the result tables bring seven estimators. Table 5 presents estimations on the effects of the total flow of private capital on economic growth.

The ordinary least squares estimate of the pooled data already shows a positive and significant effect, at 1%, of the capital flows on economic growth, which is supported by the fixed-effect and random-effect estimates. This result remains in the two-stage estimates. Considering the fixed-effect model, more suitable according to the Hausman test, the coefficient of the capital flow is shown larger, using the liberalization indicator as an instrument, than those obtained in previous estimations, and remains positive and significant at 1%. The Arellano-Bond estimate also shows a greater coefficient, positive and significant at 1% of the capital flow.

Table 5. Econometric Results: Total Private Flows, All Countries, 1970-2000

				2-stage			
	Pooled	Fixed effects	Random effects	Pooled	Fixed effects	Random effects	Arellano-Bond
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP per worker (-1) - *ln* (y_{-1})	-0,0084***	-0,0611***	-0,0102***	-0,0130***	-0,0901***	-0,0138***	-0,1104***
	(0,0027)	(0,0081)	(0,0033)	(0,0041)	(0,0128)	(0,0044)	(0,0161)
Break-even rate - *ln (n + g + d)*	-0,0522***	-0,0349	-0,0464***	-0,0560***	-0,0416	-0,0512***	-0,0296
	(0,0139)	(0,0218)	(0,0173)	(0,0144)	(0,0255)	(0,0171)	(0,0284)
Savings rate - *ln (s)*	0,0061	0,0089	0,0023	0,0078*	0,0230**	0,0054	0,0403***
	(0,0045)	(0,0083)	(0,0058)	(0,0046)	(0,0106)	(0,0057)	(0,0117)
Average Schooling - *u*	0,0004	0,0023	0,0002	0,0002	-0,0027	-0,0001	0,0014
	(0,0009)	(0,0019)	(0,0012)	(0,0009)	(0,0032)	(0,0013)	(0,0035)
Total private flows	0,0035***	0,0077***	0,0046***	0,0068**	0,0221***	0,0075**	0,0146***
	(0,0013)	(0,0016)	(0,0014)	(0,0028)	(0,0054)	(0,0030)	(0,0035)
N	280	280	280	273	273	273	217
Adjusted R^2	0,080	0,247	0,081	0,074	0,009	0,086	
Hausman test			115,65			60,06	
Sargan (*prob.*)							0,373
AB – 2^{nd}. order (*prob.*)							0,210

Notes: Numbers in parentheses are the standard deviations of coefficients. Significant at 1% (***), at 5% (**) and at 10% (*). In the fixed effects models the Adjusted R^2 is the within R^2, and in the random effects model, the overall R^2.

However, this positive effect can be challenged by the argument that the flows of direct investment have objectives different from those of other types of private flows. For this reason, some authors such as Rodrik (1998), argue that these other private capital flows are more sensitive to crises than FDI. Considering that the independent variable above gathers all types of capital flows into a single flow, the estimates of Table 5 would start from the premise that the different types of capital would have the same effect, i.e., these regressions would have implicit parameter restrictions.

In order to analyze the effects of economic growth according to the type of capital, thus eliminating the effect of the above restrictions, the total flow of private capital was subdivided into two: that of foreign direct investment (FDI) and that of other private capital[12]. The results are shown in Table 6.

Table 6. Econometric Results: FDI and Other Private Flows, All Countries, 1970-2000

				2-stage			
	Pooled	Fixed effects	Random effects	Pooled	Fixed effects	Random effects	Arellano-Bond
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDP per worker (-1) - *ln (y$_{-1}$)*	-0,0086***	-0,0683***	-0,0104***	-0,0072	-0,0654***	-0,0432***	-0,1182***
	(0,0027)	(0,0080)	(0,0032)	(0,0055)	(0,0186)	(0,0141)	(0,0138)
Break-even rate - *ln (n + g + d)*	-0,0436***	-0,0116	-0,0368**	-0,0389**	0,0080	-0,0033	-0,0113
	(0,0137)	(0,0208)	(0,0166)	(0,0166)	(0,0263)	(0,0243)	(0,0255)
Savings rate - *ln (s)*	0,0050	0,0167*	0,0050	0,0073	0,0147	0,0090	0,0427***
	(0,0044)	(0,0088)	(0,0055)	(0,0050)	(0,0127)	(0,0107)	(0,0118)
Average Schooling - *u*	-0,0004	0,0003	-0,0010	-0,0006	-0,0014	-0,0018	0,0047
	(0,0008)	(0,0019)	(0,0012)	(0,0011)	(0,0027)	(0,0024)	(0,0032)
FDI	0,0050***	0,0078***	0,0058***	0,0101	0,0163***	0,0136***	0,0056***
	(0,0012)	(0,0012)	(0,0012)	(0,0062)	(0,0051)	(0,0049)	(0,0020)
Other private flows	-0,0001	0,0037**	0,0003	-0,0057	-0,0052	-0,0047	0,0107***
	(0,0015)	(0,0017)	(0,0016)	(0,0084)	(0,0099)	(0,0091)	(0,0036)
N	267	267	267	260	260	260	202
Adjusted R^2	0,117	0,372	0,120	0,044	0,220	0,003	
Hausman test			88,97			0,99	
Sargan (*prob.*)							0,411
AB – 2nd. order (*prob.*)							0,631

Notes: Numbers in parentheses are the standard deviations of coefficients. Significant at 1% (***), at 5% (**) and at 10% (*). In the fixed effects models the Adjusted R^2 is the within R^2, and in the random effects model, the overall R^2.

The ordinary least squares estimation of the pooled data shows a positive and significant effect, at 1%, of the FDI on economic growth, but this is not true of other forms of private capital, something which could be interpreted as a favorable evidence for the control of some types of capital. This result however is not confirmed in the panel estimations. In the fixed-effects model,

[12] The flow of other types of private capital was obtained by deducting the flow of FDI from the total flow of private capital (please see definitions in footnote 5).

most suitable according to the Hausman test, the FDI coefficient is still positive and significant, at 1%, and the coefficient of the other flows of private capital now presents a positive and significant effect, at 5%. In the two-stage estimation, in a result similar to that found using the ordinary least squares, only FDI appears with a positive and significant coefficient. However, when dealing with the endogeneity problem using the Arellano-Bond procedure, both coefficients again become positive and significant, at 1%.

It can be seen that elasticity of economic growth to the other flows of capital is greater than that of growth in relation to FDI; the sum of the two coefficients comes close to the coefficient of the total flow of capital estimated in Table 5. This result is similar to that found by Soto (2003) for his total sample of countries. This means that there is no evidence in the aggregated data that the positive effect of the private capital flow on growth derives only from the flow of FDI, as argued by Rodrik (1998), among others.

The last step is to analyze the effects of the capital flows for each group of countries, whose results are shown in Table 7. In the case of developed nations, the ordinary least squares estimation of pooled data presents a positive and significant coefficient for the flow of other private capital, but not for the flow of FDI. In the estimate using the fixed-effects model, the most suitable according to the Hausman test, both flows are positive and significant, at 1%. Using the CAPOPEN indicator as an instrument of the capital flows, and estimating using the two-stage fixed-effects model (also the most suitable, according to the Hausman test), only the FDI remains with a positive and significant coefficient. In the final estimate, which takes care of the simultaneity and endogeneity problems, both the FDI and that of other private capital flows have positive and significant coefficients, like in the total sample.

For the whole set of developing nations, the ordinary least squares estimate of pooled data presents, differently from the results found for developed nations, a positive and significant coefficient, at 1%, for of FDI, but not for the other private capital flows. This is the same result as that found in the fixed-effects and random-effects models. In the estimates using two-stage instrumental variables, none of the flows presented a significant impact on growth. But, in the GMM estimate, both types of flow showed positive and significant effects. In the case of Latin America, the results are similar to those found for the group of developing nations, except for the coefficient associated to the other private capital flows, which does not appear significant.

Table 7. Econometric Results: FDI and Other Priv. Flows, Groups of Countries, 1970-2000

				2-stage			
	Pooled	Fixed effects	Random effects	Pooled	Fixed effects	Random effects	Arellano-Bond
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Developed countries							
GDP per worker (-1) - *ln* (y_{-1})	-0,0220***	-0,0584***	-0,0280***	-0,0096	-0,0612***	-0,0110	-0,1021***
	(0,0047)	(0,0089)	(0,0053)	(0,0168)	(0,0148)	(0,0164)	(0,0152)
Break-even rate - *ln (n + g + d)*	-0,0148	-0,0422**	-0,0259	-0,0122	-0,0308	-0,0156	-0,0219
	(0,0154)	(0,0174)	(0,0161)	(0,0256)	(0,0240)	(0,0265)	(0,0182)
Savings rate - *ln (s)*	0,0217***	0,0326***	0,0316***	0,0293**	0,0285*	0,0334**	0,0694***
	(0,0070)	(0,0120)	(0,0080)	(0,0122)	(0,0156)	(0,0131)	(0,0145)
Average Schooling - *u*	0,0004	0,0001	0,0002	-0,0043	-0,0028	-0,0046	0,0002
	(0,0009)	(0,0018)	(0,0010)	(0,0036)	(0,0026)	(0,0035)	(0,0019)
FDI	0,0011	0,0070***	0,0031**	0,0158	0,0162***	0,0173*	0,0038***
	(0,0013)	(0,0013)	(0,0013)	(0,0099)	(0,0054)	(0,0098)	(0,0015)
Other private flows	0,0049***	0,0037***	0,0038***	-0,0103	-0,0036	-0,012	0,0036**
	(0,0015)	(0,0014)	(0,0015)	(0,0126)	(0,0067)	(0,0122)	(0,0014)
N	112	112	112	111	111	111	86
Adjusted R^2	0,229	0,541	0,256		0,237	0,032	
Hausman test			66,19			86,5	
Sargan (*prob.*)							0,999
AB – 2nd. order (*prob.*)							0,590
Developing countries							
GDP per worker (-1) - *ln* (y_{-1})	-0,0148***	-0,0724***	-0,0199***	-0,0315**	0,0161	-0,0492	-0,1206***
	(0,0045)	(0,0126)	(0,0053)	(0,0135)	(0,0912)	(0,0300)	(0,0161)
Break-even rate - *ln (n + g + d)*	-0,0060	0,0063	0,0008	-0,0644	0,0704	-0,0805	0,0365
	(0,0243)	(0,0370)	(0,0269)	(0,0482)	(0,1101)	(0,0802)	(0,0374)
Savings rate - *ln (s)*	0,0055	0,0215	0,0068	0,0098	-0,0165	0,0125	0,0579***
	(0,0059)	(0,0140)	(0,0070)	(0,0081)	(0,0523)	(0,0119)	(0,0179)
Average Schooling - *u*	0,0011	0,0005	0,0004	-0,0033	0,0020	-0,0048	0,0092
	(0,0016)	(0,0029)	(0,0019)	(0,0041)	(0,0095)	(0,0068)	(0,0058)
FDI	0,0071***	0,0081***	0,0071***	-0,0027	0,0311	-0,0058	0,0067***
	(0,0017)	(0,0018)	(0,0017)	(0,0072)	(0,0207)	(0,0110)	(0,0020)
Other private flows	-0,0015	0,0033	0,0004	0,0196	-0,0699	0,0324	0,0082**
	(0,0025)	(0,0029)	(0,0026)	(0,0148)	(0,0640)	(0,0300)	(0,0032)
N	155	155	155	149	149	149	116
Adjusted R^2	0,117	0,349	0,142			0,008	
Hausman test			37,51			4,6	
Sargan (*prob.*)							0,999
AB – 2nd. order (*prob.*)							0,810
Latin America							
GDP per worker (-1) - *ln* (y_{-1})	-0,0073	-0,0821***	-0,0091	-0,0150	-0,0819**	-0,0150	-0,1184***
	(0,0061)	(0,0169)	(0,0067)	(0,0095)	(0,0365)	(0,0095)	(0,0209)
Break-even rate - *ln (n + g + d)*	-0,0012	0,0130	-0,0047	-0,0330	0,0532	-0,0330	0,0169
	(0,0291)	(0,0495)	(0,0306)	(0,0362)	(0,0760)	(0,0362)	(0,0491)
Savings rate - *ln (s)*	-0,0062	0,0134	-0,0043	-0,0083	0,0115	-0,0083	0,0328*
	(0,0082)	(0,0168)	(0,0086)	(0,0093)	(0,0248)	(0,0093)	(0,0185)
Average Schooling - *u*	-0,0025	-0,0032	-0,0027	-0,0033	-0,0058	-0,0033	0,0025
	(0,0021)	(0,0036)	(0,0022)	(0,0031)	(0,0079)	(0,0031)	(0,0065)
FDI	0,0084***	0,0090***	0,0084***	0,0004	0,0196	0,0004	0,0089***
	(0,0022)	(0,0025)	(0,0023)	(0,0054)	(0,0151)	(0,0054)	(0,0025)
Other private flows	0,0003	0,0019	0,0007	0,012	-0,022	0,012	0,0030
	(0,0030)	(0,0040)	(0,0031)	(0,0087)	(0,0418)	(0,0087)	(0,0040)
N	99	99	99	94	94	94	74
Adjusted R^2	0,127	0,377	0,180		0,054	0,055	
Hausman test			24,80			2,94	
Sargan (*prob.*)							0,999
AB – 2nd. order (*prob.*)							0,339

Notes: Numbers in parentheses are the standard deviations of coefficients. Significant at 1% (***), at 5% (**) and at 10% (*). In the fixed effects models the Adjusted R^2 is the within R^2, and in the random effects model, the overall R^2.

In summary, in regard to the flow of capital, it can be said that FDI had positive effects on economic growth, and this effect was consistent for all groups of countries analyzed. In regard to the other private capital flows, the result is not so robust, because it is not so significant for Latin America. At any rate, when significant, the effect is positive. None of the regressions indicate that a greater flow of other forms of private capital results in negative economic growth.

5 *Foreign direct investment and economic growth*

In the recent debate centering on the importance of FDI, Soto (2003) reaches two main conclusions: i) when developing nations are considered, FDI does not have a positive effect on growth; ii) FDI coefficients are lower than those achieved by domestic savings ones, demonstrating that foreign capital would not be more productive than domestic capital and that therefore programs designed to lure FDI would not make sense[13]. These results come from growth regressions that directly include the FDI and the national savings flows, both as a share of GDP.

The model proposed in this paper includes foreign savings and domestic savings in a steady-state product per worker equation, which allows a direct comparison between the magnitudes of the effects of each of these flows of savings on income level. The appendix of this article details how this equation is derived, which results from the open-economy steady-state model. Assuming the usual hypotheses of the steady-state product equation, we arrive at equation (4), which expresses the product per worker as a function of the steady-state determinants, of the rate θ, which expresses the relation between FDI (foreign savings) and domestic savings (S^F/S^D) and of each country's level of productivity, given by α_i.

$$\ln y_{i,t} = \beta_1 . \ln s^{D}{}_{i,t} + \beta_2 . \ln\left(n_{i,t} + g + d\right) + \beta_3 . u_{i,t} + \beta_4 . \ln\left(1 + \theta_{i,t}\right) + \alpha_i + \varepsilon_{it} \qquad (4)$$

The estimation of equation (4) applied, just as it was done above, the panel data approach. Domestic savings rate data were divided by 100, in order to make the scale compatible with the data from the S^F/S^D ratio. The estimated models follow patterns similar to that used for the capital flows, meaning that the result tables have seven estimators.

[13] The classic article discussing this aspect is Feldstein and Horioka (1980).

Table (8) brings results for the whole set of countries in the sample. In all estimations, except that of the OLS with pooled data, the inflow of FDI displays positive and significant effects at 1% on the product per worker, which strengthens the findings of Table (6). Moreover, in the two-stage estimations and GMM estimation, coefficients associated to domestic savings are below those associated to foreign savings.

Table 8. Econometric Results: GDP per worker, All Countries, 1970-2000

				2-stage			
	Pooled	Fixed effects	Random effects	Pooled	Fixed effects	Random effects	Arellano-Bond
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Break-even - *ln (n + g + d)*	-3,8939***	-0,1680	-0,4831***	-4,2369***	0,0815	-0,4062	0,0549
	(0,3042)	(0,1633)	(0,1862)	(0,4620)	(0,3338)	(0,3236)	(0,1395)
Savings - *ln (s)*	0,7583***	0,5768***	0,6021***	1,6467***	1,0230***	1,0775***	0,3564***
	(0,1231)	(0,0581)	(0,0669)	(0,2826)	(0,1645)	(0,1633)	(0,0845)
Schooling - *(u)*	0,2346***	0,1205***	0,1399***	0,1324***	0,0198	0,0556*	0,0712***
	(0,0188)	(0,0105)	(0,0118)	(0,0371)	(0,0330)	(0,0309)	(0,0266)
Ratio S^F/S^D [ln (1+θ)]	0,0547	0,4377***	0,3636***	6,6297***	2,6929***	2,5336***	0,6324***
	(0,3450)	(0,0980)	(0,1141)	(1,7623)	(0,5946)	(0,5883)	(0,1123)
N	294	294	294	271	271	271	210
Adjusted R^2	0,806	0,590	0,743	0,584		0,540	
Hausman test			0,00			34,98	
Sargan (*prob.*)							0,442
AB – 2^{nd}. order (*prob.*)							0,143

Notes: Numbers in parentheses are the standard deviations of coefficients. Significant at 1% (***), at 5% (**) and at 10% (*). In the fixed effects models the Adjusted R^2 is the within R^2, and in the random effects model, the overall R^2.

The results for the groups of countries are shown in Table (9) and suggest similar results. In the case of developed nations, the inflow of foreign savings also has positive and significant effect for all estimations. In the GMM estimation, domestic savings also has a positive and significant coefficient. For developing nations, the coefficients for foreign savings and domestic savings are significant in all regressions. Once more, the coefficient associate to θ is greater than that of savings in most estimations, especially in that using the Arellano-Bond procedure. These results are similar for the sample of Latin American countries, with the difference that domestic savings is not significant in the GMM estimation.

Table 9. Econometric Results: GDP per worker, Groups of countries, 1970-2000

				2-stage			
	Pooled	Fixed effects	Random effects	Pooled	Fixed effects	Random effects	Arellano-Bond
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Developed countries							
Break-even - *ln (n + g + d)*	-1,8707***	-0,2553	-0,4589**	-1,3101**	-0,1005	-0,4099	0,0351
	(0,3161)	(0,2014)	(0,2048)	(0,5653)	(0,2831)	(0,3069)	(0,1245)
Savings - *ln (s)*	0,9678***	-0,0519	0,1361	1,3785***	-0,2608	0,1371	0,2891***
	(0,1397)	(0,1398)	(0,1350)	(0,2684)	(0,1995)	(0,1918)	(0,1112)
Schooling - *(u)*	0,1259***	0,1400***	0,1412***	0,0741***	0,0832***	0,0861***	0,0770***
	(0,0130)	(0,0136)	(0,0131)	(0,0266)	(0,0241)	(0,0230)	(0,0198)
Ratio S^F/S^D [ln (1+θ)]	0,3880*	0,5210***	0,4961***	3,3831***	1,3421***	1,4852***	0,2331***
	(0,2134)	(0,0935)	(0,0966)	(0,9439)	(0,2570)	(0,2925)	(0,0747)
N	111	111	111	110	110	110	84
Adjusted R^2	0,630	0,778	0,433		0,582	0,322	
Hausman test			26,91			0,0	
Sargan (*prob.*)							0,999
AB – 2nd. order (*prob.*)							0,3882
Developing countries							
Break-even - *ln (n + g + d)*	-0,4381	0,2028	0,1741	-0,4074	1,1159**	1,0408**	0,5510**
	(0,5253)	(0,2334)	(0,2313)	(1,0067)	(0,5188)	(0,4915)	(0,2271)
Savings - *ln (s)*	0,7759***	0,7123***	0,7161***	1,8785***	1,4127***	1,4252***	0,5068***
	(0,1388)	(0,0790)	(0,0778)	(0,3981)	(0,2546)	(0,2439)	(0,1180)
Schooling - *(u)*	0,1931***	0,0976***	0,1026***	0,0549	0,0095	0,0177	0,1015***
	(0,0289)	(0,0136)	(0,0135)	(0,0670)	(0,0364)	(0,0352)	(0,0352)
Ratio S^F/S^D [ln (1+θ)]	0,5759	0,5028***	0,4917***	9,4130***	3,1716***	3,2286***	0,8813***
	(0,4748)	(0,1696)	(0,1692)	(2,7092)	(0,8427)	(0,8346)	(0,1889)
N	183	183	183	161	161	161	126
Adjusted R^2	0,468	0,578	0,461			0,300	
Hausman test			19,36			0,26	
Sargan (*prob.*)							0,9828
AB – 2nd. order (*prob.*)							0,3463
Latin America							
Break-even - *ln (n + g + d)*	-1,3170***	0,3442	0,1911	-1,5824*	1,4755**	1,2472**	0,7202**
	(0,4491)	(0,2690)	(0,2738)	(0,8548)	(0,6340)	(0,5828)	(0,2918)
Savings - *ln (s)*	0,4007***	0,5628***	0,5515***	1,6791***	1,2012***	1,2014***	0,1646
	(0,1511)	(0,0919)	(0,0935)	(0,5801)	(0,3019)	(0,2870)	(0,1143)
Schooling - *(u)*	0,1281***	0,0366**	0,0455***	-0,0438	-0,0376	-0,0287	-0,0189
	(0,0302)	(0,0163)	(0,0167)	(0,0869)	(0,0401)	(0,0382)	(0,0383)
Ratio S^F/S^D [ln (1+θ)]	-1,0314	0,3483*	0,2683	5,0501*	2,6224***	2,5672***	0,3988**
	(0,4159)	(0,1868)	(0,1934)	(2,6860)	(0,8620)	(0,8398)	(0,2001)
N	115	115	115	99	99	99	77
Adjusted R^2	0,435	0,372	0,321			0,045	
Hausman test			0,00			7,04	
Sargan (*prob.*)							0,999
AB – 2nd. order (*prob.*)							0,6377

Notes: Numbers in parentheses are the standard deviations of coefficients. Significant at 1% (***), at 5% (**) and at 10% (*). In the fixed effects models the Adjusted R^2 is the within R^2, and in the random effects model, the overall R^2.

The results presented contradict those of Soto (2003), which suggest that the coefficient associated to foreign savings is below the coefficient of domestic savings. To evaluate whether the effect of FDI on product per worker is higher or lower than that of domestic savings, a simple restriction test on coefficients can be built. To check if economic growth, say of one percentage

point of the sample country's GDP, arising from the additional investment is equivalent to that achieved by investing one percentage point of the GDP financed through domestic savings, all it is necessary is to check if the following derivatives are statistically identical:

$$\frac{\partial \ln y}{\partial (S^F / Y)} = \frac{\partial \ln y}{\partial (S^D / Y)}, \text{ or, in equivalent form, } \frac{\partial \ln y}{\partial \ln (S^F / Y)} = \frac{S^F}{S^D} \cdot \frac{\partial \ln y}{\partial \ln (S^D / Y)}.$$

This expression is equivalent to the simple restriction of parameters $\beta_4 = \beta_1$, considering that the values of the product per worker elasticity in relation to the domestic savings rate, obtained from equation (4), are the following:

$$\frac{\partial \ln y}{\partial \ln (S^D / Y)} = \beta 1 - \beta 4 \cdot \frac{\theta}{1+\theta} \quad \text{and} \quad \frac{\partial \ln y}{\partial \ln (S^F / Y)} = \beta 4 \cdot \frac{\theta}{1+\theta}.$$

Therefore, we can build the null hypothesis that the two savings have identical effects $(\beta_4 = \beta_1)$, to be tested using the estimators of Tables 8 and 9. Table 10 brings the statistics *t* computed for this hypothesis and the value of the difference between the two coefficients for the total sample of countries and for the selected subgroups. The difference in coefficients shows which of them is greater, whereas the computed statistics *t* point out whether this difference is null or not.

Table 10. Coefficient restriction tests

					2-stage			
		Pooled	Fixed effects	Random effects	Pooled	Fixed effects	Random effects	Arellano-Bond
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
All Countries	$\beta_4 - \beta_1$	-0,704	-0,139	-0,239	4,983	1,670	1,456	0,276
	t	-2,182	-1,508	-2,232	3,216	3,477	3,079	2,284
Developed countries	$\beta_4 - \beta_1$	-0,580	0,573	0,360	2,005	1,603	1,348	-0,056
	t	-2,553	3,167	2,055	2,377	4,248	3,575	-0,334
Developing countries	$\beta_4 - \beta_1$	-0,200	-0,210	-0,224	7,535	1,759	1,803	0,375
	t	-0,458	-1,537	-1,642	3,152	2,815	2,887	2,116
Latin America	$\beta_4 - \beta_1$	-1,432	-0,215	-0,283	3,371	1,421	1,366	0,234
	t	-3,959	-1,536	-1,940	1,559	2,372	2,323	1,315

Notes: The critical value for t-table is 1,98 (α=5%).

It can be seen that in the two-stage estimations and in the Arellano-Bond procedure for the whole sample, as well as for the set of developing nations, β_4 is significantly higher than β_1, suggesting that investment financed through foreign savings leads to higher growth than that achieved through domestic savings, unlike the findings presented by Soto (2003). For developed

nations the differences are systematically narrower and the previous result remains only in the two-stage panel estimations. This also happens in Latin America, with the difference that the impact of foreign direct investment is greater than that caused by domestic savings.

6 Conclusion

This article has analyzed the effects of capital account liberalization on economic growth, offering new and robust empirical evidence, in the form of estimations using the CAPOPEN liberalization indicator or in estimates using the flow of capital. The CAPOPEN indicator was regressed directly in the first set of convergence equations. In the two subsequent sets, using the flows of capital and incoming FDI, the indicator was used as an instrument. It is important to point out that the construction of the CAPOPEN liberalization indicator was the key element in making these panel estimations, and also helped give a better treatment to the econometric problems commonly found in this literature.

In the first set of equations (2.a), for the total sample of countries and ordinary least squares estimation with pooled data, the CAPOPEN indicator appears in a consistent form, with a positive and significant effect on economic growth, confirming the result found by Quinn (1997). When subdividing the sample, the effect remains positive and significant only for developed nations, a result similar to that found in other studies that use cross section or pooled data, such as Klein and Olivei (1999) and Edwards (2001). This result could suggest, as argued by this group of authors, that liberalization tends to benefit only countries in which proper institutional development is found, to properly take advantage of the process. In this aspect, the financial liberalization of developing nations should only take place at a later stage of the institutional economic reforms, when proper institutions have already been set up.

However, this econometric result differs in the following estimations. In the final result, the effect of liberalization on growth is positive and significant for developing nations – in especial Latin America – but it does not seem to affect the process of economic growth in developed nations. This evidence goes against the previous interpretation, which only countries that have reached a certain level of institutional development would benefit from the liberalization process. Quite the contrary, this article's econometric findings are closer to the idea proposed by Klein (2003), that liberalization would add very little to developed nations and would have considerable

effects on nations with intermediary income, which comprise the greatest share of the developing nations in this study.

In the second set of equations (2.b), and for the total sample of countries, the coefficient associated to the total flow of private capital is positive and significant in all estimations, confirming the positive effect of liberalization on growth, as estimated by the CAPOPEN indicator. This result remains when the analysis considers separately the different types of capital, evidence that challenges the idea put forth by Rodrik (1998), which states that some types of capital flow, by their very nature, would become hurdles in liberalized economies, in especial in emerging nations, subject to vulnerability and contagion problems in the face of financial crises. The above conclusion can be extended for the estimations according to groups of countries and different types of capital considered separately. The coefficients associated to the flows of capital remain positive and significant, both for developed as well as developing nations.

Lastly, the third set of equations (4) analyzed separately the effects of FDI and of domestic savings on the product per worker. This analysis led to the conclusion that evidence exists suggesting that, at least for the set of developing countries, the effect on the product, i.e., economic growth, of a larger inflow of foreign savings is greater than that brought by the rise in domestic savings. For the other groups of countries, no evidence was found to show that this relation could reverse. At the very least, the effects are quite close. In this aspect, the results found in this paper contradict those presented by Soto (2003). That is, for developing countries, foreign savings not only have a positive and significant effect on the product, but this effect is even larger than that of domestic savings, thus invalidating the argument presented by Soto (2003) regarding the ineffectiveness of policies designed to lure foreign direct investment.

Once again, it is worthwhile to point out that in a large measure the findings brought forward in this article on the relation between the liberalization of capital flows and economic growth are attributable to the proper treatment of econometric problems. This was the result mainly of the use of the liberalization indicator constructed by Santana (2004), which was employed to mitigate the simultaneity and endogeneity bias commonly found in this type of analysis.

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Appendix

Equation (4) is based on Solow's theoretical model, considering two basic equations: i) the production function, of the Cobb-Douglas type, using Harrod-neutral technology, $y_t = (k_t)^{\alpha}$, in which the product per effective work is given by $y = Y/A.L.h$, where $h = e^{\varphi.u}$; ii) the capital accumulation function, which is the net investment, lest capital depreciation, $[\dot{K} = I - d.K]$. In an open economy, it can be assumed that investment is equivalent to domestic savings plus foreign savings, or $I = S^D + S^F$, modifying the expression of net investment in the following manner, in which $\theta = S^F/S^D$:

$$\dot{K} = (S^D + S^F) - d.K = \left(\frac{S^D}{Y} + \frac{S^F}{S^D}.\frac{S^D}{Y}\right).Y - d.K = (1+\theta).s^D.Y - d.K$$

Therefore, foreign savings (S^F) drive domestic savings $(s^D.f(k_t) = S^D)$, in relation to break-even investment ($n+g+d$), encouraging greater capital accumulation and generating, in steady state, the following stocks of capital per effective work (k^*) and of product per effective worker (y^*):

$$\dot{k} = (1+\theta).s^D.f(k) - [n+g+d]k\,.$$

$$k^* = \left[\frac{(1+\theta).s^D}{(n+g+d)}\right]^{\frac{1}{(1-\alpha)}} \qquad \text{and} \qquad y^* = \left[\frac{(1+\theta).s^D}{(n+g+d)}\right]^{\frac{\alpha}{(1-\alpha)}}$$

Taking the log-linearized equation of product per worker – considering that human capital is given by $e^{\varphi.u}$ and that technical progress by $A=A_o.e^{g.t}$ – we will have the expression below. The effect of foreign savings is estimated from the coefficient that relates the product per worker with the ratio $\theta=S^F/S^D$.

$$\ln(y) = \ln A + \frac{\alpha}{1-\alpha}.\ln(1+\theta) + \frac{\alpha}{1-\alpha}.\ln s^D - \frac{\alpha}{1-\alpha}.\ln(n+g+d) + \phi.u$$