ESSAYS ON ECONOMIC GROWTH, FINANCIAL INTEGRATION AND EXCHANGE RATES

by

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This dissertation analyzes how the degree of financial integration and the exchange rate regime of a country affect its economic growth. The discussion is focused on developing countries, with special emphasis on Latin America, and it contributes to the recent economic growth and development literatures. The first paper analyzes how fiscal policy and credit constraints affect the impact of macroeconomic volatility on long-run growth. A tractable theoretical model is examined where agents engage in two types of investment: a short-run investment in physical capital and a long-run investment in R&D. The main implication is that in countries with lower degree of financial development, countercyclical fiscal policy is particularly important in reducing the negative consequences of adverse aggregate shocks on firms' long-run investments. The empirical analysis confirms the theoretical predictions from the model.

The second paper examines the relationship between exchange rate regimes, the degree of international financial integration and economic growth. The main implication of the theoretical model is that a more flexible exchange rate can reduce average growth, especially in countries with low level of domestic financial development and low degrees of international financial integration. The empirical analysis confirms the predictions from the model. This paper has policy implications, since it suggests that the exchange rate regime needs to be considered in the light of the development of domestic credit markets and the degree of international financial integration of a country.

The third paper examines the political economy of exchange rate policy in Latin America

by analyzing a model in which special interest groups and policymakers interact to determine the exchange rate regime and its level. The main implication is that the optimal exchange rate is determined by economic parameters, the distribution of special interest groups in the economy, and their capacity to influence policymakers. The empirical analysis for Latin America for the period 1975-2006 confirms the predictions of the model, and establishes that political economy factors have played a role in shaping exchange rate policy; both its regime and its level.

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PREFACE

I am especially grateful to my advisor, Marla Ripoll for her guidance and inspiration throughout my graduate career. Marla was always eager to help, and constantly supported and motivated me during many moments of the Ph.D. program. Her ability to see the big picture of any problem and the sharpness of her specific comments greatly enriched my work. She has always been there with the most positive insights, not only about research and teaching, but also about work and life; showing always the greatest empathy and encouragement.

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1.0 INTRODUCTION

This dissertation examines how the degree of financial integration and the exchange rate regime of a country affect its economic growth. The discussion is focused on developing countries, with special emphasis on Latin America, and it contributes to the recent economic growth and development literatures. In particular, the aim is to identify under what conditions higher growth rates can be predicted when countries adopt fiscal policies over the business cycle and are constrained by their degree of international financial integration with the rest of the world. Eventually, the analysis also concentrates on the political economy of exchange rate policy in the context of financially integrated economies.

The first paper, "Financial Development, Fiscal Policy and Volatility: Their Effects on Growth", studies the business cycle properties of an endogenous growth model in which firms face credit constraints and the government implements fiscal policy. The rationale is that if firms could always borrow enough funds to either reorganize their activities or move to new activities, then the best would be to recommend that governments do not intervene over the business cycle. However, this is not the case when firms face credit market imperfections that prevent them from innovating. The first part of this paper, analyzes a tractable (Schumpeterian) endogenous growth model generalizing Aghion et al. (2005) by allowing for governmental fiscal policy over the business cycle. The main hypothesis is that countries with low financial development perform countercyclical fiscal policy when facing a shock, that is, when facing volatility.

In the second part, this paper tests the main hypothesis by considering an empirical analysis of Latin American countries for the period 1960-2000. Both the model and the empirics suggest that more countercyclical fiscal policy makes growth less sensitive to volatility for incomplete credit markets. Furthermore, less procyclical fiscal policies in less financially

developed countries can have a positive effect on growth.

The second paper, "The Growth Effects of International Financial Integration and Exchange Rates: Theory and Empirics", joins two broad areas of international finance and growth. It argues that a country's level of international financial integration ought to be central in choosing the degree of flexibility of an exchange rate system; particularly, if the objective is long run growth. The first part of this paper develops a stylized open monetary economy model with wage stickiness, where exchange rate fluctuations affect the growth performance of credit constrained firms generalizing Aghion et al. (2006) by allowing for international financial markets. In other words, firms are able to borrow not only from the domestic credit market but also from foreign lenders. Still, the existence of credit constraints hinders the provision of domestic and foreign credit. The basic mechanism underlying the positive growth interaction between the degree of international financial integration and exchange rate flexibility is a balance sheet effect. The main implication is that the more financially integrated to the international capital flows a country is, the better it will do with a more flexible exchange rate.

In the second part of this paper, the main theoretical prediction is tested by conducting a systematic panel data analysis with 85 countries over the years 1960-2000. The findings support the hypothesis that a high degree of exchange rate flexibility leads to lower growth in countries with less degree of integration with the international financial markets. The implications of this paper are important from a policy perspective, since they indicate that the exchange rate regime needs to be considered in the light of the development of domestic credit markets and the degree of international financial integration of a country.

The third paper, "The Political Economy of Exchange Rates in Latin America", analyzes the nature of the process that determines exchange rate policy in Latin America. The literature on the appropriate currency policy is vast but unlike the case of trade or fiscal policy, there is no simple welfare benchmark. The debates typically involve different weightings of the trade-offs associated with the exchange rate policy choices. In the first part of the paper, a theoretical stylized model discusses how the political economy of exchange rate policy is driven. The political game follows a simplified version of Baron's (1994) and Persson's (1998) and models the interaction between special interest groups and policymakers and eventually

how this translates to pressures on the size of the change of the exchange rate. Since economic structure is crucial for defining potential actors, the focus is on the share and type of tradable goods produced in an economy and how important they are for defining preferences and strategies for special interest groups.

In the second part of this paper, an empirical exercise is conducted by analyzing the determinants of the choice of exchange rate *regime* and *level* in Latin America, placing special emphasis on political, institutional and interest-group explanations. The data suggest that political economy factors play a role in shaping exchange rate policy. In particular, special interests appear to affect currency policy, especially as the tradable goods sectors promote more flexible exchange rate regimes to maintain the competitiveness of their products.

2.0 FINANCIAL DEVELOPMENT, FISCAL POLICY AND VOLATILITY: THEIR EFFECTS ON GROWTH

2.1 INTRODUCTION

The relationship between macroeconomic volatility and economic growth is an old and important issue, both from a theoretical and an empirical standpoint. Specifically, two key questions matter: what are the determinants of economic growth and if volatility is one of them, how does this affect business cycles and welfare. Still, it is only recently that empirical and theoretical attempts have been made to analyze the relationship between volatility and growth in more depth. Starting with the seminal paper by Ramey and Ramey (1995) authors like Martin and Rogers (2000), Fatas (2002), Blattman et al. (2007), Hnatkovska and Loayza (2004) and Koren and Tenreyro (2004) find a negative relation between volatility and growth in cross-country data. Among others, Aghion et al. (2004 and 2005) and Turnovsky and Chattopadhyay (2003) have emphasized the effect of volatility on growth among countries with different levels of financial development. In particular, only recently, Aghion and Marinescu (2007) analyze the effects of countercyclical budgetary policies on growth for OECD countries. However, the role of governmental fiscal policy has not yet been analyzed in the context of an endogenous growth model where firms face volatility shocks and credit constraints.

The objective of this paper is to study the business cycle properties of an endogenous growth model in which firms face credit constraints and the government implements fiscal policy. The rationale is that if firms could always borrow enough funds to either reorganize their activities or move to new activities, then the best would be to recommend that governments do not intervene over the business cycle. However, this is not the case when we have

credit market imperfections that prevent firms from innovating. This paper involves two stages. In the first stage, a stylized (Schumpeterian) endogenous growth model is discussed generalizing Aghion et al. (2005) by allowing for governmental fiscal policy over the business cycle and focusing on the qualitative properties of the model. In particular, the interest is in evaluating whether countries with low financial development perform countercyclical fiscal policy when facing a shock, that is, when facing volatility.

In the second stage, the model is confronted with the data by testing two central hypotheses. The first one, argues for a stronger negative impact of volatility on growth at lower levels of financial development. The second hypothesis implies testing the possibility of countercyclical fiscal policy at lower levels of financial development. The empirical analysis will be focused over the period 1960-2000 for a panel of Latin American countries, as a special group of developing countries with low levels of financial development. For robustness purposes OECD countries are also considered.

The main mechanism at work in the model is as follows. Innovation requires that firms survive short run liquidity shocks and that, in order to cover liquidity costs, firms can rely only on their short run earnings plus borrowing. As in an endogenous growth model with R&D, growth is driven by innovations. In the absence of credit constraints volatility will neither affect innovation nor growth as firms can always borrow up to the net present value of their future earnings in order to cover the short-run liquidity costs. However when firms face credit constraints, that is a low financial development, the business cycle will be amplified. In other words, macroeconomic volatility tends to be more harmful to growth the lower the level of financial development. Furthermore, it will be evaluated whether countries with low financial development perform countercyclical fiscal policy when facing a shock, that is, when facing volatility. In the model, fiscal policy will depend on the state of the economy. Hence, a natural conjecture is that the tighter the credit constraints faced by firms, the greater the scope for appropriate government intervention, in particular to reduce the costs that negative liquidity shocks impose on credit constrained firms. The idea is that countercyclical fiscal policy may foster innovation and growth by reducing the negative consequences of a bad aggregate shock on firms' innovative investments[1].

[1]For example, the government may decide to increase public expenditure, investment, or even taxes in

This paper contributes to the literature in the sense that it is relevant for the implementation of macroeconomic policy. Specifically, the effects generated by credit constraints and the different levels of financial development have important practical implications, especially for developing countries. The arguement is that fiscal tax policy instruments as stabilization policies -but ultimately as growth-enhancing policies- should eventually be considered to reduce the costs that negative liquidity shocks impose on credit-constrained firms.

The rest of the paper is organized as follows. In section 2.2 the paper discusses current issues about volatility and growth and its interaction with macroeconomic policies. In section 2.3, the model is presented. Section 2.4 discusses the empirical strategy and evidence; the last section concludes.

2.2 VOLATILITY, MACROECONOMIC POLICIES AND GROWTH

According to the Schumpeterian approach, the relationship between volatility and growth can be positive or negative, depending on the mechanism underlying the growth process. A reason why a positive relationship between volatility and growth may exist, relies on the positive effect that recessions may have on long run investments[2]. Nevertheless, this argument relies heavily on the assumption of developed financial markets and to some extent on the ability to conduct countercyclical innovation expenditures; that is, the argument fits the case for developed economies alone. On the other hand, a negative relationship between volatility and growth may occur if a recession worsens financial markets so firms face credit constraints that affect long run investments and therefore growth; this is the case of developing countries.

Based on the empirical evidence it is still unclear what is the correct explanation for the observed correlation between volatility and growth. First, the impact of volatility persists even after controlling for the aggregate investment rate which implies that total investment

some sectors.

[2] The intuition is that long run investments often take place at the expense of directly productive activities, and because the return to the latter is lower in recessions due to lower demand, the opportunity cost of long run investments is lower.

cannot be the main channel through which volatility affects growth[3]. Second, the relationship may be spurious, driven by the effect that financial development and fiscal procyclicality have on both growth and volatility.

Aghion et al. (2005) present a model where economic growth is driven by R&D innovation in the spirit of an overlapping generation two-period-lived agents model. They develop an endogenous growth model where the main channel through which volatility affects growth is the composition of investment. In this model, agents (firms) engage in two types of investment activity: one type is the short-term investment (physical capital) and long-term investment (R&D). An interesting insight of this model is that they characterize the cyclical behavior of the composition of investment as a function of the level of financial development, and they analyze how this affects growth and volatility. Even though Aghion et al. (2005) provide useful conclusions, there is a reasonable extension that implies considering governmental macroeconomic policy over the business cycle. Looking for a general framework to understand the channels through which countercyclical policy in low financial development countries can affect the mean growth, the focus will be on Latin America, a region facing high volatility and credit constraints[4].

2.3 THE MODEL

2.3.1 The Economy

In Aghion et al. (2005) the basic framework is derived but under the assumption of no government intervention. Hence, in this section the model is extended to account for governmental fiscal policy over the business cycle. Time is discrete and indexed by t. In any given period t, the economy is populated by a continuum 1 of overlapping generations of two-period lived risk neutral agents (entrepreneurs) which are all *ex ante* identical, who will be indexed by i and uniformly distributed over [0,1]. As in Aghion et al. (2005), in the first period, an entrepreneur decides how much to invest in short-term or long-term projects

[3]Ramey and Ramey (1995) and Aghion et al. (2005) analyze this effect.

[4]The recent paper by Aghion and Marinescu (2007) is another reference where they analyze the effects of countercyclical budgetary policies on growth for OECD countries.

(physical capital versus R&D). Capital produces at the end of the first period while R&D produces at the end of the second period but only if the agent has spent additional resources to develop the product by the end of the initial round of investment. At the end of the second period, the agent consumes her total life-time income and dies. Productivity growth is driven by past aggregate R&D activity.

Let T_t be the aggregate stock of knowledge and A_t is the aggregate productivity at time t. So aggregate productivity (with volatility) is represented by:

$$\ln A_t = \ln T_t + \ln a_t \tag{2.1}$$

where

$$\ln a_t = \rho \cdot \ln a_{t-1} + \varepsilon_t \tag{2.2}$$

with a_t representing an exogenous productivity shock, $\rho < 1$ and $\varepsilon_t \sim N(0, \sigma^2)$.

Each agent born in period t has initial wealth, W_t^i, which is proportional to the aggregate level of knowledge. In the first period the agent must decide how to allocate her wealth endowment between short-run investment, K_t^i ,and long-run investment, Z_t^i. Therefore the initial detrended budget constraint is thus given by:

$$k_t^i + z_t^i \leq w \tag{2.3}$$

Short-term investment at date t generates profit:

$$\Pi_t^i = A_t \pi \left(k_t^i\right) \tag{2.4}$$

where π is a neoclassical production function. Long-term investment at date t generates income only if the investment is successful in generating an innovation by the end of period t, and the entrepreneur has implemented the innovation. That is, the initial long-term investment pays off in period $t+1$, but only if the liquidity needs at the end of period t have been met: $C_t^i = c_t^i T_t$. Also, c_t^i to be i.i.d. both across agents and periods[5]. Conditional on paying this cost, the income generated by the long-run investment is:

$$\Pi_{t+1}^i = V_{t+1} q(z_t^i) + C_t^i \tag{2.5}$$

[5]With cdf F and positive density f over $\mathbb{R}_+$.

where V_{t+1} is the value of the new innovation and $V_{t+1}q(z_t^i)$ is the return to R&D. By assuming that q is a neoclassical production function and letting $v_{t+1} = V_{t+1}/T_t$ denote the knowledge-adjusted final wealth and the knowledge-adjusted value of a new innovation in $t+1$. As in Aghion et al. (2005) the returns to R&D are less procyclical than return to capital investment [6]. Also, from the special case where $V_{t+1} = A_{t+1}$, in which $\ln v_{t+1} = \rho \cdot \ln a_t + \varepsilon_{t+1}$ [7] , a more general case will be used where $\ln v_{t+1} = \theta \cdot \ln a_t + \xi_{t+1}$ with $\xi_{t+1} \sim N(0, \sigma_v^2)$ which implies that:

$$E_t v_{t+1} = (a_t)^\theta \tag{2.6}$$

An agent born at date t can borrow only up to μ times her initial wealth, so that she faces the investment constraint

$$k_t^i + z_t^i \leq \mu \cdot w \tag{2.7}$$

Similarly, after the realization of the liquidity cost c_t^i on the long-term investment at the end of period t, the entrepreneur can borrow up to μ times her end-of-current-period wealth x_t^i for the purpose of covering these liquidity needs. Therefore, her initial R&D investment at the beginning of period t will pay out next period if and only if:

$$c_t^i \leq \mu \cdot x_t^i \equiv \mu \cdot [a_t \pi(k_t^i)] \tag{2.8}$$

Following Aghion et al. (2005) define the probability of the agent being able to meet the liquidity shock and implement her innovation given by[8]:

$$\Pr\left(c_t^i \leq \mu \cdot x_t^i\right) \equiv F\left(x_t^i\right) \tag{2.9}$$

This probability of meeting the R&D liquidity shock will be assumed to be procyclical, that is $\partial F(x)/\partial x > 0$, and concave $\partial^2 F(x)/\partial x^2 < 0$.

[6] This amounts to assuming that the correlation between v_{t+1} and a_t over the business cycle is less than one.

[7] This implies that $v_{t+1} = a_t^\rho e^{\varepsilon_{t+1}}$ and therefore $E_t v_{t+1} = a_t^\rho$

[8] The special case of the log linear approximation $\ln F\left(x_t^i\right) \approx \phi \cdot \ln(\mu \cdot x_t^i)$ where ϕ is the local elasticity of F and both parameters μ and ϕ reflect the tightness of credit constraints is used. A lower value of μ corresponds to tighter credit constraints or equivalently to a lower degree of financial development. On the other hand, a higher value of ϕ means that the probability of surviving the long-term investment liquidity needs is dependent on the wealth.

2.3.2 The Government

The government will finance its expenditure requirements by the way of a tax on capital investment and by issuing public debt. Tax on capital investment is $\tau_t(a_t)$ and depends positively on the state of the economy, that is, it will be assumed that $\tau_t(a_t)$ is procyclical such that $0 < \tau_t(a_t) < 1$ and $\partial\tau_t/\partial a_t > 0$, with tax collection as G_t[9]. The government will rebate tax collection to individuals by taxing in period t in order to transfer the proceeds to agents in period $t+1$ so they can consume it. With this framework, the government is assumed to follow a procyclical fiscal policy by endogenizing the decision. The government's budget constraint is thus,

$$b_t + \tau_t(a_t) = (1 + r_t) \cdot b_{t-1} + G_t \tag{2.10}$$

2.3.3 Credit market

In this section the paper presents the basic framework of an agent facing both credit constraints and governmental fiscal policy. Credit constraints limit agents' borrowing capacity to what is necessary in order to cover the R&D adjustment costs to a finite multiple μ of their current wealth in both periods of their lifetime. At the beginning of period t an agent born at date t faces the constraint[10]:

$$k_t + z_t \leq \mu \cdot w$$

At the end of period t the entrepreneur must satisfy the following constraint if she wants to survive until next period

$$c_t^i \leq \mu \cdot [a_t \pi(k_t)(1 - \tau_t(a_t)) + (1 + r_t)b_t] \tag{2.11}$$

[9] I benefited from a discussion with Maria Julia Bocco about this assumption.

[10] Dropping the i superscripts since all agents born at date t are *ex ante* identical.

Using condition (2.11) to substitute for the probability of survival in the entrepreneur's objective function so a new agent born at date t will be choosing:

$$\begin{aligned} &\max_{k_t,z_t} \{a_t\pi(k_t)(1-\tau_t(a_t)) + (1+r_t)b_t + \\ &+E_t v_{t+1} q(z_t) F\left[\mu \cdot (a_t\pi(k_t)(1-\tau_t(a_t)) + (1+r_t)b_t)\right] + G_t\} \\ &s.t.\ k_t + z_t + b_t \leq w \end{aligned} \tag{2.12}$$

From the first order conditions and using the log -linear specification for the distribution function of the liquidity cost c_t for some constant ϕ, the following marginal rate of substitution between short-run investment (k_t) and long-run investment (z_t) is obtained:

$$\begin{aligned} \frac{q'(z_t)}{\pi'(k_t)} \approx\ & a_t^{1-\theta}\left(1-\tau_t(a_t)\right) \cdot \left\{ \frac{1}{\left[\mu \cdot (a_t\pi(k_t)(1-\tau_t(a_t)) + (1+r_t)\bar{b})\right]^{\phi}} + \right. \\ & \left. +\phi \cdot \frac{a_t^{\theta} \cdot q(z_t)}{[a_t\pi(k_t)(1-\tau_t(a_t)) + (1+r_t)\bar{b}]} \right\} \end{aligned} \tag{2.13}$$

From this last condition[11], it follows that the right hand side is equal to the first order conditions for the case of complete markets times a greater-than-one bracket term. Under complete markets an increase in a_t reduces the share of R&D z_t and increases the share of capital investment k_t. This conclusion implies that the share of capital investment is procyclical and the share of R&D investment is countercyclical. Specifically, the share of R&D would be more countercyclical the less persistent the aggregate shock or the longer the horizon of R&D investment and the higher the tax is[12]. This is the case for the *opportunity cost effect* stated by many scholars. The intuition is that short run capital investment profits are more sensitive to the current state of the economy than the long run R&D investment. That is, after a "bad" aggregate shock agents expect that investment in the short run will not be very profitable, while the value of R&D investment is less correlated with the contemporaneous state of the economy.

[11] And the fact that debt is constant in equilibrium.

[12] To see this, it is useful to consider a standard Cobb-Douglas specification for $\pi(k_t)$ and $q(k_t)$ recalling that in the complete markets' case $\phi = 0$ implying that the probability of surviving the investment liquidity need is independent of the wealth.

However, in the general case of incomplete markets the share of R&D, z_t, becomes procyclical and the share of capital investment, k_t, becomes countercyclical[13]. The intuition in this case is that with credit constraints, whenever the economy faces a "bad" aggregate shock, a low level of short run investment profits will be realized in the current period. Moreover, low level of short run investment profits implies -because of the credit constraints- a low borrowing capacity and thus a low probability of responding to the liquidity shock c_t on the long term R&D investment. With a low probability of covering the liquidity shock in the first period it is unlikely that long term R&D investment will pay out in the future. Thus, agents facing the situation of a low probability of covering c_t will anticipate and move away from long term R&D investment generating the procyclicality in this type of investment. In fact, the procyclicality of z_t increases with a short horizon of long term investment ϕ, a lower financial development μ, a high persistence of the shocks θ or a low tax $\tau_t(a_t)$. Therefore, in the context of our assumption of procyclicality of fiscal policy, in countries facing financial constraints a "bad" aggregate shock will determine a decrease in the level of long run investment z_t as well as an increase in its procyclicality.

2.3.4 Volatility and growth

This section will consider the effect of increased volatility on long-run average growth, and how growth is affected by credit constraints and fiscal policy. As in other models of endogenous technological progress, such as Romer (1990) or Aghion and Howitt (1992, 1998), only long-term investments, z_t, contributes to long-run growth. In an economy with credit constraints only those firms that can meet their adjustment costs are able to innovate and therefore contribute to aggregate productivity growth. Thus, assuming that knowledge grows at a rate proportional to the number of implemented innovations, then the growth rate of technology is given by:

$$g_t \equiv \ln T_{t+1} - \ln T_t \equiv \gamma \cdot q(z(a_t))\delta(a_t) \tag{2.14}$$

[13] Again, if considering a standard Cobb-Douglas specification for $\pi(k_t)$ and $q(k_t)$ the result is straightforward.

where $z(a_t)$ is the equilibrium level of R&D and

$$\begin{aligned} \delta(a_t) &\equiv F\left[\mu \cdot (a_t \pi(k_t)(1-\tau_t(a_t)) + (1+r_t)\bar{b})\right] \\ &\equiv F\left[\mu \cdot (a_t \pi(w - z(a_t))(1-\tau_t(a_t)) + (1+r_t)\bar{b})\right] \end{aligned} \tag{2.15}$$

is the equilibrium probability of meeting the R&D adjustment costs. In the previous section the conclusion was that z_t is increasing in a_t, that is, z_t is procyclical. Additionally, as pointed out by Aghion et al. (2005), R&D investment should be $0 \leq z_t \leq w$ implying that z_t must be not only increasing but also partly concave on this interval. Hence, this suggests the possibility of a negative correlation between volatility and R&D, and therefore mean productivity growth. Thus, it can be shown that $q(z(a_t))$ is concave and similarly $\delta(a_t)$ is increasing in a_t and bounded between 0 and 1, which suggests that $\delta(a_t)$ is also concave in a_t. Note that $(1-\tau_t(a_t))$ is less than 1, thus, g_t is a concave function of a_t, so the mean growth will fall in response to an increase in the variance of a_t[14]. Therefore, in an economy facing credit constraints, an increase in volatility will result in lower mean growth, and all the more when μ is lower and when the tax $\tau_t(a_t)$ is more procyclical. In particular, the tighter the credit constraint, the more procyclical long term R&D investment is and therefore the lower its mean is over time, implying a lower average growth rate for the economy.

As in Aghion et al. (2005) this simple model emphasizes the importance of distinguishing between short run capital investment and long term R&D investment and the latter as the determinant of the average growth rate for the economy. Moreover, another important issue to emphasize is the role of the channel through which fiscal policy can be countercyclical over the business cycle. The analysis shows that in countries with lower financial development, negative shocks or higher volatility have more damaging effects on average long-term R&D investment and growth. Considering the cyclical effects of the tax introduced in the model suggest that countercyclical fiscal policies should be more growth-enhancing in countries

[14] Although this paper is not focusing on the case of complete markets, it is interesting to analyze the implications. In this latter case, the probability of covering the liquidity shock of R&D investment at the end of the first period will be one, that is $\delta(a_t) = 1$. The implication from section 3.3 is that without credit constraints z_t is countercyclical with respect to a_t (and mitigates the business cycle), hence $z(a_t)$ is decreasing in a. So at least in the interval [0,w] the equilibrium R&D investment $z(a_t)$ is convex. In particular, an increase in the variance of a_t will increase the mean of R&D investment. Hence, the latter is the Aghion et al.'s (2005) complete markets case where the effect of volatility on growth is positive.

with lower degrees of financial development to reduce the negative consequences of a bad aggregate shock on firm's innovative R&D investments.

2.4 EMPIRICAL ANALYSIS

The model of the previous section explains the relationship between volatility and growth, the interaction with financial development and the possibility of macroeconomic (fiscal) policy. To take these predictions to the data, three steps will be followed using the panel data structure. The first case will explore the relationship between volatility and growth in the context of credit constraints. In the second step, the relationship between fiscal policy cyclicality and growth also in the context of credit constrained countries. Finally, the relationship between fiscal policy cyclicality, volatility and growth in countries that face credit constraints is addressed.

2.4.1 Data

For the empirical exercise, two samples - Latin America and the OECD countries- will be considered mainly for two reasons, (i) to compare two different circumstances: an incomplete market case (Latin America) and a complete market sample (OECD) and (ii) to be able to compare our estimates with the work by Aghion and Marinescu (2007). The data set is then composed by 20 countries from Latin America and 19 OECD countries over the 1960-2000 period. GDP, annual growth and government expenditure as a share of GDP were obtained from the Penn World Tables mark 6.1 (PWT). The terms of trade serie is from the World Development Indicators (WDI) of the World Bank over the period 1960-2000. The ratio of private credit to GDP first compiled by Levine et al. (2000) and recently updated by Beck under the project Financial Structure Dataset of the World Bank[15] is used as a measure of financial development. The average years of schooling in the population over 15 years old series is borrowed from the Barro-Lee dataset[16]. The control variables considered, relative

[15] Data downloadable at http://econ.worldbank.org/staff/tbeck

[16] This measure corresponds better to the labor force for many developing countries than the over-25 age group.

GDP per capita, investment share of GDP, openness[17], population growth and inflation were also obtained from PWT. Following Levine et al. (2000) policy control variables such as black market exchange rate premium and property rights are considered. Black market premium was obtained from the Levine et al. data set from the World Bank while the property rights information was obtained from the Fraser Institute's Economic Freedom of the World database.

As a robustness check for the results of the estimations for Latin America, the same 19 OECD countries that Aghion and Marinescu (2007) considered will be used. The only difference here is that government expenditure will be used as the measure of fiscal policy while Aghion and Marinescu (2007) use government consumption and government investment. The reason for the choice depends on governmental data availability for Latin America[18]. By performing the empirical analysis based on two samples it is expected to have a more conclusive evidence of the predictions of the theoretical model. Specifically note that the idea of considering developed countries allows the comparison of two different structures of financial development: the 20 Latin American developing countries and the 19 OECD developed countries. This is the composition of the whole sample considered. Latin America is a region that faces more volatility and credit constraints than OECD countries, so in that sense it will be enriching to have another sample as a reference to compare with. Furthermore, the data for OECD countries have the same sources as in the case for Latin America.

2.4.2 Volatility and Credit Constraints: Their Effects on Growth

This section explores the relationship between volatility and growth in a panel of credit constrained countries. Specifically in this first step the following specification is estimated over a 5-year period interval in a panel for the sample of 20 Latin American countries.

$$\begin{aligned} growth_{i,t} &= \alpha_0 + \beta_0 priv.credit_{i,t} + \beta_1 volatility_{i,t} + \\ &\quad + \beta_2 priv.credit_{i,t} volatility_{i,t} + \delta X_{i,t} + \mu_i + \varepsilon_{i,t} \end{aligned} \tag{2.16}$$

[17] Defined as exports and imports over GDP.

[18] It is not yet available a systematic source of information with a comparable discrimination of government expenditures into consumption and investment.

where the i subscript denotes countries and the t subscript denotes time. *growth* is annual growth rate of GDP per capita, *volatility* is a measure of annual GDP per capita variation that will be explained below, *priv.credit* is private credit over GDP. X denotes a vector of country specific control variables described below. In essence, equation (2.16) is similar to equation (11) from Aghion et al. (2005) but in that case the authors perform a cross section analysis while this paper explores the panel structure of the data. This equation is a starting point for the hypotheses discussed following the model. To deal with the potential problem of omitted country-level variables, country fixed effects by country were included. Moreover, to capture possible time trends affecting all countries in the sample, year fixed effects were also considered. The main interest is in the interaction term β_2 between volatility and private credit, and it is expected to be positive: more private credit should make growth less sensitive to volatility. A positive β_2 would imply that the marginal impact of volatility on growth is increasing in private credit so "better" private credit lessens the adverse impact of volatility on growth.

In this specification the concept of volatility is introduced through the term *volatility* and an interaction term to account for the relationship with private credit. Since the data is annual, output volatility is the 5-year standard deviation of the residuals of a first-order autoregressive process of the annual growth rate of GDP for each country over the period 1965-2000. This is the unpredictable component of real output growth and ensures that the standard deviation is measured in percentage terms and is therefore unit free. Moreover, X denotes a vector of control variables such as relative GDP per capita, average years of schooling for the population over 15 years old, openness, inflation, population growth, government share of GDP, investment share of GDP, property rights and black market premium. As another step equation (2.16) is estimated for the 19 OECD countries as well as the whole sample.

Table 1 shows the results for Latin America, OECD and for the whole sample. For the case of Latin America there is a direct and significant negative effect of volatility on growth and a positive and significant coefficient on the interaction term between volatility and private credit. This interaction term has a positive sign which implies that more credit to the private sector should make growth less sensitive to volatility. There is evidence of

Table 1: Volatility and Credit Constraints: Their Effects on Growth

	Latin America		OECD		Whole sample	
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
private credit	-3.5338	-3.7123	-1.5546	-2.3799	-3.3291	-2.8377
	(2.9047)	(3.1483)	(0.5896)**	(0.8405)**	(0.7035)*	(0.8481)**
volatility	-0.2669	-0.2807	0.4916	0.1192	-0.1812	-0.2432
	(0.1629)*	(0.1710)*	(0.2141)**	(0.1984)	(0.1105)*	(0.1396)*
private credit*volatility	-0.0766	0.0352	-0.9142	-0.4828	-0.1431	-0.0400
	(0.6312)	(0.0213)*	(0.2952)**	(0.2881)**	(0.0867)*	(0.0244)*
relative GDP per capita	0.0212	-0.0274	-0.1106	-0.0817	-0.0552	-0.0570
	(0.0456)	(0.0688)	(0.0291)**	(0.0335)**	(0.0268)**	(0.0306)*
investment/GDP	0.1628	0.1363	0.2121	0.2127	0.2117	0.1883
	(0.0525)	(0.0683)**	(0.0485)**	(0.0568)**	(0.0367)**	(0.0381)**
years of schooling pop.		-0.4926		-0.2569		-0.4605
over 15 years old		(0.3425)		(0.1839)		(0.1892)**
openness		0.0148		0.0261		0.0143
		(0.0147)		(0.0168)		(0.0106)
inflation		-0.0903		-0.0596		-0.0613
		(0.0422)**		(0.0337)*		(0.0282)**
population growth		0.4712		0.1895		0.3996
		(0.7180)		(0.4252)		(0.4320)
government size		-0.0827		-0.0022		-0.0586
		(0.0583)		(0.0383)		(0.0390)
property rights		0.3287		-0.1447		0.0811
		(0.1760)*		(0.1691)		(0.1288)
black market premium		0.0217		2.2056		0.0111
		(0.0160)		(16.263)		(0.0134)
N of observations	160	140	152	133	312	273
N of groups	20	20	19	19	39	39
R-squared	0.1354	0.2607	0.4260	0.4478	0.1965	0.2944

Note: Dependent variable is the 5-year average growth of GDP per capita
over the period 1960-2000. Robust standard errors in parentheses.
Constant term is not shown although it is included. We consider country fixed effects.
*significant at 10%; ** significant at 5%

a strong direct negative effect of volatility on economic growth of -0.28 and a significant positive coefficient on the interaction term of 0.034 (Column(2)). This is consistent with the predictions of the model discussed in section 2.3 in the sense that there is evidence of a negative relationship between volatility and growth in the context of credit constraints. For the case of OECD countries, it seems to be some evidence that favors the idea that volatility and growth have a positive relationship when facing no credit constraints. This is consistent with the theoretical model in the case of complete credit markets[19]. For the cross section analysis of OECD countries, Aghion et al. (2005), do not find significant coefficients for the direct effect of volatility on growth and the interaction term. When making the estimation for the whole sample, the evidence favors the incomplete markets' hypothesis where volatility has a negative effect on growth under credit constraints.

2.4.3 Cyclicality of fiscal policy

2.4.3.1 In the cross country sample In the empirical characterization of fiscal policy the measure of fiscal policy that will be used is government expenditure. There are two reasons for this choice. The first one is that most of the fluctuations on the revenue side of the budget come from automatic reaction of tax revenues to the state of the economy, this way we are less exposed to endogeneity problems. The second reason is that only for a small number of countries disaggregated time series data on government consumption and government investment is available; while, aggregate government expenditure is available for all countries and ready to use.

Following Gavin and Perotti (1997), Catao and Sutton (2002) and Alesina and Tabellini (2005) a measure of cyclicality of fiscal policy will be constructed. Separately, for each country in the sample for Latin America the following regression is estimated, where β is the coefficient of interest:

$$\Delta G_t = \alpha + \beta \cdot GDPGAP_t + \gamma_1 \cdot TOT_t + \gamma_2 \cdot G_{t-1} + \delta \cdot W_t + \varepsilon_t \tag{2.17}$$

where G_t is the government expenditure as a percentage of GDP; $GDPGAP_t$ is the output

[19] See discussion in section 2.3.3.

gap, defined as the log deviation of GDP from its Hodrick-Prescott trend; TOT_t is a measure of the gap in terms of trade (that accounts for relative price shocks); and W_t represents additional control variables. Specifically, for each country a time trend, inflation and inflation squared were used[20]. A positive coefficient on $GDPGAP_t$ implies that a cyclical boom is associated with an increase in government expenditure; that is, a procyclicality fiscal policy.

Table 2 shows the estimate of the parameter β for Latin America in a sample that corresponds to 1965 to 2000. Estimates confirm previous results by other scholars: in Latin America, government spending is procyclical. Still, many of the β coefficients exhibit large standard errors and are not significantly different from zero while some others have the wrong sign, something consistent with Alesina and Tabellini (2005). To cope with likely measurement error, instead of weighting observations with the inverse of the estimated standard error of the β coefficient, like Alesina and Tabellini (2005), it was decided to perform another analysis to make full use of the panel structure of the data.

2.4.3.2 A time series approach Barro's (1979) tax-rate smoothing approach is a useful and broadly used framework to analyze budget deficits and cyclicality. The argument is that for a given path of government spending, tax rates should be held constant over the business cycle and the budget surplus should move in a procyclical fashion. In particular, the focus will be on the cyclicality of government spending rather than on its financing. Indeed, as suggested by Aghion and Marinescu (2007), this approach can also be helpful in the context of panel data. To get a more comprehensive model an empirical counterpart of the tax-rate smoothing model of budget deficits in terms of government expenditure is used:

$$\frac{G_t - G_{t-1}}{Y_t} = \alpha_1 \cdot Ygap_t \cdot \overline{\left(\frac{G_t}{Y_t}\right)} + \alpha_2 \cdot Ggap_t \cdot \left(\frac{G_t}{Y_t}\right) + \alpha_3 \cdot \left(\frac{G_{t-1}}{Y_t}\right) + \alpha_4 + \varepsilon_t \qquad (2.18)$$

where G_t is the government expenditure; Y_t is the GDP in year t; $Ygap_t$ is the output gap; $Ggap_t$ is the government expenditure gap, defined as the log deviation of government

[20] Inflation was included to ensure that results are not driven by high-inflation episodes in which monetary instability may be causing the comovement between government expenditure and output. Inflation squared is also included to control for possible non-linearities in the relationship between inflation and government expenditure.

Table 2: Cyclicality

	Beta
Argentina	1.4724**
Bolivia	-0.8896**
Brazil	0.5195*
Chile	0.0373
Colombia	0.4181 #
Costa Rica	-0.4501*
Dominican Republic	0.4161
Ecuador	1.0671**
El Salvador	0.4957
Guatemala	-0.5744
Honduras	-2.1211**
Jamaica	0.0144
Mexico	5.8975**
Nicaragua	0.0424
Panama	0.3056 #
Paraguay	2.7088**
Peru	0.2044 #
Trinidad	-2.2877**
Uruguay	0.3359 #
Venezuela	0.0742
Latin America	0.0437*

significant at 11%,
*significant at 10%; ** significant at 5%

expenditure from its Hodrick-Prescott trend. Finally, $\overline{(\cdot)}$ indicates the Hodrick-Prescott trend.

To measure the cyclicality of fiscal policies it is very common to use regression based approaches, with the drawback of getting only one observation of cyclicality per country. Thus, to make use of the whole panel structure, for each country yearly measures for the cyclicality of government spending will be constructed. To do so, it will be allowed the possibility of time-varying coefficients in (2.18) as suggested by Schlicht (2003) and Aghion and Marinescu (2007), although the latter authors use Markov Chain Monte Carlo methods instead of the Bayesian inference in a hierarchical model associated with the method proposed by Schlicht[21]. The idea is that, instead of having fixed coefficients as in ordinary least squares regressions, coefficients will be allowed to vary over time using a state space representation. The assumption made here is that all changes in the coefficients are datadriven rather than induced by the structure of the model. Therefore, a random walk will generate each of the coefficients[22] in (2.18) as:

$$\alpha_{i,t} = \alpha_{i,t-1} + \varepsilon_t^{\alpha_i}, \qquad \varepsilon_t^{\alpha_i} \sim N(0, \sigma_{\alpha_i}^2)$$

This procedure is statistically superior to the Kalman filter since it is a two-sided filter[23]. Separately for each country these equations using the VC program by Schlicht[24] are estimated. Specifically the interest is in the coefficient α_1 to characterize the time path of the procyclicality of government expenditure in each of the 20 Latin American and the 19 OECD countries in the sample.

Figure 1 and 2 plot the evolution of procyclicality of government spending in Latin America. The low variation in the estimated coefficient values gives evidence that procyclicality

[21] The Markov Chain Monte Carlo method explores randomly a wide spectrum of possible values for the variances, and one then retains a set that is representative of probable values given the data. In practice, the estimates obtained by Aghion and Marinescu (2006) using this method are highly correlated with the ones obtained using Schlicht method.

[22] As noted by Schlicht (2003), the assumption which links the past with the future is that the stability, or variance, of any coefficient be time invariant.

[23] The estimate of the state of coefficients at time t will depend not only on past and current conditions but on future observations too. Also, instead of using maximum likelihood methods, in the VC program a GMM estimator is implemented.

[24] Downloadable from www.semverteilung.vwl.uni-muenchen.de/mitarbeiter/frameset_es.htm

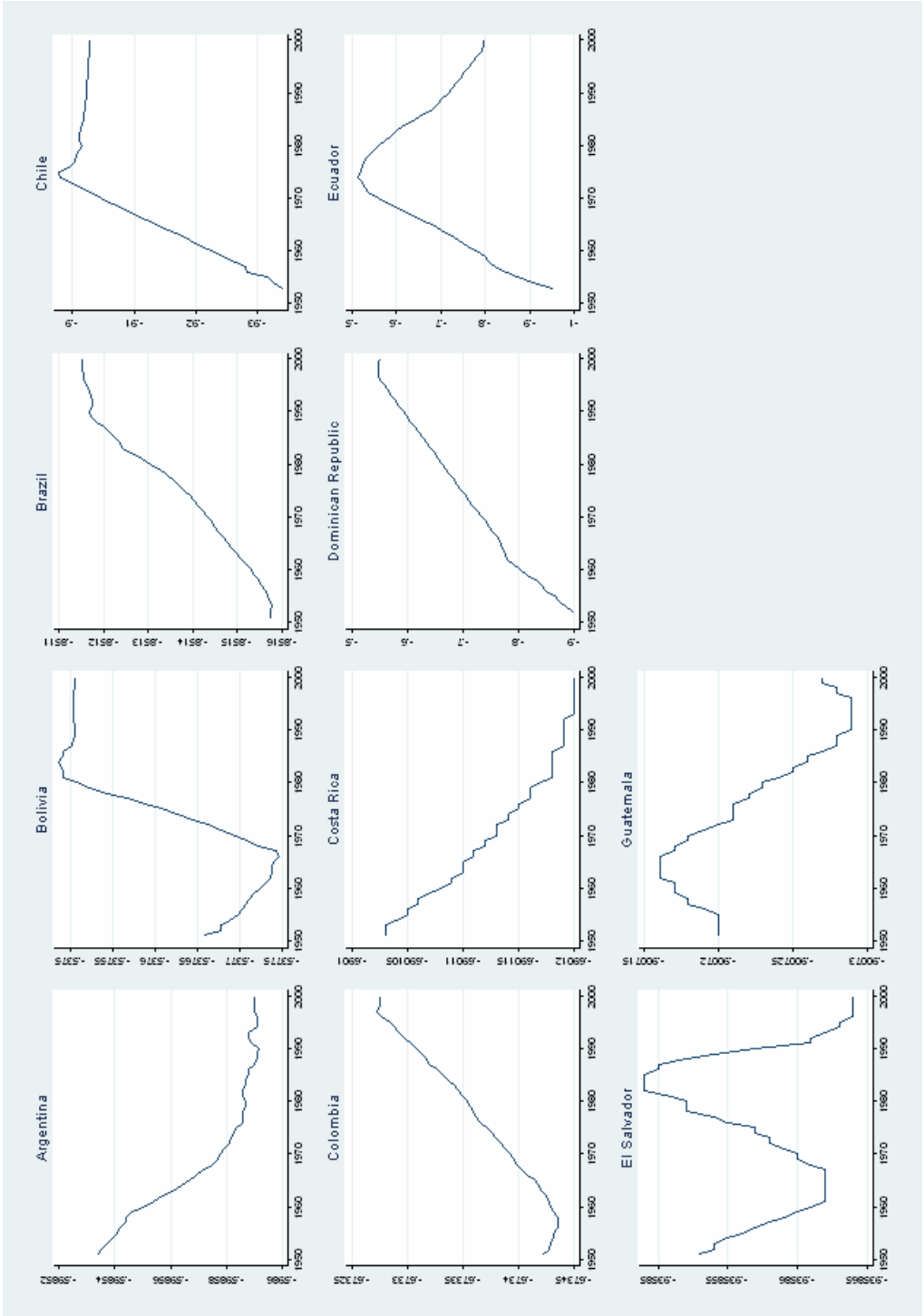

Figure 1: Procyclicality of government expenditure in Latin America

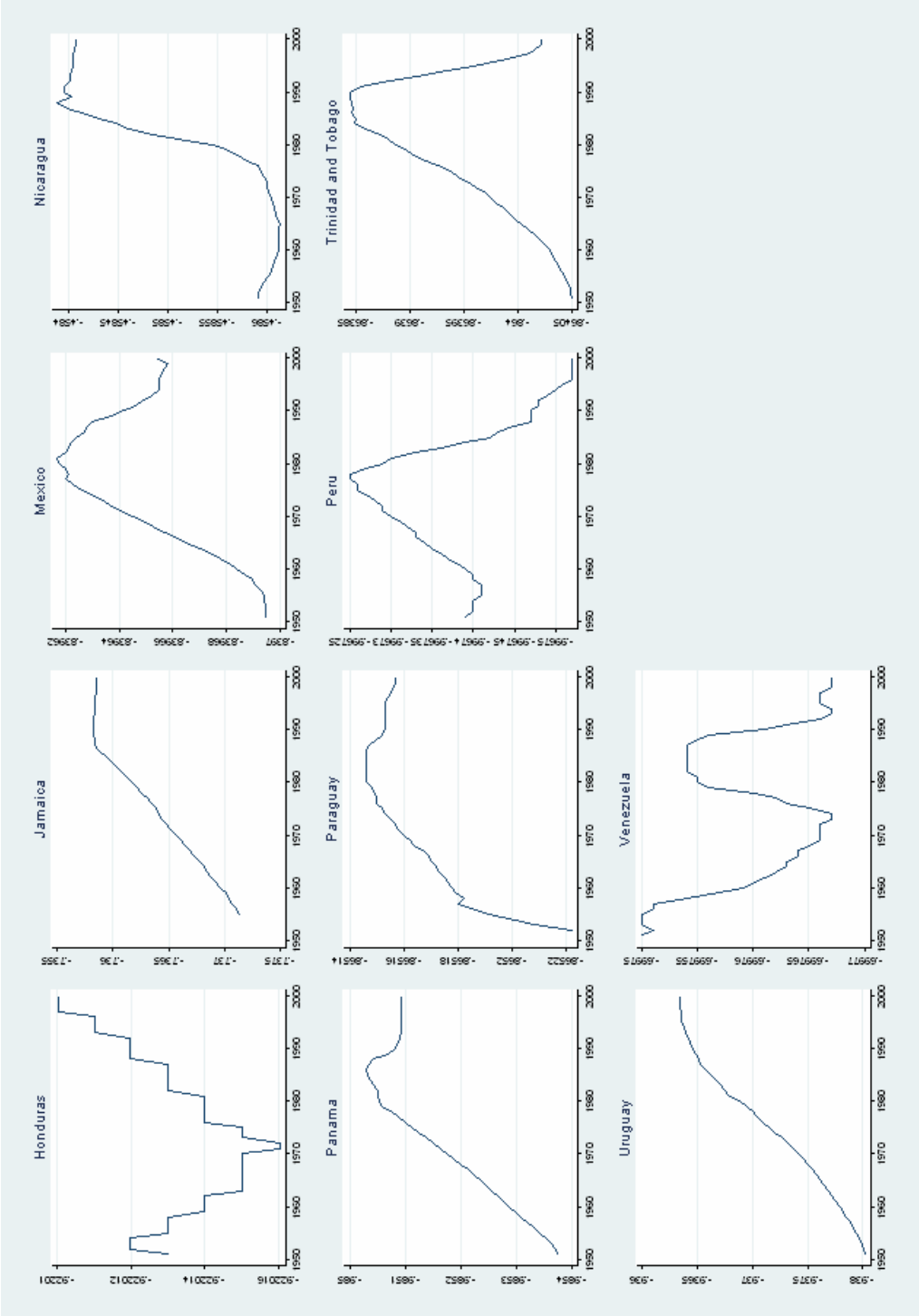

Figure 2: Prociclicality of government expenditure in Latin America (cont.)

is stable or increasing over time in all countries and only in Argentina and Peru a declining trend is observed. These results are consistent with the idea that fiscal policy is procyclical in Latin America. A vast literature explored this issue regarding procyclicality in developing countries and at least three arguments appear as answers. Some researchers argue that the (lack of) credit supply is the answer why we observe procyclicality in developing countries: Hausmann and Stein (1996), Gavin and Perotti (1997), Gavin and Hausmann (1998), Talvi and Végh (2005), Catao and Sutton (2002), Lane (2002) and Kaminsky et al. (2004) among others. Others authors understand that differences in the cyclical stance of macroeconomic policy across developing countries may be attributed to differences in their level of institutional quality: Alesina and Wagner (2006), Calderon et al. (2004). Finally, a third answer to this issue comes from the political economy literature: Lane and Tornell (1996,1998), Tornell and Lane (1999), and Alesina and Tabellini (2005). The findings from the current paper are in line with the first argument and are consistent with the focus of the analysis of a market failure -the financial constraint. For OECD countries the evidence so far is mixed: some researchers like Perotti (2004) understand that fiscal policy is countercyclical while others like Lane (2002) find that it is procyclical.

Figures 3 and 4 show, for OECD countries, stability and sometimes increasing procyclicality over time. These figures are consistent with Lane (2002) and also with the current work by Aghion and Marinescu (2007), who find that government consumption and investment are procyclical. In this case, although using government expenditure as the reference measure, these conclusions are perfectly consistent. These estimated coefficients represent the procyclicality of fiscal policy and extend the cyclicality analysis pursued in the previous section and therefore, will be used in the panel estimation.

2.4.4 Procyclicality and Financial Development: Their Effects on Growth

This section analyzes the relationship between fiscal policy cyclicality and growth in the context of credit constrained countries. As in the previous equation, the regression is estimated over a 5-year period interval. The specification is:

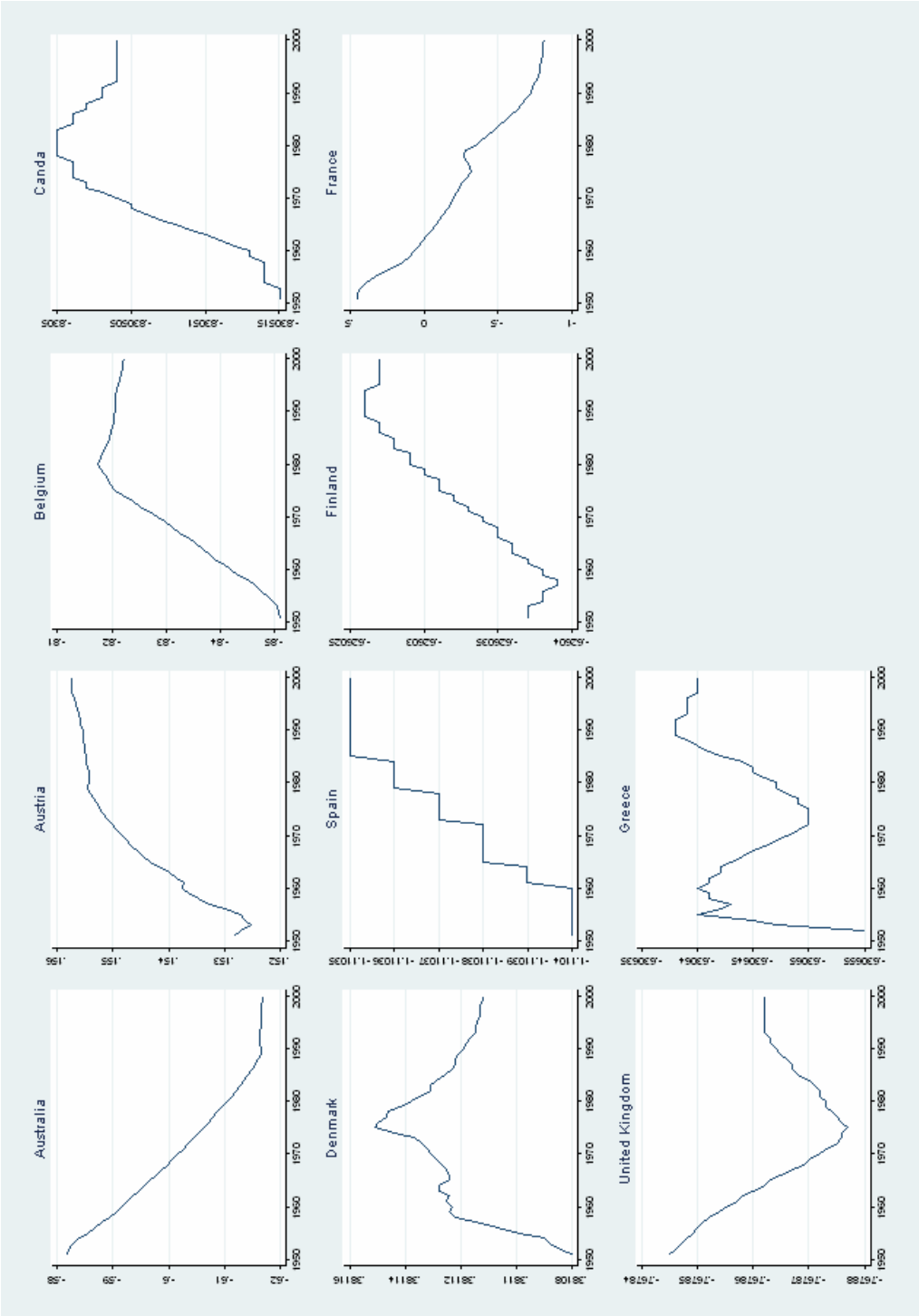

Figure 3: Procyclicality of government expenditure in OECD countries

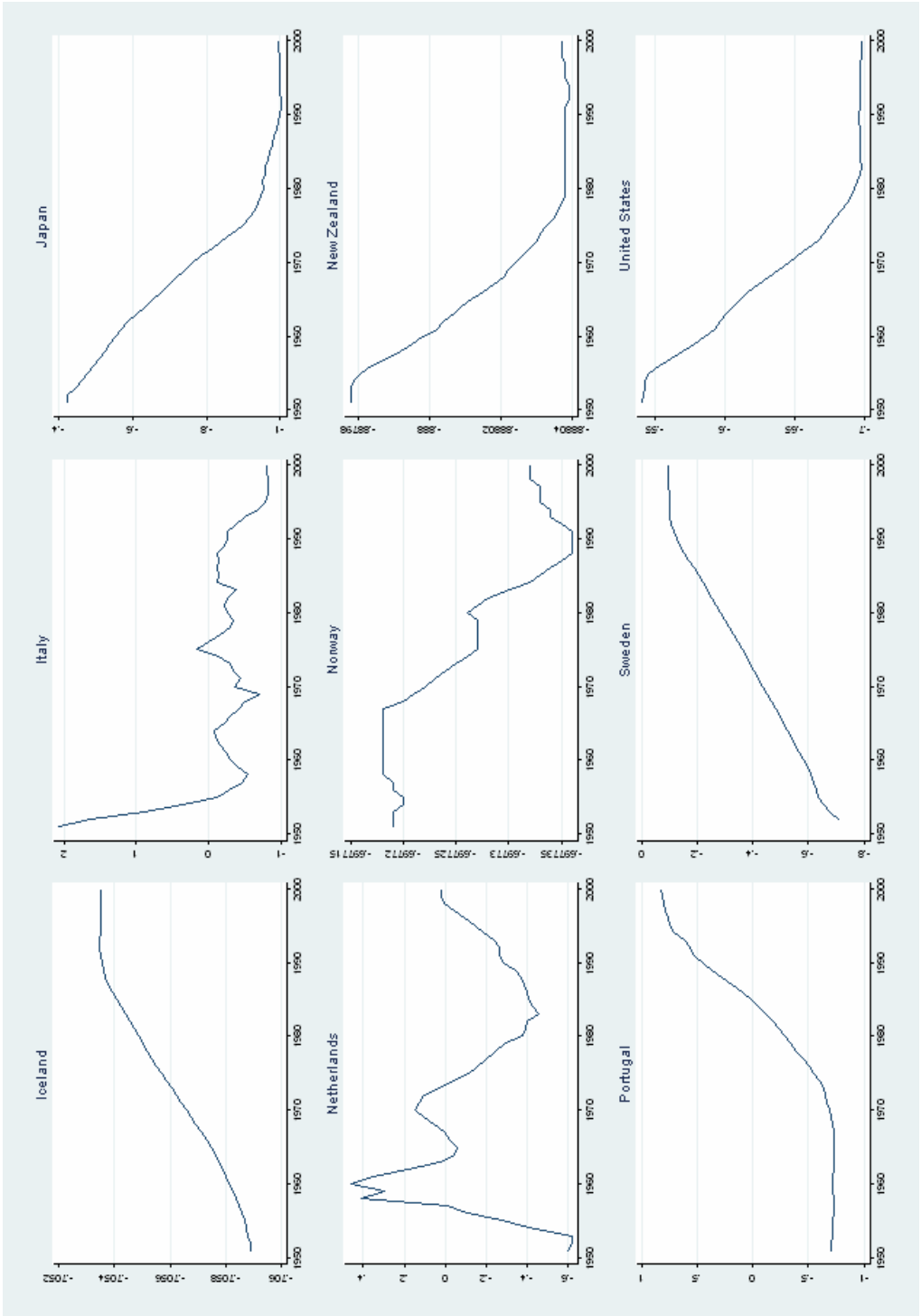

Figure 4: Procyclicality of government expenditure in OECD countries (cont.)

$$growth_{i,t} = \alpha_0 + \beta_0 procyclicality_{i,t-1} + \beta_1 priv.credit_{i,t-1} + \\ + \beta_2 procyclicality_{i,t-1} priv.credit_{i,t-1} + \delta X_{i,t} + \mu_i + \varepsilon_{i,t} \tag{2.19}$$

where *procyclicality* is a measure of procyclicality of fiscal policy that will be described below. To address the potential problem of reverse causality country fixed effects were used to capture the possible effect that countries with higher average growth rates can pursue more countercyclical fiscal policies. There might be concern about the potential endogeneity of fiscal policy and private credit in this type of estimation. Hence, to mitigate this issue, lagged values of both variables will be used to exploit the significant time variation. The coefficient of interest is the interaction term β_2, between procyclicality and private credit. That coefficient is expected to be positive since the less financially developed a country is, the more growth enhancing it is for the government to be countercyclical in its fiscal policy. A positive β_2 implies that the marginal impact of procyclicality on growth is increasing in private credit so "better" private credit lessens the adverse impact of procyclicality on growth.

In essence in this specification *procyclicality* is introduced plus an interaction term with *priv.credit*. The variable *procyclicality* is the coefficient α_1 estimated for section 2.4.3.2 for each year for each country.

Table 3 shows the results. For the different samples considered, there is evidence of a negative and significant effect of procyclicality in government expenditures on growth whereas a positive and significant interaction effect between the procyclical variable and private credit. Therefore, the more credit constrained a country is, the more growth enhancing it is for the government to be countercyclical in its fiscal policy. This is also consistent with the theoretical model discussed, although the coefficients associated with procyclicality and with the interaction term for Latin America and for OECD countries differ in magnitude. For the whole sample similar evidence than for each individual sample is found, but estimates are closer to the results for OECD countries.

Table 3: Procyclicality and Financial Development: Their Effects on Growth

	Latin America		OECD		Whole sample	
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
lag(procyclicality of gov.	-0.3945	-0.5956	-0.0697	-0.0915	-0.0857	-0.0908
expenditure)	(0.2320)#	(0.3283)*	(0.0375)*	(0.0406)**	(0.0516)#	(0.0560)*
lag(private credit)	-0.1431	1.7902	-1.8558	-1.8506	-1.7329	-1.2397
	(1.9697)	(2.2447)	(0.6913)**	(1.0233)*	(0.7119)**	(0.8296)
lag(procyclicality of gov.	1.4559	2.6493	0.1033	0.1316	0.1386	0.1160
expenditure*priv.credit)	(0.8877)*	(1.4696)*	(0.0626)#	(0.0749)*	(0.0840)#	(0.0689)#
relative GDP per capita	0.0193	-0.0302	-0.1007	-0.0709	-0.0476	-0.0496
	(0.0452)	(0.0688)	(0.0372)**	(0.0342)**	(0.0304)#	(0.0325)
investment/GDP	0.2230	0.1287	0.2495	0.1931	0.2461	0.1783
	(0.0574)	(0.0706)*	(0.0571)**	(0.0593)**	(0.0401)**	(0.0416)**
years of schooling pop.		-0.6146		-0.4452		-0.5755
over 15 years old		(0.3482)*		(0.2263)**		(0.2018)**
openness		0.0106		0.0174		0.0096
		(0.0139)		(0.0172)		(0.0110)
inflation		-0.0947		-0.0585		-0.0654
		(0.0489)**		(0.0345)**		(0.0287)**
population growth		0.6603		-0.2763		0.3613
		(0.7676)		(0.4589)		(0.4727)
government size		-0.0681		0.0035		-0.0439
		(0.0611)		(0.0440)		(0.0426)
property rights		0.3418		-0.0532		0.1519
		(0.1846)*		(0.1615)		(0.1310)
black market premium		0.0045		1.5962		0.0089
		(0.0223)		(17.816)		(0.0149)
N of observations	140	140	133	133	273	273
N of groups	20	20	19	19	39	39
R-squared	0.1115	0.2240	0.284	0.3812	0.1579	0.2396

Note: Dependent variable is the 5-year average growth of GDP per capita
over the period 1960-2000. Robust standard errors in parentheses
Constant term is not shown although it is included. We consider country fixed effects.
significant at 11%; *significant at 10%; ** significant at 5%;

2.4.5 Volatility and Procyclicality through Financial Development

Finally the relationship between fiscal policies and economic growth in the context of volatility is analized. The main interest is in getting evidence about the effect of fiscal policies on growth when facing volatility and credit constraints. For this purpose careful attention is paid to the results for Latin America since this sample faces incomplete credit markets. Still, the OECD countries and the whole sample were also estimated. As in previous cases, estimations were preformed over a 5-year period interval. Considering samples for Latin America and for OECD countries adds more insights into the credit market structure and reinforces the predictions of the model. The specification in this case is:

$$\begin{aligned} growth_{i,t} &= \alpha_0 + \beta_0 procyclicality_{i,t-1} + \beta_1 volatility_{i,t} + \\ &\quad + \beta_2 procyclicality_{i,t-1} volatility_{i,t-1} + \delta X_{i,t} + \mu_i + \varepsilon_{i,t} \end{aligned} \tag{2.20}$$

In this last step the interest is in the interaction term β_2, between procyclicality and volatility. This analysis is an afterthought of the main prediction of the model. To deal with the identification problem -as in the previous section- country fixed effects were used, as well as lagged averages of volatility and policy cyclicality to mitigate the potential endogeneity and omitted variable biases. That coefficient is expected to be negative since more countercyclical fiscal policy should make growth less sensitive to volatility. A negative β_2 implies that the marginal impact of procyclicality on growth is decreasing in volatility so low volatility lessens the adverse impact of procyclicality on growth.

Table 4 shows the results. For the case of Latin America there is evidence that supports our predictions from the theoretical model: the coefficient associated with the interaction term between volatility and procyclicality is negative. Thus more countercyclical fiscal policy should make growth less sensitive to volatility for incomplete credit markets. For OECD countries the evidence favors the idea that having less countercyclical fiscal policy should make growth less sensitive to volatility because the coefficient of the interaction term is positive. This argument relies on the fact that for developed financial markets the relationship between volatility and growth seems to be positive. When considering the whole sample

Table 4: Volatility and Procyclicality: Their Effects on Growth

	Latin America		OECD		Whole sample	
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
lag(procyclicality of gov.	-0.0418	0.2046	-0.0379	-0.0536	-0.0213	0.0347
expenditure)	(0.1977)	(0.2328)	(0.0567)	(0.0544)	(0.0342)	(0.0556)
volatility	-0.2786	-0.2723	0.0946	-0.1496	-0.1613	-0.2377
	(0.1191)**	(0.1328)**	(0.1116)	(0.1352)	(0.0827)**	(0.0984)**
lag(procyclicality of gov.	-0.0149	-0.0863	-0.0023	0.0260	-0.0129	-0.0385
expenditure*volatility)	(0.0316)	(0.5337)*	(0.0369)	(0.0159)#	(0.0177)	(0.0235)#
relative GDP per capita	0.0094	-0.0495	-0.1023	-0.0707	-0.0675	-0.0679
	(0.0402)	(0.0641)	(0.0257)**	(0.0388)*	(0.0219)**	(0.0339)**
investment/GDP	0.1237	0.1451	0.2120	0.1746	0.1705	0.1853
	(0.0504)**	(0.0666)**	(0.0469)**	(0.0597)**	(0.0377)**	(0.0387)**
years of schooling pop.		-0.6466		-0.6175		-0.6995
over 15 years old		(0.3148)*		(0.2302)**		(0.1876)**
openness		0.0132		0.0024		0.0074
		(0.0149)		(0.0159)		(0.0107)
inflation		-0.1017		-0.0545		-0.0523
		(0.0434)**		(0.0358)		(0.0287)*
population growth		0.4799		-0.1527		0.2986
		(0.7301)		(0.4418)		(0.4395)
government size		-0.0776		0.0251		-0.0366
		(0.0563)		(0.0427)		(0.0399)
property rights		0.2275		-0.0985		0.0811
		(0.1759)		(0.1737)		(0.1247)
black market premium		0.0314		-2.6408		0.0085
		(0.0171)*		(18.995)		(0.0143)
N of observations	179	140	171	133	350	273
N of groups	20	20	19	19	39	39
R-squared	0.0982	0.2596	0.2279	0.3630	0.1028	0.2658

Note: Dependent variable is the 5-year average growth of GDP per capita
over the period 1960-2000. Robust standard errors in parentheses
Constant term is not shown although it is included. We consider country fixed effects.
significant at 11%; *significant at 10%; ** significant at 5%;

again there is evidence of a negative coefficient as in the case for Latin America. Also for the whole sample the negative coefficient of volatility supports a more incomplete credit markets' interpretation.

Furthermore, to analyze the relationship between volatility, procyclicality and credit constraints a new specification will be considered for the two samples of countries over a 5-year period interval.

$$\begin{aligned} growth_{i,t} &= \alpha_0 + \beta_0 procyclicality_{i,t-1} + \beta_1 volatility_{i,t} + \\ &+\beta_2(procyclicality_{i,t-1} volatility_{i,t-1}) + \beta_3 priv.credit_{i,t} + \\ &+\beta_4(priv.credit_{i,t} volatility_{i,t}) + \delta X_{i,t} + \mu_i + \varepsilon_{i,t} \end{aligned} \tag{2.21}$$

Equation (2.21) is a combination of the previous analyses so the main interest is in the direct effect of volatility on growth through β_1, the interaction term β_2 between procyclicality and volatility and the interaction term β_4 between private credit and volatility. The interpretation of these coefficients separately in terms of their marginal impact was already discussed in the previous sections. In this specification the idea is to capture the joint effect on economic growth. Again in this estimation country fixed effects and lagged averages of volatility and policy cyclicality were used to mitigate endogeneity and omitted variable biases.

Table 5 shows the results. For the Latin America sample there is evidence of a strong direct effect of volatility on economic growth of -0.28 (Column (2)), a similar magnitude than for specification (2.16), although the interaction term between private credit and volatility is no longer significant. The reason for this result might be related with the fact that β_2 is capturing some of the impact of volatility that used to be associated with the interaction term between private credit and volatility in equation (2.16). Moreover, the interaction term between procyclicality and volatility is significant and negative as the theoretical model is predicting and is in line with the results from specification (2.19). Thus, again evidence suggests that a more countercyclical fiscal policy makes growth less sensitive to volatility in incomplete credit markets. For OECD countries the same evidence than in specification

Table 5: Volatility and Procyclicality through Financial Development: Their Effects on Growth

	Latin America		OECD		Whole sample	
Dependent variable:	(1)	(2)	(3)	(4)	(5)	(6)
lag(procyclicality of gov.	-0.0107	0.1139	-0.0503	-0.0334	-0.0088	0.0292
expenditure)	(0.2304)	(0.2482)	(0.0527)	(0.0561)	(0.0512)	(0.0543)
volatility	-0.3128	-0.2889	0.4913	0.1240	-0.1820	-0.2599
	(0.1352)**	(0.1347)**	(0.2151)**	(0.2065)	(0.1453)	(0.1364)**
lag(procyclicality of gov.	-0.0376	-0.0640	-0.0242	0.0096	-0.0012	-0.0323
expenditure*volatility)	(0.0544)	(0.0391)#	(0.0320)	(0.0353)	(0.0306)	(0.0201)#
private credit	-3.9372	-3.6443	-1.5821	-2.3856	-3.3117	-2.8234
	(2.1809)*	(2.4691)	(0.6067)**	(0.8486)**	(0.7207)**	(0.8606)**
private credit*volatility	0.2761	0.3278	-0.9099	-0.4817	-0.1410	-0.0094
	(0.3842)	(0.3546)	(0.2958)**	(0.2922)*	(0.2583)	(0.2390)
relative GDP per capita	0.0054	-0.02291	-0.1102	-0.0816	-0.0552	-0.0563
	(0.0454)	(0.0680)	(0.0294)**	(0.0342)*	(0.0268)**	(0.0306)**
investment/GDP	0.2356	0.1486	0.2115	0.2108	0.2109	0.1876
	(0.0536)**	(0.0673)**	(0.0486)**	(0.0578)**	(0.0369)**	(0.0386)**
years of schooling pop.		-0.5689		-0.2625		-0.4659
over 15 years old		(0.3513)*		(0.1853)		(0.1901)**
openness		0.0142		0.0262		0.0151
		(0.0142)		(0.0175)		(0.0109)
inflation		-0.1000		-0.0591		-0.0656
		(0.0452)**		(0.0345)*		(0.0287)**
population growth		0.4109		0.1982		0.4035
		(0.7357)		(0.4273)		(0.4382)
government size		-0.0919		-0.0074		-0.0613
		(0.0586)		(0.0396)		(0.0408)
property rights		0.2997		-0.1415		0.0711
		(0.1773)*		(0.1709)		(0.1262)
black market premium		0.0311		-2.6542		0.0167
		(0.0179)*		(16.5624)		(0.0146)
N of observations	140	140	152	133	312	273
N of groups	20	20	19	19	39	39
R-squared	0.1799	0.2777	0.4278	0.4497	0.1967	0.2986

Note: Dependent variable is the 5-year average growth of GDP per capita
over the period 1960-2000. Robust standard errors in parentheses
Constant term is not shown although it is included. We consider country fixed effects.
significant at 11%; *significant at 10%; ** significant at 5%;

(2.16) regarding volatility and its interaction term with private credit was found. Furthermore, although the interaction term associated with volatility and procyclicality is positive as the theoretical model predicts, it is no longer significant. When considering the whole sample results show a strong direct effect of volatility on growth of -0.25 (Column (6)) in Table 5 which compares with the -0.23 (Column (6)) in Table 4 -that is using specification (2.20)- giving evidence of the structural nature of volatility. The other relevant result is that the interaction term between procyclicality and volatility is significant and negative, -0.0323 in Column (6) in Table 5 and also compares with the -0.0385 in Column (6) in Table 4 through specification (2.20). Again with these results, the whole sample supports a more incomplete market's interpretation.

2.4.6 Robustness

This section checks the robustness of the results from the previous sections, mainly through the analysis of equations (2.16), (2.19) and (2.20). The whole sample will be used defining an indicator variable that is 1 if the country is from Latin America and 0 if it is from the OECD. This dummy variable will be interacted with financial development, volatility and procyclicality.

In the first case the following equation that follows from (2.16) is estimated:

$$\begin{aligned} growth_{i,t} &= \alpha_0 + \beta_0 priv.credit_{i,t} + \beta_1 volatility_{i,t} + \beta_2 priv.credit_{i,t} volatility_{i,t} + \\ &+ \beta_3 D(priv.credit_{i,t}) + \beta_4 D(volatility_{i,t}) + \beta_5 D(priv.credit_{i,t} volatility_{i,t}) + \\ &+ \delta X_{i,t} + \mu_i + \varepsilon_{i,t} \end{aligned} \tag{2.22}$$

where $D = 1$ if the country is from Latin America and 0 otherwise. Results are presented in Table 6 where it is notable the differentiable effect of Latin America.

The implications can be ordered as following: (i) there is a positive significant effect of volatility on growth for OECD countries, given by coefficient β_1 in Column (8) while there is a differential effect for Latin America given by the fact that both β_1 and β_4 are significant implying a strong negative effect of volatility on growth of -0.29 for Latin American countries. This is consistent with the results from the previous sections and with the theoretical model.

Table 6: Robustness. Volatility and Credit Constraints: Their Effects on Growth

	Whole sample with dummy	
Dependent variable:	(7)	(8)
private credit	-1.8553	-2.2452
	(0.6771)**	(0.8026)**
volatility	0.4268	0.0839
	(0.2123)**	(0.0509)*
private credit*volatility	-0.81528	-0.3999
	(0.3009)**	(0.241)*
D(private credit)	-2.1088	-0.7295
	(2.9896)	(2.9837)
D(volatility)	-0.7327	-0.3749
	(0.2975)**	(0.2281)*
D(private credit*volatility)	0.8060	0.3983
	(0.5006)#	(0.2410)#
relative GDP per capita	-0.0625	-0.0612
	(0.0256)**	(0.0315)**
investment/GDP	0.1944	0.1802
	(0.0369)**	(0.0387)**
years of schooling pop.		-0.4276
over 15 years old		(0.1895)**
openness		0.0153
		(0.0112)
inflation		-0.0618
		(0.0281)**
population growth		0.4463
		(0.4343)
government size		-0.0597
		(0.0389)
property rights		0.0757
		(0.1306)
black market premium		0.0119
		(0.0133)
N of observations	312	273
N of groups	39	39
R-squared	0.2134	0.2989
F-statistics and p-values testing exclusion of group of variables:		
private credit coefficents = 0	1.85	1.02
	[0.1748]	[0.3140]
volatility coefficents = 0	2.65	2.71
	[0.1044]	[0.1012]
private credit*volatility	2.50	2.53
coefficents = 0	[0.1111]	[0.1127]

Note: Dep. variable is 5-year average growth of GDP per capita over the period 1960-2000. Robust S.E. in parentheses.
Constant term is not shown although it is included.
We consider country fixed effects.
D=1 if Latin America, 0 otherwise
# significant at 11%, *significant at 10%; ** significant at 5%

Table 7: Robustness. Procyclicality and Financial Development: Their Effects on Growth

	Whole sample with dummy	
Dependent variable:	(7)	(8)
lag(procyclicality of gov.	-0.0766	-0.0851
expenditure)	(0.4793)#	(0.0456)*
lag(private credit)	-1.8385	-1.5778
	(0.7719)**	(0.8452)*
lag(procyclicality of gov.	0.1227	0.1027
expenditure*priv.credit)	(0.0764)#	(0.0641)#
D(lag(procyclicality of gov.	-0.2944	-0.4940
expenditure))	(0.1793)*	(0.3071)*
D(lag(private credit))	1.6154	3.7661
	(1.000)#	(1.9333)**
D(lag(procyclicality of gov.	1.3500	2.4931
expenditure*priv.credit))	(0.8219)*	(1.3714)*
relative GDP per capita	-0.0478	-0.0502
	(0.0302)#	(0.0321)#
investment/GDP	0.2450	0.1643
	(0.0413)**	(0.0429)**
years of schooling pop.		-0.5946
over 15 years old		(0.2029)**
openness		0.0116
		(0.0112)
inflation		-0.0654
		(0.0288)**
population growth		0.3950
		(0.4712)
government size		-0.0457
		(0.0427)
property rights		0.1358
		(0.1305)
black market premium		-0.0728
		(0.0185)
N of observations	273	273
N of groups	39	39
R-squared	0.1616	0.2519
F-statistics and p-values testing exclusion of group of variables:		
procyclicality of gov.	2.63	3.68
expenditure coefficents = 0	[0.1064]	[0.0565]
private credit coefficents = 0	1.76	1.36
	[0.1994]	[0.2446]
(procyclicality of gov. expen*	2.51	3.61
private credit) coefficents = 0	[0.1141]	[0.0588]

Note: Dep. variable is 5-year average growth of GDP per capita
over the period 1960-2000. Robust S.E. in parentheses.
Constant term is not shown although it is included.
We consider country fixed effects.
D=1 if Latin America, 0 otherwise
# significant at 11%, *significant at 10%; ** significant at 5%

(ii) The coefficient β_2 of the interaction term has a negative sign which characterizes the developed markets where credit is available so countries can benefit from volatility. For Latin America, although that β_5 is positive and significant (0.3983) which implies that more credit to the private sector should make growth less sensitive to volatility the total effect $(\beta_2 + \beta_5)$ seems to be small. (iii) From the exclusion tests of Column (8) the hypotheses that $(\beta_1 + \beta_4) = 0$ and that $(\beta_2 + \beta_5) = 0$ were rejected. To answer the question if volatility and the interaction between volatility and private credit have a differential effect for Latin American countries than for OECD countries, the exclusion tests conclude that there is evidence that favors the idea that the effect is sensitive to the choice of country groups.

As a second robustness check from (2.19) the following equation is estimated:

$$\begin{aligned} growth_{i,t} &= \alpha_0 + \beta_0 procyclicality_{i,t-1} + \beta_1 priv.credit_{i,t-1} + \\ &+\beta_2 procyclicality_{i,t-1} priv.credit_{i,t-1} + \beta_3 D(procyclicality_{i,t-1}) \\ &+\beta_4 D(priv.credit_{i,t-1}) + \beta_5 D(procyclicality_{i,t-1} priv.credit_{i,t-1}) \\ &+\delta X_{i,t} + \mu_i + \varepsilon_{i,t} \end{aligned} \tag{2.23}$$

where $D = 1$ if the country is from Latin America and 0 otherwise. As expected from previous regression, there might be concerns about the endogeneity of fiscal policy and private credit. Hence, lagged values of those variables will be used to address this issue. Although not a perfect solution it will considerably mitigate the endogeneity bias. Results are presented in Table 7 and the focus will be on the estimates from Column (8).

The estimation can be interpreted as following: (i) there is a negative and significant effect of procyclicality in government expenditures on growth for Latin America and for OECD countries. For OECD countries, because β_0 is negative and significant and for Latin America because β_3 is also negative and significant implying a negative total effect. (ii) The interaction term between the procyclical variable and private credit is positive and significant, both β_2 and β_5. Thus, this effect goes in the same direction for Latin American countries and for OECD countries. The general implication is therefore that more credit constrained a country is, the more growth enhancing it is for the government to be countercyclical in its fiscal policy. This is consistent with the results from the previous sections and with the theoretical model. (iii) From the exclusion test of Column (8) the hypothesis that

$(\beta_0+\beta_3) = 0$, which means that procyclicality in government expenditures has no differential effect on countries for Latin America was rejected. In this case the difference is in magnitude. The other hypothesis that $(\beta_2 + \beta_5) = 0$ which implies an effect of the interaction term for countries from the Latin America group was also rejected, giving evidence of a direct effect for Latin American countries.

Finally, the equation that follows from (2.20) to analyze the relationship between volatility and procyclicality is estimated:

$$\begin{aligned} growth_{i,t} &= \alpha_0 + \beta_0 procyclicality_{i,t-1} + \beta_1 volatility_{i,t} + \\ &+\beta_2 procyclicality_{i,t-1} volatility_{i,t-1} + \beta_3 D(procyclicality_{i,t-1}) + \\ &+\beta_4 D(volatility_{i,t}) + \beta_5 D(procyclicality_{i,t-1} volatility_{i,t-1}) + \\ &+\delta X_{i,t} + \mu_i + \varepsilon_{i,t} \end{aligned} \tag{2.24}$$

where $D = 1$ if the country is from Latin America and 0 otherwise. Again in this case, and due to the potential endogeneity of fiscal policy and financial development, lagged values of procyclicality and private credit will be used to mitigate this problem. The focus will be on the results reported in Column (8) from Table 8.

As in Table 4 the main conclusion from this estimation is related with β_2 and β_5 . There is evidence of a positive and significant β_2 which implies that for OECD countries the evidence favors the idea that having less countercyclical fiscal policy should make growth less sensitive to volatility. For Latin American countries, given that β_2 and β_5 are significant, it implies a negative interaction term. This implies that the marginal impact of procyclicality on growth is decreasing in volatility so low volatility lessens the adverse impact of procyclicality on growth. These results are consistent with the results from the previous sections and with the theoretical model. Furthermore, although at a 11% of significance, the exclusion test on $(\beta_1+ \beta_5) = 0$, gives evidence of a differential effect that is sensitive to the choice of country groups.

Table 8: Robustness. Volatility and Procyclicality : Their Effects on Growth

	Whole sample with dummy	
Dependent variable:	(7)	(8)
lag(procyclicality of gov.	-0.0393	-0.0559
expenditure)	(0.2901)	(0.0538)
volatility	0.1196	-0.1013
	(0.0717)*	(0.0617)*
lag(procyclicality of gov.	-0.0192	0.0164
expenditure*volatility)	(0.0012)#	(0.0103)#
D(lag(procyclicality of gov.	0.0163	0.2097
expenditure))	(0.0107)	(0.2139)
D(volatility)	-0.4006	-0.1895
	(0.1612)**	(0.1159)*
D(lag(procyclicality of gov.	-0.0113	-0.0922
expenditure*volatility))	(0.0071)#	(0.5882)#
relative GDP per capita	-0.0646	-0.0651
	(0.0210)**	(0.0328)**
investment/GDP	0.1609	0.1820
	(0.0372)**	(0.0382)**
years of schooling pop.		-0.6997
over 15 years old		(0.1892)**
openness		0.0075
		(0.0109)
inflation		-0.0557
		(0.0300)*
population growth		0.2506
		(0.4414)
government size		-0.0400
		(0.0391)
property rights		0.0809
		(0.1249)
black market premium		0.0107
		(0.0156)
N of observations	350	273
N of groups	39	39
R-squared	0.1210	0.2741
F-statistics and p-values testing exclusion of group of variables:		
procyclicality of gov.	2.08	1.65
expenditure coefficents = 0	[0.1503]	[0.2003]
volatility coefficents = 0	5.52	4.95
	[0.0194]	[0.0271]
(procyclicality of gov. expen*	2.56	2.55
volatility) coefficents = 0	[0.1109]	[0.1112]

Note: Dep. variable is 5-year average growth of GDP per capita over the period 1960-2000. Robust S.E. in parentheses.
Constant term is not shown although it is included.
We consider country fixed effects.
D=1 if Latin America, 0 otherwise
# significant at 11%, *significant at 10%; ** significant at 5%

2.5 CONCLUSIONS

This paper analyzes how fiscal policies and credit constraints can affect the impact of macroeconomic volatility on long run growth. In the first part, the paper generalizes Aghion et al. (2005) by accounting for government fiscal policy in a more general framework and preserving the distinction between short-run and long-run investment and the presence of credit constraints. The main implication from the model is that in an economy facing credit constraints, an increase in volatility will result in lower mean growth, and all the more the less financially developed a country is and the more procyclical the fiscal policy is. Considering the cyclical effects of the tax introduced in the model, countercyclical fiscal policies should be more growth-enhancing in countries with lower degrees of financial development to reduce the negative consequences of a bad aggregate shock on firms' long-run investments. For the empirical part of the paper, and making use of the panel structure of the data, a measure of cyclicality of government expenditure considering a coefficient variation method is created. Through this analysis the main policy implications of the paper are built. By taking the model to the data and analyzing a panel of Latin American and OECD countries the main theoretical predictions from the model were confirmed.

The model and the empirical analysis presented suggest that more countercyclical fiscal policy makes growth less sensitive to volatility for incomplete credit markets. Furthermore, less procyclical - or more countercyclical- fiscal policies in less financially developed countries can have a positive effect on growth. These conclusions are empirically confirmed for countries from the Latin America sample. This outcome is also compared with the case of more developed financial markets like the OECD countries finding evidence in the opposite direction. Therefore, the empirical evidence confirms that the model supports a developing country approach.

Through the measure of government expenditure as fiscal policy, procyclicality is stable or increasing over time in Latin America while to a much smaller degree in OECD countries. These results are in line with Aghion and Marinescu (2007) that less financially developed countries display less countercyclical- or more procyclical- fiscal policies.

It should be noted that conclusions drawn from this paper are positive rather than norma-

tive. There is no ideal situation or viewpoint stated but rather a relationship assuming that countercyclical fiscal policy can mitigate volatility for countries with low levels of financial development.

There is however an unanswered question regarding the reason why countries follow sub-optimal procyclical fiscal policies that may be contributing to macroeconomic instability. There are at least two arguments for this question. On the one hand, procyclicality may arise due to credit market imperfections. In bad times developing countries cannot borrow or can do so only at very high interest rates and therefore they cannot run deficits and have to cut spending. In booms they can borrow more easily and choose to do so, increasing public spending. On the other hand, political economic factors may play a role. Hence, procyclicality may arise when more resources are available (i.e. in booms), the common pool problem is more severe, and the fight over common resources intensifies, leading to a procyclical bias in fiscal policy. This discussion is certainly an interesting question that exceeds the scope of this paper and opens an avenue for future research. Moreover, another possible avenue is the analysis theoretically and empirically of an open economy with domestic and international financial integration in the context of a growth model.

3.0 THE GROWTH EFFECTS OF INTERNATIONAL FINANCIAL INTEGRATION AND EXCHANGE RATES: THEORY AND EMPIRICS

3.1 INTRODUCTION

Does the choice of exchange rate regime matter? The choice of exchange rate regime stands as one of the most contentious aspects of macroeconomic policy. The recent policy discussion on which exchange rate regime should a country choose has tended to consider this policy decision largely independent from country-specific characteristics and the external environment. To some extent, this may be a result of witnessing extreme cases: China's inflexible exchange rate system in one hand and South Africa's highly volatile currency on the other hand. Moreover, after the collapse of Bretton Woods, popularity of pegs grew significantly in the 80s and early 90s until the eruption of currency crises in the mid nineties starting with the Mexican devaluation. Still, although it may seem a key question of policy which exchange rate regime to choose, in particular for long run growth, the existing theoretical and empirical literature offers little guidance. The "one-size-fits-all" view of exchange rate regimes that underlies such fashion, seem at odds with both the causal evidence and the conventional wisdom that indicate that the regime choice is itself endogenous to the local and global economic contexts. The classical theoretical literature, like Garber and Svensson (1995) and Obstfeld and Rogoff (1996), that analyzes the determinants of the regime choice is mainly focused in developed countries with developed institutions and markets. Moreover, there is little connection between the exchange rate regime and long run growth implications. In particular, are floating exchange rates associated with faster output growth? The empirical literature, in general, is largely negative, suggesting that the degree of exchange rate flexibility simply does not matter for growth. Baxter and Stockman (1989) were among the

first to analyze this issue but also recently Gosh, Gulde and Wolf (2003) in an extensive survey conclude that the exchange rate arrangement does not matter for growth at all, or for anything except the real exchange rate. Furthermore, Levy-Yeyati, Sturzenegger and Reggio (2004), Razin and Rubinstein (2004), Husain, Mody and Rogoff (2005) and Aghion, Bacchetta, Ranciere and Rogoff (2006) analyze at different levels and focusing in different aspects to what extent the exchange rate regime matters. In particular Aghion, Bacchetta, Ranciere and Rogoff (2006) analyze how a country's level of (domestic) financial development is central in choosing how flexible an exchange rate system to adopt. However, the focus so far has been on the development level of domestic credit markets but other factors such as the level of international financial integration (IFI) has not yet been analyzed as a key element of the exchange rate regime for long run productivity growth and economic stability.

There is a widespread belief among policymakers that IFI, that is, the degree to which an economy does not restrict cross-border transactions, generates positive effects for host countries. Some of the positive externalities include better global allocation of capital and improved international risk-sharing possibilities. Still, empirical findings and existing theory provide conflicting predictions about the effects IFI on economic growth. From a theoretical standpoint, on one hand, Obstfeld (1994), Acemoglu and Zilibotti (1997) and Kalemi-Ozcan, Sorensen and Yosha (2001) have pointed out that IFI facilitate risk-sharing and thereby enhance production specialization, capital allocation, and economic growth. Moreover, IFI mainly influences growth through indirect channels: "potential collateral benefits". Thus, under certain circumstances, IFI may promote the development of financial systems through the intensification of competition and the importation of financial services as analyzed by Klein and Olivei (2000) and Levine (2001), and encourage better government and corporate governance, with positive growth effects. On the other hand, Lucas (1990), Rodrick (1998), Bhagwati (1998) and Stiglitz (2002) view increasing capital account liberalization as a serious impediment to global financial stability and eventually to economic growth. The empirical evidence is also not conclusive and findings are divided. Eichengreen (2002) surveyed the literature on capital account liberalization and concluded that there is no empirical substantiation of the conventional theoretical tenets about the growth benefits of capital account

liberalization. Still, Kose, Prasad, Rogoff and Wei (2006) in an extensive survey argue that a key and nontrivial issue in the empirical studies is related to the measurement of financial integration[1].

This paper will join these two broad areas of international finance and growth and will argue that a country's level of IFI ought to be central in choosing how flexible an exchange rate system to adopt, particularly, if the objective is long run growth. In particular, the main implication would eventually be that the more financially integrated to the international capital flows a country is, the better it will do with a more flexible exchange rate.

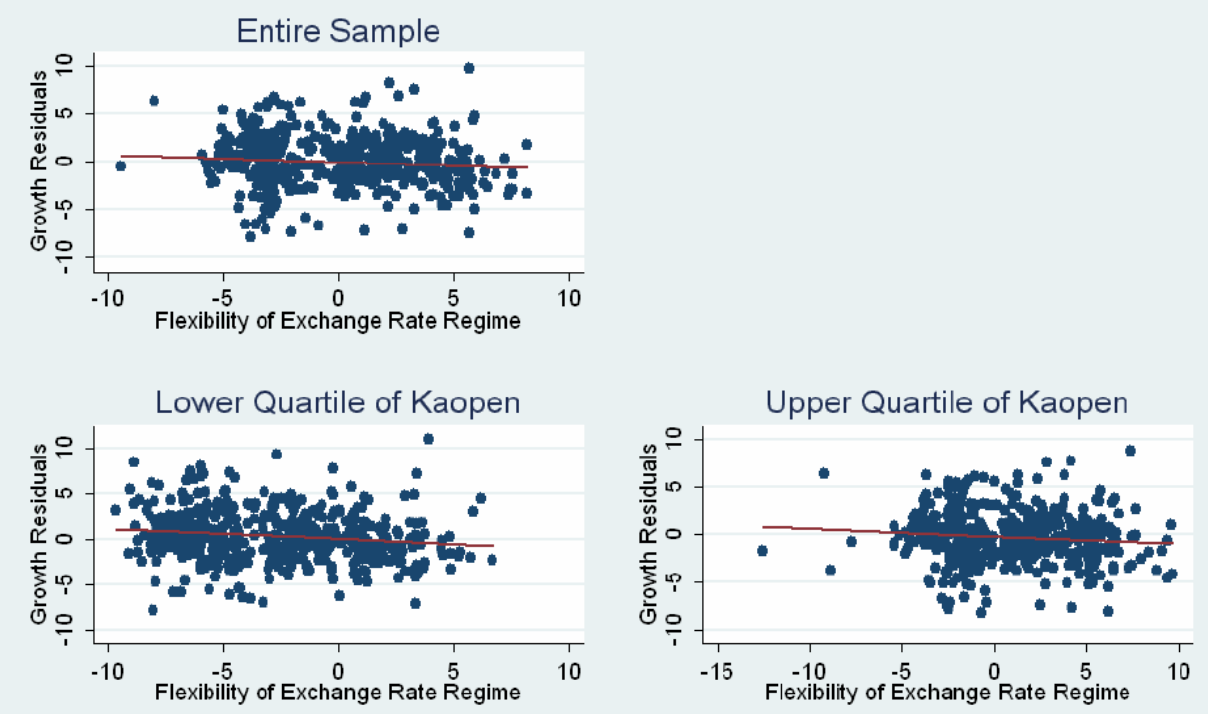

Figure 5: Real Exchange Rate Flexibility and Productivity Growth by Degree of International Financial Integration

Figure 5 shows the relationship between productivity growth and exchange rate flexibility for countries at different levels of IFI[2]. In particular, the idea is to compare the residuals of a productivity growth regression on a set of variables with the residuals of an exchange rate

[1] In Kose, Prasad, Rogoff and Wei (2006) there is a detailed literature review of the growth effects of financial globalization.

[2] Exchange rate flexibility is the exchange rate classification proposed by Reinhart and Rogoff (2004). More about this variable in the data description section.

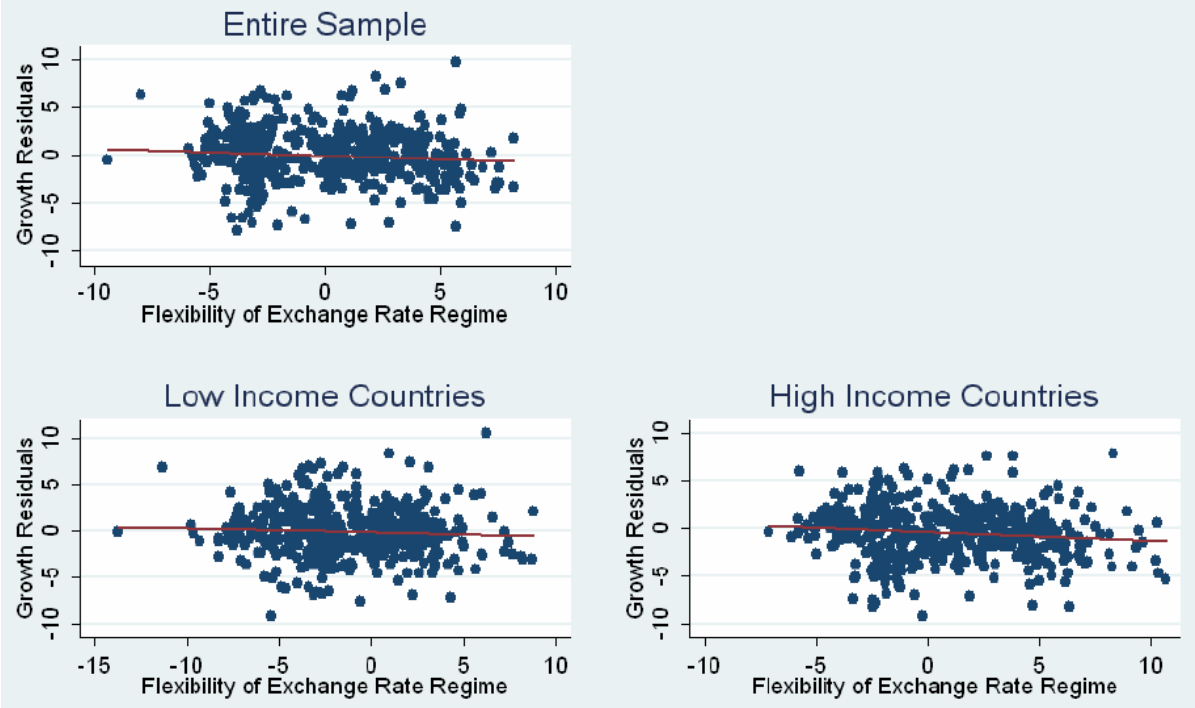

Figure 6: Real Exchange Rate Flexibility and Productivity Growth by the World Bank Categories

flexibility regression on the same variables[3]. This adjusted measure of flexibility is purged from any colinearity with the standard growth determinants. Dividing the country sample by the level of IFI, Figure 1 shows the regression of growth residuals on the adjusted measure of flexibility of the exchange rate regime for the whole sample, the lower quartile and the upper quartile of the distribution. Although not strong, there is a negative relationship between productivity growth and exchange rate flexibility for the whole sample and for the different quartiles of IFI distribution. Figure 6 shows the same exercise but now dividing the sample by the World Bank categories of income[4]. The same pattern as in Figure 1 is observed. Although this is preliminary and not evidence enough, this might be giving some indication that the growth effects of the flexibility of the exchange rate regime vary with the level of IFI. The main purpose of this paper is to rationalize and then explore the robustness of this claim.

This paper involves two stages. In the first stage, Section 3.2 develops a stylized open monetary economy model with wage stickiness, where exchange rate fluctuations affect the growth performance of credit constrained firms generalizing Aghion, Bacchetta, Ranciere and Rogoff (2006) by allowing for international financial markets. In other words, firms will be able to borrow not only from the domestic credit market but also from foreign lenders. Still, the existence of credit constraints will hinder the provision of credit both in the domestic and the international markets. The basic mechanism underlying the positive growth interaction between IFI and exchange rate flexibility is a balance sheet effect that can be explained as follows. Suppose that the nominal wage is preset and cannot be adjusted by firms to variations in the nominal exchange rate. In addition, suppose that the borrowing capacity of firms is proportional to their current earnings. Hence, following an exchange rate depreciation (less units of domestic currency needed to buy the same amount of foreign currency), firms' current earnings are reduced, and so is their ability to borrow in order to survive idiosyncratic liquidity shocks and thereby innovate in the longer term. Their ability to borrow is conditioned by the degree of financial development and IFI of the domestic

[3]A pooled regression using five-year average data for 85 countries over 1960-200 period is performed. Initial productivity, secondary schooling, financial development, government expenditure, trade openness, terms of trade growth and an indicator of currency crises were used as control variables. A detailed description will be given in Section 3.

[4]In particular, 1=low income, 2=lower middle, 3=upper middle and 4=high.

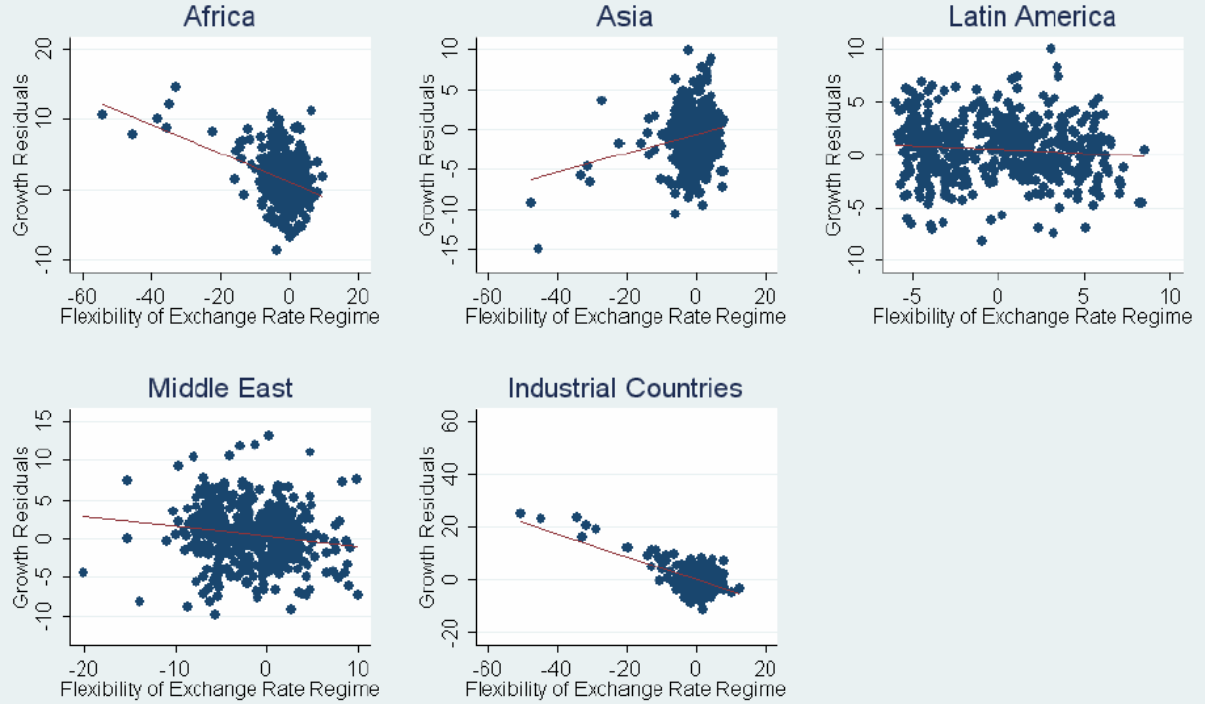

Figure 7: Real Exchange Rate Flexibility and Productivity Growth by Region of the World

economy. The main mechanism, in spirit, is similar to Aghion, Bacchetta, Ranciere and Rogoff (2006), but with the key addition that international credit markets can reinforce the impact on growth.

In the second stage a reduced form of the model is confronted with the data by testing the main theoretical prediction by conducting a systematic panel data analysis with a data set for 85 countries over the years 1960-2000. When a country's level of IFI is interacted with the degree of exchange rate flexibility the results prove both robust and significant. The main empirical analysis is pursued using the classification of Reinhart and Rogoff (2004) for the degree of flexibility of exchange rate, but this main result holds to other de facto classification as the one by Levi-Yeyati and Sturzenegger (2003). The findings support the hypothesis that a high degree of exchange rate flexibility leads to lower growth in countries with a lower degree of integration with the international financial markets. The main results, generalize Aghion, Bacchetta, Ranciere and Rogoff (2006) where they only focus on the domestic market while in this paper a more broad international financial market is also considered. Finally, to address the potential endogeneity problem associated with exchange rate regimes a dynamic panel data GMM methodology is used as well as a treatment effect decomposition of the influence of IFI on growth through the exchange rate regime.

The rest of the paper is organized as follows. In Section 3.2, the model and the main theoretical prediction are presented. Section 3.3, develops the empirical strategy and the data used. In Section 3.4, the main findings and a robustness analysis are discussed. The last section concludes.

3.2 THE MODEL

This section presents a simple model to analyze the effect of exchange rate flexibility on productivity growth. In particular, a generalization of Aghion, Bacchetta, Ranciere and Rogoff (2006) allowing for international financial credit markets will be discussed. Hence, the model is a small open economy populated by successive overlapping generations of two period lived entrepreneurs and workers. Nominal wages are rigid and the central bank

fixes the nominal exchange rate[5]. Therefore, as in Aghion, Bacchetta, Ranciere and Rogoff (2006), macroeconomic volatility is driven by nominal exchange rate movements in presence of wage stickiness. Finally, and most important, productivity grows as a result of innovation. This innovation is the result of entrepreneurs with funds enough to meet short run liquidity shocks at the end of their first period[6]. It should be noted, nevertheless, that this may be a simplification since innovation might not be always a feasible option. For instance, other things equal, countries with low initial levels of domestic financial development and IFI may only be capable of imitate from developed countries rather than innovate by themselves. This clarification does not change the model and gives insights and intuition about the mechanism and the upcoming empirical testing.

The intuition behind the main mechanism can be explained through a balance sheet effect. First, the nominal wage is preset and cannot be adjusted by firms to variations in the nominal exchange rate. Second, the borrowing capacity of firms is proportional to their current earnings -what that naturally involves wages. Hence, after a change in the exchange rate, firm's current earnings can be reduced, and so is their ability to borrow in order to survive idiosyncratic liquidity shocks and thereby innovate in the longer term. Their ability to borrow is conditioned by a domestic multiplier that reflects the degree of financial development of the economy and an international multiplier reflecting the degree of IFI of the domestic economy with the international credit market.

In the following analysis, the discussion will be centered on the impact of regimes on productivity growth but not on the analysis of the factors that lead a country to choose one or other regime.

3.2.1 The Environment

There is one good identical to the world good. The economy is populated by half workers and half entrepreneurs. Individuals are risk neutral and consume their accumulated income at the end of their life. Finally growth is determined by the proportion of entrepreneurs who

[5] Actually, the central bank can also follow an interest rate rule.

[6] To some extent this feature is similar to Aghion, Angeletos, Banerjee and Manova (2005) and Rodriguez (2007).

innovate.

Since firms in the small open economy are price-takers, they take the foreign price of the good at any date t, P_t^* , as given. Assuming purchasing power parity (PPP), converted back in units of the domestic currency, the value of one unit of sold output at date t, is equal to:

$$P_t = S_t P_t^* \tag{3.1}$$

where P_t is the domestic price level and S_t is the nominal exchange rate. It will be assumed that P_t^* is constant and normalize to 1, thus $P_t = S_t$.

In a fixed exchange rate regime, S_t, is constant, whereas under a flexible exchange rate regime S_t is random and fluctuates around its mean value $E(S_t) \equiv \overline{S}$. The reason why fluctuations in the nominal exchange rate S_t will lead to fluctuations in firms' real wealth, with consequences for innovation and growth, is that nominal wages are rigid for one period and preset before the realization of S_t. Firms' short-run profits are eventually exposed to an exchange rate risk as the value of sales will vary according to S_t.

As in Aghion, Bacchetta, Ranciere and Rogoff (2006) the wage rate at date t equals the real wage at the beginning of that period to some reservation value, ωA_t, where $\omega < 1$ refers to the workers' productivity-adjusted reservation utility and A_t is current aggregate productivity. Hence the real wage is

$$\frac{W_t}{E(P_t)} = \omega A_t$$

where W_t is the nominal wage rate preset at the beginning of period t and $E(P_t)$ is the expected price level. Using the fact that $E(P_t) = E(S_t) \equiv \overline{S}$, then

$$W_t = \omega \overline{S} A_t \tag{3.2}$$

3.2.2 Output and Entrepreneur's Profits

At the beginning of their first period, the individuals who became entrepreneurs need to decide how much labor to hire at the given nominal wage; this decision occurs after the aggregate shocks are realized. Second, at the end of their first period, entrepreneurs face a liquidity shock and must decide whether or not to cover it (if they can) in order to survive and thereby innovate in the second period. The proportion ρ_t of entrepreneurs who innovate determines the growth rate of the economy.

The production of an entrepreneur born at date t in her first period, is given by

$$y_t = A_t \sqrt{l_t} \tag{3.3}$$

where l_t and A_t denotes the firm's labor input and current aggregate productivity, which it will be first assumed non-random, at date t respectively [7].

Aggregate nominal profits net of debt repayments in period t are given by,

$$\Pi_t = P_t y_t - W_t l_t = A_t S_t \sqrt{l_t} - \omega \overline{S} A_t l_t$$

In the second period, the entrepreneur innovates and thereby realizes the value of innovation v_{t+1} with probability ρ will depends upon whether the entrepreneur can cover her liquidity cost at the end of her first period. As we shall see, in an economy with credit constraints, the latter depends upon the short-term profit realization and therefore upon both the level of employment and the aggregate shocks in the first period.

The optimal level of employment in the first period is then chosen by the entrepreneur in order to maximize her net present value

$$\max_{l_t} \left\{ A_t S_t \sqrt{l_t} - \omega \overline{S} A_t l_t + \beta \rho E_t v_{t+1} \right\} \tag{3.4}$$

where β denotes the entrepreneur's discount rate.

[7] This choice of production technology is made for analytical simplicity, but it can easily be extend to more general settings.

3.2.3 Innovation and Liquidity Shocks

Innovation upgrades the entrepreneur's technology up to some factor $\gamma > 1$, so that a successful innovator has productivity $A_{t+1} = \gamma A_t$. It is natural to assume that the value of innovation v_{t+1} is proportional to the productivity level achieved by a successful innovator, that is $v_{t+1} = vP_{t+1}A_{t+1}$, with $v > 0$. Next, the model considers that innovation occurs in any firm i only if the entrepreneur in that firm survives the liquidity shock C_t^i that occurs at the end of the first period. Due to the existence of credit constraints, the probability of the entrepreneur being able to innovate will depend upon her current cash-flow but eventually upon the choice of the optimal level of borrowing.

As in Aghion, Bacchetta, Ranciere and Rogoff (2006), the liquidity cost of innovation is proportional to productivity A_t, according to the following linear form (multiplied by P_t as it is expressed in nominal terms):

$$C_t^i = c^i P_t A_t$$

where c^i is independently and identically distributed across firms in the domestic economy, with uniform distribution function F over the interval $[0, \bar{c}]$. While all firms face the same probability distribution over c^i ex ante, ex post the realization of c^i differs across firms. Moreover, it is assumed that the net productivity gain from innovating (measured by $v\gamma$) is sufficiently high that it is always profitable for an entrepreneur to try and overcome her liquidity shock.

In order to pay for her liquidity cost, the entrepreneur can borrow on local credit market or on the foreign market. However, credit constraints are present in this economy. Due to the existence of these credit constraints, entrepreneurs can borrow an amount $\mu\alpha\Pi_t$ from the domestic market and an amount $\mu^*(1-\alpha)\Pi_t$ from the foreign market. In particular, α represents the share of current cash flow Π_t that the entrepreneur borrows from the local credit markets. Define μ and μ^* as proportionality coefficients, or credit multipliers with $1 > \mu > 0$ and $1 > \mu^* > 0$. Therefore μ reflects the degree of financial development in the domestic economy while μ^* reflects the degree of international financial integration of the domestic economy. Higher values of μ correspond to higher levels of financial development and higher values of μ^* correspond to a high degree of international financial integration.

It will be assumed that the proportionality factor μ and μ^* are constant[8]. The borrowing constraints are no longer binding if μ and μ^* becomes large.

Thus, the funds available for innovative investment at the end of the first period are at most equal to

$$\mu\alpha\Pi_t + \mu^* (1-\alpha) \Pi_t$$

and therefore the entrepreneur will innovate whenever:

$$\mu\alpha\Pi_t + \mu^* (1-\alpha) \Pi_t \geq C_t^i \tag{3.5}$$

From these last equations the extreme cases can be analyzed. When the domestic economy does not have access to international financial markets, i.e. $\mu^* = 0$, the model collapses to Aghion, Bacchetta, Ranciere and Rogoff (2006) since $\alpha = 1$ and the entrepreneur borrows only on the local credit market. Another special case is $\mu = 0$, that is no access to the domestic credit market, which is also solved as in Aghion, Bacchetta, Ranciere and Rogoff (2006) but μ^* is used instead of μ .The last special case is when both μ and μ^* are 1, that is the complete markets case. In this situation, borrowing constraints are no longer binding and the condition for growth is trivially satisfied. From this step it can be anticipated that there might be heterogeneity in the nature of μ and μ^* depending on the level of (financial) development. In fact, developing countries entrepreneurs, borrowing not only on the local credit market but also on the international credit market will face additional foreign currency restrictions. This might affect the amount of effective credit and therefore the level of μ and μ^*, shaping a differential impact whether a developed or a developing country. This distinction does not affect the main implications from the model and will be further explored in the empirical section.

As described above, the timing here implies that first the shock is realized at the end of the first period and then the entrepreneur decides to cover it (if she can). Here a new decision is introduced. The entrepreneur chooses the share α of her cash flow Π_t to borrow

[8] Aghion, Banerjee and Picketty (1999) consider μ to be a negative function of the nominal interest rate: $\mu_t = \mu(i_{t-1})$. In this case, the negative effect would be reinforced. Moreover, if a foreign interest rate for foreign borrowing with the usual arbitrage (uncovered) parity condition is also considered, then the negative effective would be reinforced even more.

from the domestic and the foreign capital markets subject to the credit constraints from each market. In particular, from (3.5), the share α will be at most

$$\alpha = \frac{1}{(\mu - \mu^*)} \left(\frac{C_t^i}{\Pi_t} - \mu^* \right) \tag{3.6}$$

where it will be assumed:

Assumption A1:

$$\mu \neq \mu^* \tag{3.7}$$

to rule out non-existence.

Finally, from (3.5) the probability of innovation ρ_t is equal to[9]

$$\rho_t = F \left(\frac{\mu \alpha \Pi_t + \mu^* (1 - \alpha) \Pi_t}{S_t A_t} \right) \tag{3.8}$$

3.2.4 Equilibrium Profits

Now, ρ_t can be substituted in the entrepreneur's maximization problem. The entrepreneur will choose the level of employment l_t to maximize (3.4) which yields

$$l_t = \left[\frac{S_t}{2\omega \overline{S}} \right]^2 \tag{3.9}$$

and therefore

$$\Pi_t = \left(\frac{1}{4\omega \overline{S}} \right) A_t S_t^2 = \psi A_t S_t^2 \tag{3.10}$$

with $\psi = \frac{1}{4\omega \overline{S}}$. It can be shown that equilibrium profits are increasing in the nominal exchange rate S_t. Hence, from (3.8) the probability of innovation can be expressed as:

$$\begin{aligned} \rho_t &= F \left(\mu \alpha \psi S_t + \mu^* (1 - \alpha) \psi S_t \right) \\ &= \Pr \left(\mu \alpha \psi S_t + \mu^* (1 - \alpha) \psi S_t \geq c^i \right) \end{aligned} \tag{3.11}$$

and using the fact that c^i is independently and identically distributed across firms in the domestic economy with uniform distribution over the interval $[0, \overline{c}]$, then

$$\rho_t = \begin{cases} 1 & \text{if } \widetilde{\rho}_t \geq 1 \\ \widetilde{\rho}_t & \text{if } 0 < \widetilde{\rho}_t < 1 \\ 0 & \text{if } \widetilde{\rho}_t \leq 0 \end{cases} \tag{3.12}$$

[9] Since $\Pi_t > 0$ in equilibrium and $S_t > 0$, it is always the case that $\rho_t > 0$.

where

$$\widetilde{\rho}_t = \frac{1}{c}\left(\mu\alpha\psi S_t + \mu^*\left(1-\alpha\right)\psi S_t\right) \tag{3.13}$$

Moreover the share α can be expressed as:

$$\widetilde{\alpha} = \frac{1}{\left(\mu-\mu^*\right)}\left(\frac{c^i}{\psi S_t} - \mu^*\right) \tag{3.14}$$

Furthermore from (3.14) it can be shown that the amount of cash flows borrowed from the local credit market ($\widetilde{\alpha}$) is an increasing function of μ and a decreasing function of μ^*. In particular, assuming that

Assumption A2:

$$-c^i + \mu^*\psi S_t > 0 \tag{3.15}$$

then

$$\frac{\partial\widetilde{\alpha}}{\partial\mu} = \frac{-c^i + \mu^*\psi S_t}{S_t\left(\mu-\mu^*\right)^2\psi} > 0 \tag{3.16}$$

$$\frac{\partial\widetilde{\alpha}}{\partial\mu^*} = -\frac{1}{\left(\mu-\mu^*\right)} - \frac{-c^i + \mu^*\psi S_t}{S_t\left(\mu-\mu^*\right)^2\psi} < 0 \tag{3.17}$$

from where it can be concluded that when the degree of financial development increases then the entrepreneur will weight more the local credit market. In a similar fashion, when the degree of international financial integration increases then the entrepreneur will weight more the foreign credit market. Finally if one analyzes the balance sheet effect of the impact of the nominal exchange rate in (3.14) it can be seen that

$$\frac{\partial\widetilde{\alpha}}{\partial S_t} = -\frac{\mu^*}{S_t\left(\mu-\mu^*\right)} - \frac{-c^i + \mu^*\psi S_t}{S_t^2\left(\mu-\mu^*\right)\psi} > 0 \tag{3.18}$$

since

$$-\frac{\mu^*}{S_t\left(\mu-\mu^*\right)} < \frac{-c^i + \mu^*\psi S_t}{S_t^2\left(\mu-\mu^*\right)\psi}$$

and

$$\mu^*\psi S_t < -c^i + \mu^*\psi S_t$$

where eventually

$$0 < -c^i + 2\mu^*\psi S_t$$

holds by assumption A2. Hence, equation (3.18) implies that whenever the nominal exchange rate depreciates the entrepreneur will put more weight on the local credit market for her borrowing needs.

Going back to (3.12) it can be seen that the probability ρ_t depends on the nominal exchange rate. In particular the innovation probability ρ_t declines with the occurence of a domestic currency appreciation. However, this decline is mitigated the higher financial development μ or international financial integration μ^*. Furthermore, equation (3.12) compares with equation (8) from Aghion, Bacchetta, Ranciere and Rogoff (2006), but in particular, it can be shown that when nominal exchange rate varies, the magnitude of the change in ρ_t is greater in this paper rather than in Aghion, Bacchetta, Ranciere and Rogoff (2006), which gives evidence of the importance of considering international financial credit markets in the analysis.

3.2.5 Productivity Growth

Expected productivity at date $t+1$ will be defined as in Aghion, Bacchetta, Ranciere and Rogoff (2006):

$$E(A_{t+1}) = E(\rho)\gamma A_t + (1 - E(\rho))\, A_t \tag{3.19}$$

Hence, the expected rate of productivity growth between date t and date $t+1$ is given by:

$$g_t = \frac{E(A_{t+1}) - A_t}{A_t} = (\gamma - 1)\, E(\rho) \tag{3.20}$$

Proposition 1. *Moving from fixed to flexible exchange rate reduces average growth. Moreover, as financial development measured by μ becomes large and/or as international financial integration measured by μ^* increases the growth gap decreases.*

Proof: As stated in (3.20), the average growth rate is proportional to the expected proportion of innovating firms. Hence for the comparison between fixed exchange rate and flexible exchange rate, first the focus will be on the difference between the corresponding expected innovation probabilities:

$$\Delta_t = \overline{\rho} - E(\rho_t),$$

where

$$\begin{aligned}\overline{\rho} &= F\left(\mu\alpha\psi\overline{S} + \mu^*\left(1-\alpha\right)\psi\overline{S}\right) \\ &= F\left(\mu\alpha\frac{1}{4\omega} + \mu^*\left(1-\alpha\right)\frac{1}{4\omega}\right)\end{aligned}$$

and

$$E(\rho_t) = E\left(F\left(\mu\alpha\psi S_t + \mu^*\left(1-\alpha\right)\psi S_t\right)\right)$$

The first part of the proposition follows from the form of the distribution function F. If $\rho_t < 1$ for all S_t , then ρ_t would be linear in S_t and therefore $E(\rho_t) = E\left(\overline{\rho}\right) = \overline{\rho}$. But it may be the case that for some values of S_t, $\rho_t = 1$, then ρ_t is a concave function of S_t and therefore $E(\rho_t) < \overline{\rho}$. The second part of the proposition follows from the fact that $\overline{\rho}$ and $E(\rho_t)$ converges to 1 as μ and μ^* increase. Note that once μ and μ^* equal one, any further growth impact can be attained through the change in the exchange rate channel.

3.3 EMPIRICAL METHODOLOGY

The effect of international financial integration or just financial liberalization on growth is in general a matter of great controversy. As argued before, evidence is not conclusive and findings are divided. Still, as Ranciere, Tornell and Westermann (2006) show, there are two competing effects that can be brought together with an overall positive impact effect[10]. The basic hypothesis to be tested is that the degree of flexibility of the exchange rate regime has a negative impact on long run growth when countries face a lower degree of IFI.

In order to test the main hypothesis, a standard growth regression is considered to which a measure of exchange rate flexibility is add, as well as an interaction term with exchange rate flexibility and IFI. In this analysis, two measures of exchange rate flexibility will be used: (i) the exchange rate regime based on the natural classification of Reinhart and Rogoff (2004) and (ii) the exchange rate classification of Levy-Yeyati and Sturzenegger (2003) which includes changes in reserves in the classification. Furthermore, two measures of IFI will also

[10]In particular, the two competing effects are: in one hand, financial liberalization strengthens financial development and contributes to higher long run growth and in the other hand, liberalization induces excessive risk-taking, increasing macroeconomic volatility and leads to more frequent crises. Decomposing both effects Ranciere, Tornell and Westermann (2006) show that the overall impact is positive.

be used: (i) Chinn and Ito's (2006) measure of de jure capital account openness and (ii) a *de jure* binary indicator constructed by Ranciere, Tornell and Westermann (2006) using the official dates of equity market liberation described in Beckaert, Harvey and Lundblad (2005).

As it is now standard in the literature, and will be explained below, instead of using annual data, the time series data will be transformed into five-year averages. The main reason why this is done is to filter out business cycle fluctuations, so to focus on long run growth effects. The panel consists of data for 85 countries over the period 1960-2000.

3.3.1 Flexibility of the Exchange Rate Regime

Classifying a country's exchange rate regime is not a trivial issue. Although the textbook answer is simple: either fixed or flexible, the richness of real world regimes belies this elegant dichotomy because most governments try to reach some compromise between the different elements of the so-called "impossible trinity", that is, independent monetary policy, rigidly fixed exchange rates, and complete capital mobility. Moreover, popular regimes run the array from currency board and traditional pegs to crawling pegs to crawling pegs, target zones, and floats, with varying degrees of intervention. In their survey, Ghosh, Gulde and Wolf (2003) provide an extensive and detailed description of the different classifications as well as a discussion about what should be relevant for this issue. Hence to pursue this empirical section it is important to decide upon the methodology for classifying regimes.

Two measures to capture the flexibility of exchange rate regime were used. First, the classification of Reinhart and Rogoff (2004). This measure is based on the verification of the de facto regime, reclassifying the regimes where the exchange rate behavior does not match what is expected from the stated policy. Ignoring the free falling category, this annual broad classification orders regimes from the most rigid to the most flexible, i.e. $ERR_t \in \{1, 2, 3, 4\} = \{$*fix, peg, managed float, float*$\}$. To make it more operational, an index of exchange rate flexibility in each five-year interval is constructed, such that flexibility of the exchange rate for that period is equal to the average regime (for the period). Second, the classification of Levy-Yeyati and Sturzenegger (2003) was used. This measure is available

for 118 countries since 1974 and it is a variable that is based on a comparison of exchange rate movements and foreign exchange intervention. Actually it has two different classifications, one is a three-way and the other is five-way. For the purposes of the estimations in this paper the three-way classification, i.e. $ERR_t \in \{1, 2, 3\} =$ $\{$*fix, intermediate, float*$\}$ will be used. To deal with the five-year period, the same treatment as before was followed, constructing a new five-year average index.

Finally, it is worth noting that the Reinhart and Rogoff (2004) classification offers the advantage that it corrects for multiple exchange rates, a practice that, while common among developing countries until the early 1970s, diminished steadily to less than 10 percent of cases during the post Bretton Woods period. However, it is not giving information about the degree of exchange rate intervention, an aspect that is essential to characterize exchange rate policy, particularly when it comes to regime choice.

3.3.2 International Financial Integration

As noted before, a key issue in the empirical studies is related to the measurement of financial integration. Some authors used proxies for government restrictions on capital flows -*de jure* measures which uses the International Monetary Fund's (IMF)-restriction measure on international financial transactions. This dummy variable takes the value of one when a country faces restrictions. As noted by Kose, Prasad, Rogoff and Wei (2006) this measure is quite coarse and may not capture the true extent of IFI. A finer version of IMF-restriction measure was developed by Quinn (1997), but unfortunately this measure is only available for intermittent years for most countries[11]. In the search for more sophisticated and comprehensive measures to capture the influence of financial linkages two alternatives were used. First, Chinn and Ito's (2006) measure of de jure capital account openness, usually referred as *KAOpen*. This measure is available for 185 countries since 1970 and it is based on four binary dummy variables reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* with a higher number indicating a lower overall level of restrictions[12].

[11] 1958, 1973, 1982 and 1988.

[12] Kaminsky and Schmukler (2001) have a capital controls index that may be an alternative but it only covers information for 28 countries.

Second, a *de jure* binary indicator constructed by Ranciere, Tornell and Westermann (2006) using the official dates of equity market liberation described in Beckaert, Harvey and Lundblad (2005). This measure is available for the 85 countries in our sample since 1980 and it is dummy variable based on the dates of official equity market liberalization corresponding to formal regulatory changes after which foreign investors officially have the opportunity to invest in domestic equity securities.

3.3.3 Dynamic Panel Data Model

To avoid the potential bias associated with the fixed effects estimator, an estimator based on the generalized method of moments (GMM) is used. This section follows the methodological description of DeJong and Ripoll (2006). This GMM panel estimator controls for the potential endogeneity of all explanatory variables, which is superior to controlling for the endogeneity of the main interested regressor only. The way the panel estimator controls for endogeneity is by using "internal instruments", that is, instruments based on lagged values of the explanatory variables. This method does not allow to control for full endogeneity but for a weak type of it. To be precise, it is assumed that the explanatory variables are only "weakly exogenous", which means that they can be affected by current and past realizations of the growth rate but must be uncorrelated with the future realizations of the error term. In sum, the weak exogeneity assumption implies that future *innovations* of the growth rate do not affect current IFI. To be clear about this assumption, note that weak exogeneity does not mean that agents do not take into account expected future growth in their decision to develop conditions for the degree of IFI of the domestic economy; it just means that future (unanticipated) shocks to growth do not influence current IFI. It is the *innovation* in growth that must not affect IFI. Eventually, the validity of the weak exogeneity assumption will be assessed below.

The GMM estimators developed for dynamic panel data introduced by Holtz-Eakin, Newey, and Rosen (1990), Arellano and Bond (1991), and Arellano and Bover (1995) are going to be used following the methodology proposed by Windmeijer (2004). As stated before, the panel consists of data for 85 countries over the period 1960-2000 but it is an

unbalanced panel[13]. In particular, data is averaged over non-overlapping, five-year periods, so that data permitting there are eight observations per country[14]. Letting the subscripts i and t represent country and time period respectively, the equation considered is given by

$$y_{it} - y_{it-1} = (\alpha - 1)\, y_{it-1} + \beta' X_{it} + \xi_t + \eta_i + \varepsilon_{it} \tag{3.21}$$

where y_{it} is the logarithm of real per capita GDP in country i at time t, X_{it} represents a set of explanatory variables (other than lagged per capita GDP), ξ_t is a period-specific constant, η_i is an unobserved county-specific effect and also time dummies to account for time-specific effects were included. Equation (3.21) can be rewritten as:

$$y_{it} = \alpha y_{it-1} + \beta' X_{it} + \xi_t + \eta_i + \varepsilon_{it} \tag{3.22}$$

which makes apparent that the estimation of (3.21) is analogous to the estimation of a dynamic equation with a lagged-dependent variable on the right-hand side. Equation (3.22) is sometimes called a *partial adjustment model,* since it is possible to separate the short-run from the long-run impact of IFI on growth and allows for the possibility that IFI affects growth only with a lag. Although attractive because of its interpretation, equation (3.22) is subject to Caselli, Esquivel and Lefort (1996) critique. In particular, these authors discuss that consistency of OLS estimators, or any variant that allows for non-spherical disturbances, depends on the assumption that the country-specific effect η_i is uncorrelated with the other right-hand side variables. This assumption is violated by (3.22) due to the presence of y_{it-1} as an explanatory variable since $E\left[y_{it-1}\eta_i\right] \neq 0$. Thus, to estimate this equation it is first needed to eliminate η_i.

One approach to eliminating η_i that has been employed in the empirical literature involves its interpretation as a country-specific constant term. This interpretation motivates the implementation of a fixed effects estimator, as in Islam (1995) or the closely-related between estimator. As an alternative, a second approach has involved the interpretation of η_i as a country-specific random variable that is uncorrelated with the included regressors. In particular one can use the feasible generalized least squares estimator (FGLS) if

[13] Table 1 presents the list of countries included in the sample.

[14] To be even more precise, the reasons for this averaging can be at least twofold: (i) to isolate from business cycles and (ii) to stay in the Arellano Bond (1991) and Arellano Bover (1995) assumption of $T < N$.

the covariance structure of $\eta_i + \varepsilon_{it}$ is taken as invariant. This is often characterized as the random-effects estimator. As Caselli, Esquivel and Lefort (1996) note, under either interpretation, unless all explanatory variables are strictly exogenous, contemporaneous correlation between explanatory variables and error terms will remain, and inconsistency will continue to be problematic.

An alternative GMM-based approach can be derived by taking first differences of (3.22)

$$y_{it} - y_{it-1} = \alpha \left(y_{it-1} - y_{it-2} \right) + \beta' \left(X_{it} - X_{it-1} \right) + \left(\xi_t - \xi_{t-1} \right) + \left(\varepsilon_{it} - \varepsilon_{it-1} \right) \tag{3.23}$$

The use of instruments is required to deal with the likely endogeneity of the explanatory variables and with the problem that OLS procedures cannot be used to estimate $(\varepsilon_{it} - \varepsilon_{it-1})$ because by construction the new error term is correlated with the lagged dependent variable, $y_{it-1} - y_{it-2}$.Under the assumptions that the error term ε_{it} is not serially correlated $(E\left[\varepsilon_{it}\varepsilon_{it-j}\right] = 0 \; for \; all \; j \neq 0)$ and that the period-specific constant is uncorrelated with future realizations of the error term $(E\left[\xi_t \varepsilon_{it+s}\right] = 0 \; for \; all \; t \; and \; s \geq 0)$, Arellano and Bond (1991) propose a GMM *difference* estimator based on the following moment conditions:

$$E\left[y_{it-s} \left(\varepsilon_{it} - \varepsilon_{it-1} \right) \right] = 0 \; for \; t = 3, \ldots, T \; and \; s \geq 2 \tag{3.24}$$

$$E\left[X_{it-s} \left(\varepsilon_{it} - \varepsilon_{it-1} \right) \right] = 0 \; for \; t = 3, \ldots, T \; and \; s \geq 2 \tag{3.25}$$

As discussed in Alonso Borrego and Arellano (1999), Blundell and Bond (1998) and Easterly and Levine (2001), this *difference* estimator has the statistical shortcoming that when the explanatory variables are persistent, then lagged levels of the regressors are weak instruments for the regression in differences. To overcome the bias and imprecision associated with the usual difference estimator, Arellano and Bover (1995) and Blundell and Bond (1998) developed a systems estimator that combines the differenced model (3.23) with the levels model (3.22). In this case, the instruments for the regression in differences are the same as above while the instruments for the regression in levels are the lagged *differences* of the corresponding variables. In order to be able to use lagged differences of the variables on the right-hand side of (3.22) as valid instruments for the regression in levels, additional identifying assumptions are needed. In particular, what is needed is the assumption that

there is no correlation between the differences of the regressors and the country-specific effect; i.e., interactions between the country-specific effect and the regressors are stationary. Moreover, the additional moment conditions for the second part of the system (the regression in levels) are:

$$E\left[\left(y_{it-s}-y_{it-s-1}\right)\left(\eta_i+\varepsilon_{it}\right)\right]=0 \;\; for \;\; s=1 \tag{3.26}$$

$$E\left[\left(X_{it-s}-X_{it-s-1}\right)\left(\eta_i+\varepsilon_{it}\right)\right]=0 \;\; for \;\; s=1 \tag{3.27}$$

Therefore, using the moment conditions presented in (3.24), (3.25), (3.26) and (3.27) a GMM procedure to generate consistent and efficient parameter estimates of (3.22) was employed. Still, the equation to be estimated is eventually a variation of (3.22):

$$y_{it}=\alpha y_{it-1}+\varphi_1 ER_{it}+\varphi_2 ER_{it}*IFI_{it}+\delta IFI_{it}+\beta' X_{it}+\xi_t+\eta_i+\varepsilon_{it} \tag{3.28}$$

where ER_{it} is the degree of flexibility of the exchange rate regime, IFI_{it} is the measure of international financial integration, X_{it} represents a set of explanatory variables (other than lagged per capita GDP), ξ_t is a period-specific constant, η_i is an unobserved county-specific effect and time dummies to account for time-specific effects and regional dummies were also included. The set of control variables includes average years of secondary schooling as a proxy for human capital inflation, trade openness as imports and exports as a share of GDP, the size of the government as government expenditure as proportion of GDP to control for macroeconomic stability. In addition to this baseline framework, following Aghion, Bacchetta, Ranciere and Rogoff (2006) a dummy indicating the frequency of a systemic banking crisis within each five-year period interval is introduced. In this specific case, this indicator controls for rare but severe episodes of aggregate instability and is a much broader indicator where a bank run or a currency crisis are only a subset of the cases captured by this index based on Caprio and Klingebiel (2003) and Glick and Hutchinson (2001). A more detailed definition and sources for all variables included in this analysis are given in Tables 9, 10 and 11.

The main prediction of the model can be tested using (3.28) and implies that $\varphi_1<0$ and $\varphi_2>0$ so that the impact of exchange rate flexibility is more negative at low levels

Table 9: List of 85 countries included

COUNTRY	WB CATEGORY*	REGION**
ALGERIA	2	4
ARGENTINA	3	3
AUSTRALIA	4	5
AUSTRIA	4	5
BANGLADESH	1	2
BELGIUM-LUXEMBOURG	4	5
BOLIVIA	2	3
BRAZIL	2	3
BURKINA FASO	1	1
BURUNDI	1	1
CAMEROON	2	1
CANADA	4	5
CHILE	3	3
CHINA,P.R.: MAINLAND	2	2
CHINA,P.R.:HONG KONG	4	2
COLOMBIA	2	3
COSTA RICA	3	3
COTE D IVOIRE	1	1
DENMARK	4	5
DOMINICAN REPUBLIC	2	3
ECUADOR	2	3
EGYPT	2	4
EL SALVADOR	2	3
FIJI	2	2
FINLAND	4	5
FRANCE	4	5
GABON	3	1
GERMANY	4	5
GHANA	1	1
GREECE	4	5
GUATEMALA	2	3
GUYANA	2	3
HAITI	1	3
HONDURAS	2	3
INDIA	1	2
INDONESIA	2	2
IRAN, I.R. OF	2	4
IRELAND	4	5
ISRAEL	4	4
ITALY	4	5
JAMAICA	2	3
JAPAN	4	5
JORDAN	2	4
KENYA	1	1
KOREA	4	2
LESOTHO	2	1
MALAWI	1	1
MALAYSIA	3	2
MAURITIUS	3	1
MEXICO	3	3
MOROCCO	2	4
NEPAL	1	2
NETHERLANDS	4	5
NEW ZEALAND	4	5
NICARAGUA	2	3
NIGER	1	1
NIGERIA	1	1
NORWAY	4	5
PAKISTAN	1	2
PANAMA	3	3
PAPUA NEW GUINEA	1	2
PARAGUAY	2	3
PERU	2	3
PHILIPPINES	2	2
PORTUGAL	4	5
SENEGAL	1	1
SIERRA LEONE	1	1
SINGAPORE	4	2
SOUTH AFRICA	3	1
SPAIN	4	5
SRI LANKA	2	2
SWEDEN	4	5
SWITZERLAND	4	5
TANZANIA	1	1
THAILAND	2	2
TOGO	1	1
TRINIDAD AND TOBAGO	3	3
TUNISIA	2	4
TURKEY	3	4
UNITED KINGDOM	4	5
UNITED STATES	4	5
URUGUAY	3	3
VENEZUELA, REP. BOL.	3	3
ZAMBIA	1	1
ZIMBABWE	1	1

* WB CATEGORY: 4 = high-income countries; 3= upper middle-income countries; 2= lower-middle income countries and 1=low-income countries.

** REGION: 1= Africa; 2= Asia; 3= Latin America; 4= Middle Esst and 5= Industrial countries

Table 10: Definitions and sources of variables included in the regressions

Variable	Description	Source
Real per capita GDP	Ratio of total GDP to total population. GDP is in 1985 PPP-adjusted US$	Penn World Tables
GDP per capita growth	log difference of real GDP per capita	Penn World Tables
Degree of Exchange Rate Flexibility - RR	See Section	Reinhart and Rogoff (2004)
Degree of Exchange Rate Flexibility - LYS	See Section	Levy-Yeyati and Sturzenegger (2003)
International Financial Integration	See Section	Chin and Ito (2006)
De Jure Index of Financial Liberalization	See Section	Ranciere, Tornell and Westermann (2006) based on Beckaert and Harvey (2005)
Total capital flows	Sum of inflows and outflows as share of GDP	International Financial Statistics, IMF
Private credit	Credit by banks and other financial intermediaries to private enterprises as share of GDP	Beck and Levine (2002)
Average years of secondary schooling	Average years of secondary schooling in the population over 15	Barro and Lee (1996)
Openness to trade	Log sum of exports and imports as share of GDP	Penn World Tables
Government size	Log government expenditure as share of GDP	Penn World Tables
Inflation rate	Log of 1 + difference of Consumer Price Index	World Development Indicators
Crisis dummy	Number of years in which a country underwent a systemic banking or currency crisis, as a fraction of the number of years in the corresponding period	Caprio and Klingebiel (1999) and Gosh , Gulde and Wolf (2000)
Terms of Trade Shocks	Standard deviation of the logarithm of terms of trade growth	World Development Indicators
Years in Office	Years the chief executive has been in office	Worldbank Database of Political Institutions
Veto Points	Variable referred to the extent of institutionalized constraints on the executive	Polcon_2002 Database
Variable1	Lagged value of variable	

Table 11: Descriptive statistics and correlations

	Mean	Standard Deviation	Minimun	Maximum	Observations
Real GDP per capita	8.34	1.04	5.81	10.28	678
GDP growth	2.21	2.90	-6.71	15.32	680
Degree of Exchange Rate Flexibility - RR	6.21	3.74	1.00	13.00	619
Degree of Exchange Rate Flexibility - LYS	2.25	0.75	1.00	3.00	473
International Financial Integration	-0.04	1.40	-1.77	2.60	500
de jure Financial Liberalization	0.06	0.24	0.00	1.00	680
Total Flows	0.08	0.13	-0.37	1.37	447
Private Credit	3.29	0.91	0.23	5.27	571
Average years of secondary schooling	1.50	1.19	0.03	5.74	637
Openness to Trade	3.85	0.72	1.71	6.29	680
Government Size	2.86	0.44	1.03	4.21	674
Inflation Rate	0.14	0.25	-0.05	2.81	635
Crisis Dummy	0.03	0.10	0.00	0.67	680

of IFI. Moreover, a similar analysis to Aghion, Bacchetta, Ranciere and Rogoff (2006) can be followed by computing a threshold effect where a *threshold level of IFI* can be obtained above which a more flexible exchange rate regime becomes growth enhancing. Thus, from (3.28), the interest is to estimate the level of IFI such that an increase in the flexibility of the exchange rate regime turns positive the following expression

$$\frac{\partial y_{it}}{\partial ER_{it}} = \varphi_1 + \varphi_2 IFI_{it}$$

When doing this analysis the standard errors associated with the threshold are obtained using the delta method[15].

Another interesting issue associated with the estimation of (3.28) is that α can be interpreted as the speed of convergence to steady state values of the growth rate. Furthermore, λ, the annualized rate of conditional convergence, or divergence if negative, can be estimated implicitly by the coefficient estimates associated with lagged per capita GDP α. In particular, $\alpha = \exp(-\lambda t)$, where t is the time distance between current and lagged income[16].

To assess the validity of the instruments it is standard to consider two specification tests suggested by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). First, Hansen's (1982) J test of over-identification restrictions, which tests the exogeneity assumption of the instruments. The second test examines the hypothesis that the error term ε_{it} is not serially correlated. Indeed here two statistics are used: m_1 and m_2. m_1 test is of the null hypothesis of no first-order serial correlation, which should be rejected under the identifying assumption that ε_{it} is not serially correlated; and m_2 test is of the null hypothesis of no second-order serial correlation, which should not be reject.

3.4 ESTIMATION RESULTS

In the next subsection the estimation results are presented. First the results of testing the main theoretical hypothesis are presented followed by a discussion regarding convergence. Then, endogeneity issues are addressed and finally, a robustness analysis is discussed.

[15] Although it is known that in small sample the delta method result in excessively large standard errors, by bootstrapping similar values are obtained.

[16] In Barro and Sala-i-Martin (2003) more details about the link between α and λ can be found.

3.4.1 Exchange Rate Flexibility, International Financial Integration and Economic Growth

Estimation results are presented in Tables 12, 13 and 14. Each table displays the results of four regressions. In the first column the effects of the exchange rate measure along with the measure of IFI and a set of control variables, without interaction term are displayed. The second regression adds the interaction term of the exchange rate measure and the measure of IFI in order to test the main prediction: that the exchange rate regime, has a negative impact on long run growth when countries face a lower degree of IFI. In other words, this implies a non linear effect of exchange rate flexibility on growth depending on the level of IFI. The third and fourth columns replicate the same regressions with the addition of a dummy variable indicating the frequency of a systemic crisis.

In Table 12, the first regression is giving evidence of a negative effect of the flexibility of exchange rate on per capita growth, something that is consistent with pervious studies. The second regression shows that the interaction term of exchange rate flexibility and IFI is positive and significant: the more the level of IFI of a country, the higher is the point estimate of the impact of exchange rate flexibility on productivity growth. Moreover, the total effect of the flexibility of the exchange rate regime turns out to be significant at a 5% level (as indicated by the Wald test in Column 2). Although in this first regression the degree of domestic financial integration is not significant, its positive effect on productivity growth is strong when introducing the interaction effect on the second regression. This positive and significant result is consistent with many previous studies about the effect of financial development on growth. Furthermore -although not always significant- education exerts a positive impact while government burden has a significant negative effect in the per capita growth. It will be clear from other specifications that the latter impact is consistent and robust across different specifications.

By combining the degree of exchange rate flexibility and the interaction effect it is possible to identify a threshold level of IFI above which a more rigid regime fosters economic growth. In this case, the point estimate of the threshold is in the 82nd percentile, that is, in the upper part of the distribution of the measure of IFI. In other words, only above this threshold a

Table 12: Growth Effects of the Flexibility of Exchange Rate Regimes

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.4034	0.7013	0.3884	0.6721
(log(initial real GDP per capita))	(0.1222)***	(0.1071)***	(0.1277)***	(0.1157)***
Degree of the Exchange Flexibility	-0.0929	-0.0317	-0.0894	-0.0314
(Reinhart and Rogoff classification)	(0.0415)**	(0.0196)#	(0.0408)**	(0.0194)*
Financial Development	0.1632	0.2906	0.1777	0.2942
(private domestic credit/GDP, in logs)	(0.1613)	(0.1066)***	(0.1525)	(0.0941)***
International Financial Integration	0.2048	0.0527	0.2097	0.0599
(Chinn-Ito, capital account variable)	(0.0996)**	(0.0646)	(0.1020)**	(0.0662)
Flexibility*International Financial Integration		0.0192		0.0196
		(0.0096)**		(0.0098)**
Education	0.2691	0.0993	0.2660	0.1098
(secondary enrollment, in logs)	(0.1228)**	(0.0641)	(0.1227)**	(0.0652)*
Trade Openness	0.1560	0.0442	0.1403	0.0575
(exports+imports / GDP, in logs)	(0.2235)	(0.1979)	(0.2149)	(0.1883)
Government Burden	-1.4867	-0.6788	-1.4884	-0.6530
(government consumption/GDP, in logs)	(0.4870)***	(0.1995)***	(0.5022)***	(0.1813)***
Price instability	0.8224	0.1175	0.8136	0.1307
(inflation rate, in log[100+inf.rate])	(0.3071)***	(0.2103)	(0.3142)**	(0.2079)
Crisis			0.0870	0.1324
(banking or currency crisis dummy)			(0.1122)	(0.1396)
Implied lambda (1-e^-λt)	0.1135	0.0444	0.1182	0.0497
	(0.0379)***	(0.0191)***	(0.0411)***	(0.0215)***
No. Countries	75	72	75	72
No. Observations	382	324	382	324
Specification Tests (p-values)				
(a) Hansen Test:	0.3981	0.430	0.288	0.515
(b) Serial Correlation:				
First-Order	0.002	0.006	0.001	0.008
Second-Order	0.289	0.825	0.295	0.585
Wald Tests (p-values)				
Ho: Exchange Rate Flexibility Total Effect = 0		0.0178		0.0191
Ho: International Financial Intergration Total Effect = 0		0.0925		0.0994

*** means significant at 1%, ** at 5% and * at 10%

Threshold Analysis				
Growth enhancing effect of exchange rate flexibility:				
IFI variable greater than:		1.6823		1.6843
s.e.		1.0234		1.0225

more flexible regime is growth enhancing. In particular, this level applies mostly to advanced economies. Finally in the third and fourth columns, the crisis dummy variable is introduced in the regressions and although it has the expected negative impact on productivity growth, it is not significant. Furthermore, the interaction term and its point estimate stay almost unchanged.

The main result from Table 12 is that countries with lower levels of IFI may derive growth benefits from maintaining a rigid exchange rate regime. Thus, through this analysis it is possible to get another and by now widespread accepted evidence of the Calvo and Reinhart "fear of floating" behavior.

In Table 13, the Levy-Yeyati and Sturzenegger (2003) exchange rate regime classification is used. The first and the third column indicate that the flexibility of the exchange rate regime has a significant negative impact on economic growth. This effect is economically important: an increase of one unit in measure of the flexibility or the exchange rate regime leads to a 0.21 percent points reduction in annual economic growth -when controlling for the impact of crises-. Regressions two and four show that the interactions between exchange rate flexibility and IFI are positive and significant. As already discussed, this implies that the more the level of IFI of a country, the less adversely it is affected by the flexibility of the exchange rate regime -now captured through the Levy-Yeyati and Sturzenegger (2003) classification-. To illustrate the main lesson here, an example can be considered. For instance, Indonesia, which is a lower middle income country according to the World Bank classification, increased approximately 83% its level of IFI measuring it through Chinn and Ito's (2006) index of de jure capital account openness. This drastic change decreases the negative impact of a more flexible exchange rate regime by a factor of 1.04. So, although not particularly big in magnitude, the economic impact is statistically significant. Furthermore, the combined interacted and non-interacted coefficients of flexibility become significant at the 10% level, as indicated by the Wald tests. Regarding the threshold effect below which a more rigid regime fosters economic growth, the point estimate evidences a level in the 80th percentile, that is, in the upper part of the distribution of the measure of IFI. It is worth noting here that these are similar results as the one reported in Table 12. In other words, a more flexible regime is growth enhancing but only when you are above this threshold. Hence, this result

Table 13: Growth Effects of the Flexibility of Exchange Rate Regimes with LYS Classification

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.6414	0.9386	0.6667	0.9302
(log(initial real GDP per capita))	(0.1082)***	(0.0426)***	(0.1170)***	(0.0355)***
Degree of the Exchange Flexibility	-0.1731	-0.0527	-0.2086	-0.0488
(Levy-Yeyati and Sturzenegger classification)	(0.0760)**	(0.0294)*	(0.0991)**	(0.0235)**
Financial Development	0.3353	0.1388	0.3498	0.1493
(private domestic credit/GDP, in logs)	(0.0613)***	(0.0275)***	(0.0711)***	(0.0260)***
International Financial Integration	0.0523	0.0972	0.0480	0.0997
(Chinn-Ito, capital account variable)	(0.0313)*	(0.0421)**	(0.0292)*	(0.0470)**
Flexibility*International Financial Integration		0.0392		0.0362
		(0.0172)**		(0.0181)**
Education	0.1017	0.0194	0.0886	0.0226
(secondary enrollment, in logs)	(0.0510)**	(0.0263)	(0.0518)*	(0.0237)
Trade Openness	-0.1305	0.0316	-0.1318	0.0488
(exports+imports / GDP, in logs)	(0.0984)	(0.0392)	(0.1216)	(0.0382)
Government Burden	-0.3462	-0.1495	-0.4176	-0.1759
(government consumption/GDP, in logs)	(0.2106)*	(0.0570)**	(0.2091)**	(0.0541)***
Price instability	0.1089	0.0177	0.1074	0.0314
(inflation rate, in log[100+inf.rate])	(0.0964)	(0.0436)	(0.0956)	(0.0313)
Crisis			-0.1240	-0.0491
(banking or currency crisis dummy)			(0.1285)	(0.0575)
Implied lambda (1 + d = exp(-λt))	0.0555	0.0478	0.0507	0.0090
	(0.0211)***	(0.0201)**	(0.0219)**	(0.0048)*
No. Countries	80	80	81	80
No. Observations	393	393	394	393
Specification Tests (p-values)				
(a) Hansen Test:	0.422	0.206	0.345	0.998
(b) Serial Correlation:				
First-Order	0.004	0.003	0.008	0.000
Second-Order	0.227	0.282	0.265	0.370
Wald Tests (p-values)				
Ho: Exchange Rate Flexibility Total Effect = 0		0.0742		0.1119
Ho: International Financial Intergration Total Effect = 0		0.0288		0.0508

*** means significant at 1%, ** at 5% and * at 10%

Threshold Analysis				
Growth enhancing effect of exchange rate flexibility:				
IFI variable greater than:		1.3903		1.3913
s.e.		0.9173		1.1461

is consistent with what was discussed before, and mostly applies to advanced economies. What should be noted by now is the need for a more detailed analysis to disentangle the potential differences between rich and poor countries, something that will be discussed in the next sections.

In Table 14, the classification of Reinhart and Rogoff (2004) is used again but now the modification is the IFI measure. In particular, a *de jure* binary indicator constructed by Ranciere, Tornell and Westermann (2006) using the official dates of equity market liberation described in Beckaert, Harvey and Lundblad (2005) is used. The regression in the first column is giving evidence of a negative effect of the exchange rate regime on per capita growth. This result is not changed when the crisis dummy variable is introduced in the third column. Furthermore, the second regression shows that the interaction term of exchange rate flexibility and IFI is positive and significant, although at a 10% level. Hence, again the implication is that the more the level of IFI of a country, the higher is the point estimate of the impact of exchange rate flexibility on productivity growth. In terms of the combined interacted and non-interacted coefficient of flexibility the Wald test showed a statistically significant effect at the 5% level. Eventually, the crisis dummy variable is introduced in the regressions and although again it has the expected negative impact on productivity growth, it is not significant. As in Tables 12 and 13, the degree of domestic financial integration has a clear positive and significant effect, giving evidence of the importance of financial intermediation on productivity growth.

3.4.2 Convergence Discussion

The measure of conditional convergence estimated in each regression of Tables 12, 13 and 14 deserves a brief discussion. First, the GMM system estimates of the speed of convergence is statistically significant in all regressions. In particular, when using the exchange rate regime flexibility measure of Reinhart and Rogoff (2004) and Chinn and Ito's (2006) measure of de jure capital account openness in Table 12, the point estimates vary between 0.4% and 1.2%. When using the classification of Levy-Yeyati and Sturzenegger (2003) for exchange rate regime flexibility, the point estimates vary between 0.9% and 6%. Finally, using Rein-

Table 14: Growth Effects of the Flexibility of Exchange Rate Regimes with de jure Classification

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.4463	0.8665	0.4601	0.8751
(log(initial real GDP per capita))	(0.1916)**	(0.0662)***	(0.1895)**	(0.0506)***
Degree of the Exchange Flexibility	-0.0405	0.0085	-0.0531	0.0097
(Reinhart and Rogoff classification)	(0.0247)*	(0.0051)*	(0.0323)*	(0.0059)*
Financial Development	0.6794	0.1747	0.6576	0.1565
(private domestic credit/GDP, in logs)	(0.2111)***	(0.0627)***	(0.2029)***	(0.0476)***
International Financial Integration	1.6133	0.2485	1.4200	0.2640
(de jure official equity market liberalization)	(0.8052)**	(0.1456)*	(0.8365)*	(0.1580)*
Flexibility*International Financial Integration		0.0295		0.0314
		(0.0167)*		(0.0181)*
Education	0.0713	0.0348	0.0803	0.0390
(secondary enrollment, in logs)	(0.0968)	(0.0314)	(0.0899)	(0.0339)
Trade Openness	0.1227	-0.0023	0.1077	-0.0046
(exports+imports / GDP, in logs)	(0.2545)	(0.0398)	(0.2354)	(0.0427)
Government Burden	0.0155	-0.2400	-0.0685	-0.2437
(government consumption/GDP, in logs)	(0.4405)	(0.0731)***	(0.4335)	(0.0755)***
Price instability	0.4695	-0.0113	0.4435	-0.0328
(inflation rate, in log[100+inf.rate])	(0.2690)*	(0.0861)	(0.2818)	(0.0694)
Crisis			-0.3338	0.1240
(banking or currency crisis dummy)			(0.8699)	(0.1026)
Implied lambda	0.1009	0.0179	0.0970	0.0167
(1+d = exp(-λt))	(0.0637)	(0.0096)*	(0.0615)	(0.0072)**
No. Countries	75	75	75	75
No. Observations	438	438	438	438
Specification Tests (p-values)				
(a) Hansen Test:	0.686	0.442	0.468	0.505
(b) Serial Correlation:				
First-Order	0.001	0.000	0.008	0.000
Second-Order	0.559	0.844	0.485	0.894
Wald Tests (p-values)				
Ho: Exchange Rate Flexibility Total Effect = 0		0.0493		0.0658
Ho: International Financial Intergration Total Effect = 0		0.0905		0.0972

*** means significant at 1%, ** at 5% and * at 10%

hart and Rogoff (2004) and *de jure* binary indicator constructed by Ranciere, Tornell and Westermann (2006) in Table 14, the significant point estimates tend to fluctuate around 1.8%. A widely used benchmark in conditional convergence analysis is the cross-section OLS estimates of Barro and Sala-i-Martin (2003). They obtain a convergence estimate of 2.5% using a broad set of explanatory variables. The results in this paper, are in line with DeJong and Ripoll (2006) that highlighted the benefits of using a GMM system estimator in this type of analysis, and are close to the range of convergence estimates traditionally associated with OLS estimators.

3.4.3 Endogeneity Discussion

In any growth regression analysis a standard question to address is the issue of endogeneity. More specifically it is relevant to account both for possible endogeneity and the reverse causation associated with the relationship that one tries to analyze. The GMM system estimator used controls for the potential endogeneity of all explanatory variables and accounts explicitly for the biases induced by including the initial level of real GDP per capita in the growth regressors. Moreover, the dynamic panel procedure using the GMM system estimator is superior to the GMM difference estimator where a weak-instrument bias is known to plague the estimates, particularly given the use of persistent explanatory variables. As pointed up in the previous section, the GMM system estimation procedure is valid only under the assumption of weak exogeneity of the explanatory variables, which means that they can be affected by current and past realizations of the growth rate but must be uncorrelated with the future realizations of the error term. Hansen's (1982) J test of over-identification restrictions, which tests the exogeneity assumption of the instruments, was used to test this assumption. Tables 12, 13 and 14 report that the null hypothesis is not rejected, hence the validity of instruments cannot be rejected.

In particular, the empirical approach used in this paper has several features that makes it less vulnerable to a potential endogeneity bias. Since the focus here is on the contrasting growth effects of exchange rate flexibility at different levels of IFI endogeneity is a second order effect. This last conclusion comes from the fact that focusing on an interaction term

rather than on a single variable makes the analysis less sensitive to the potential endogeneity bias[17].

3.4.4 Robustness Checks

Tables 12, 13 and 14 presented above established evidence that the level of IFI plays a key role in mitigating the negative effects of exchange rate flexibility on productivity growth. Domestic financial development appears always positive and significant while control variables have the expected effects: education a positive but not always significant impact and government burden a negative and always statistically significant impact. Trade openness and price stability usually lacked significance. Moreover, results stay unchanged when the effects of crises are accounted for.

Nevertheless, since the channel through which exchange rates affect productivity growth in the model described is through a balance sheet effect there is a key issue to account for: the fact that rich and poor countries might be differently affected. As discussed in the model, rather than just innovation, poor -credit constrained- countries engage in imitation behavior. This feature does not alter the main prediction of the model, but certainly affects the empirical strategy. The fact that rich countries do not face credit constraints and poor countries face them, determines that the amount of credit will be substantially different: poor countries that imitate have less credit than rich countries that innovate. Furthermore, poor countries may even need to borrow from international markets to imitate. This is because there are information restrictions and domestic credit constraints that do not let poor countries rely on such source of financing. This argument motivates the need to analyze poor and rich countries separately. Rather than using dummies and omitting a subgroup of countries from the regression in Tables 12-14, this section will split the sample into two subsamples: rich and poor, according to the World Bank classification[18].

The regressions from Table 12 are repeated for poor and rich countries in Tables 15 and 16

[17] Another fact that may be diminishing the endogeneity bias is the exclusion of the category "free falling" exchange rate regimes in the baseline regressions. This way, cases where low per capita growth and the choice of flexible exchange rate regime are explained simultaneously are not taken into account.

[18] The subsample division is based on the World Bank classification, such that categories 1 and 2 represent the "poor" sample and categories 3 and 4 the "rich" sample.

Table 15: Growth Effects of the Flexibility of Exchange Rate Regimes in Poor Countries

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.8676	0.8630	0.8862	0.8877
(log(initial real GDP per capita))	(0.0532)***	(0.0569)***	(0.0789)***	(0.0723)***
Degree of the Exchange Flexibility	-0.0250	-0.0078	-0.0131	-0.0082
(Reinhart and Rogoff classification)	(0.0089)***	(0.0047)*	(0.0065)**	(0.0049)*
Financial Development	0.1983	0.1550	0.1525	0.1899
(private domestic credit/GDP, in logs)	(0.0438)***	(0.0639)**	(0.0644)**	(0.0611)***
International Financial Integration	0.0297	0.0888	0.0225	0.0666
(Chinn-Ito, capital account variable)	(0.0169)*	(0.0323)**	(0.0136)*	(0.0279)**
Flexibility*International Financial Integration		0.0153		0.0128
		(0.0077)**		(0.0066)*
Education	0.1113	0.0814	0.0706	0.0614
(secondary enrollment, in logs)	(0.0421)**	(0.0548)	(0.0482)	(0.0458)
Trade Openness	-0.0864	-0.0649	-0.0389	-0.0966
(exports+imports / GDP, in logs)	(0.0518)	(0.1262)	(0.0846)	(0.1059)
Government Burden	-0.3648	-0.3201	-0.3571	-0.3225
(government consumption/GDP, in logs)	(0.0948)***	(0.0606)***	(0.1591)**	(0.0866)***
Price instability	-0.0860	-0.0976	-0.2009	-0.1439
(inflation rate, in log[100+inf.rate])	(0.0674)	(0.1342)	(0.3427)	(0.1919)
Crisis			-0.0844	-0.1661
(banking or currency crisis dummy)			(0.1339)	(0.2458)
Implied lambda	0.0177	0.0184	0.0151	0.0150
($\alpha = \exp(-\lambda t)$)	(0.0077)**	(0.0082)**	(0.0091)*	(0.0091)*
No. Countries	39	38	39	38
No. Observations	193	164	190	164
Specification Tests (p-values)				
(a) Hansen Test:	0.844	0.932	0.590	0.933
(b) Serial Correlation:				
First-Order	0.001	0.004	0.001	0.003
Second-Order	0.336	0.908	0.540	0.948
Wald Tests (p-values)				
Ho: Exchange Rate Flexibility Total Effect = 0		0.0853		0.1007
Ho: International Financial Intergration Total Effect = 0		0.1196		0.1101

*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Threshold Analysis				
Growth enhancing effect of exchange rate flexibility:				
IFI variable greater than:		0.5117		0.6410
s.e.		0.3134		0.3739

Table 16: Growth Effects of the Flexibility of Exchange Rate Regimes in Rich Countries

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.9791	0.9510	0.9796	0.9483
(log(initial real GDP per capita))	(0.0749)***	(0.0882)***	(0.0924)***	(0.0692)***
Degree of the Exchange Flexibility	-0.0187	-0.0035	-0.0193	-0.0046
(Reinhart and Rogoff classification)	(0.0097)*	(0.0021)*	(0.0102)*	(0.0027)*
Financial Development	0.1175	0.1112	0.1131	0.1214
(private domestic credit/GDP, in logs)	(0.0420)***	(0.0419)**	(0.0411)***	(0.0464)**
International Financial Integration	0.0171	0.0883	0.0249	0.0962
(Chinn-Ito, capital account variable)	(0.0104)*	(0.0468)*	(0.0151)*	(0.0542)*
Flexibility*International Financial Integration		0.0075		0.0072
		(0.0042)*		(0.0044)*
Education	0.0656	0.0100	0.0661	0.0168
(secondary enrollment, in logs)	(0.0389)*	(0.0053)*	(0.0405)#	(0.0096)*
Trade Openness	0.0228	0.0763	0.0362	0.0672
(exports+imports / GDP, in logs)	(0.0688)	(0.0622)	(0.1115)	(0.0446)
Government Burden	-0.2498	-0.1683	-0.2562	-0.1825
(government consumption/GDP, in logs)	(0.1325)*	(0.1017)*	(0.1536)*	(0.1102)*
Price instability	-0.1584	-0.0262	-0.1302	-0.0564
(inflation rate, in log[100+inf.rate])	(0.1011)	(0.2598)	(0.1498)	(0.1980)
Crisis			0.0910	0.0676
(banking or currency crisis dummy)			(0.1329)	(0.1225)
Implied lambda	0.0026	0.0063	0.0026	0.0066
($\alpha = \exp(-\lambda t)$)	(0.0016)*	(0.0032)*	(0.0017)*	(0.0039)*
No. Countries	36	34	36	34
No. Observations	192	160	192	160
Specification Tests (p-values)				
(a) Hansen Test:	0.735	0.997	0.985	0.997
(b) Serial Correlation:				
First-Order	0.010	0.024	0.009	0.014
Second-Order	0.340	0.633	0.273	0.703
Wald Tests (p-values)				
Ho: Exchange Rate Flexibility Total Effect = 0		0.1253		0.1285
Ho: International Financial Intergration Total Effect = 0		0.0691		0.0707

*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Threshold Analysis				
Growth enhancing effect of exchange rate flexibility:				
IFI variable greater than:		0.4766		0.6500
s.e.		0.2833		0.4001

respectively. These results are consistent with results from Table 12: the degree of exchange rate flexibility is negative and significant, IFI remains positive and significant and the interaction term between exchange rate flexibility and IFI is also positive and significant. When comparing the point estimates of the interaction terms it is clear that poor countries face a higher value than rich countries (Columns (2) and (4) from Tables 15 and 16). This result is consistent and confirms the theory behind this empirical analysis: poor countries -that face credit constraints- need to borrow from international markets affected by their degree of IFI implying a higher point estimate with respect to rich countries. Again in this case, domestic financial development appears positive and significant, education positive -although not always significant-, government burden significantly negative across specifications and the introduction of the crisis dummy did not reverse the main result. In terms of the total effect both for the exchange rate flexibility measure and the IFI, Wald tests reported significance although usually at the 11%. Regarding the threshold effect below which a more rigid regime fosters economic growth, in Table 15, the point estimate proved significant at the 5% and evidences a level in the 89th percentile, something that is consistent with the poor countries subsample.

Figures 8 and 9 show the entire "poor" distribution of IFI and the threshold value -when crossing the horizontal axis-. In Table 16, the threshold is also significant -at a 5% level- and determines a level in the 48th percentile. Figures 10 and 11 show the "rich" distribution of the IFI measure and the threshold values at 0.48 and 0.65 levels of IFI respectively. These results are consistent with the fact that when facing low levels of IFI, moving from a flexible to a fixed exchange rate is (more) growth enhancing. That is the reason why the threshold is in the 89th percentile for the poor countries sample while in the 48th percentile for the rich ones.

From Table 12, Column (4) the analysis might suggest that the direct impact of IFI on growth per capita is at odds with the impact reported on Columns (4) from Tables 15 and 16 from the split of the whole sample into poor and rich. Nevertheless, it can be shown that the quantitative implication of the IFI effect on growth is consistent across all samples and the seeming disagreement only arises from the fact that the poor sample is much more volatile than the other samples. For instance, by keeping the degree of exchange rate flexibility at

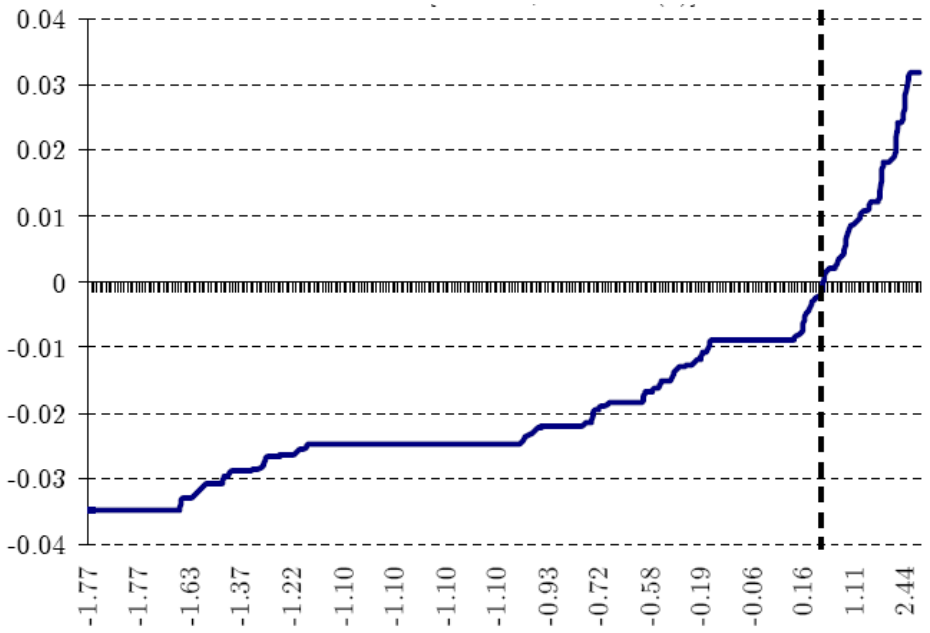

Figure 8: International Financial Integration Threshold in Poor Countries [Table 15, Column (2)]

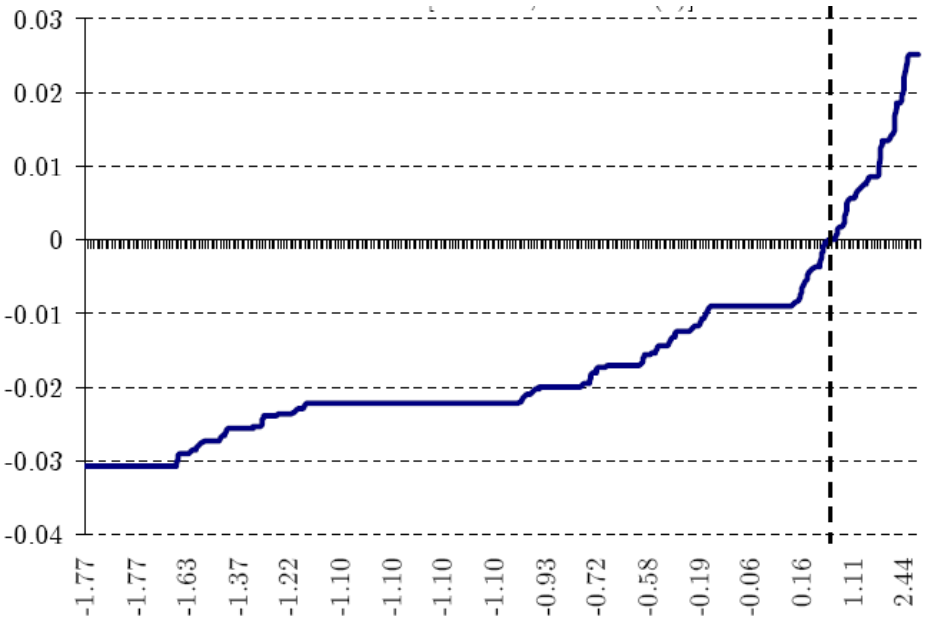

Figure 9: International Financial Integration Threshold in Poor Countries [Table 15, Column (4)]

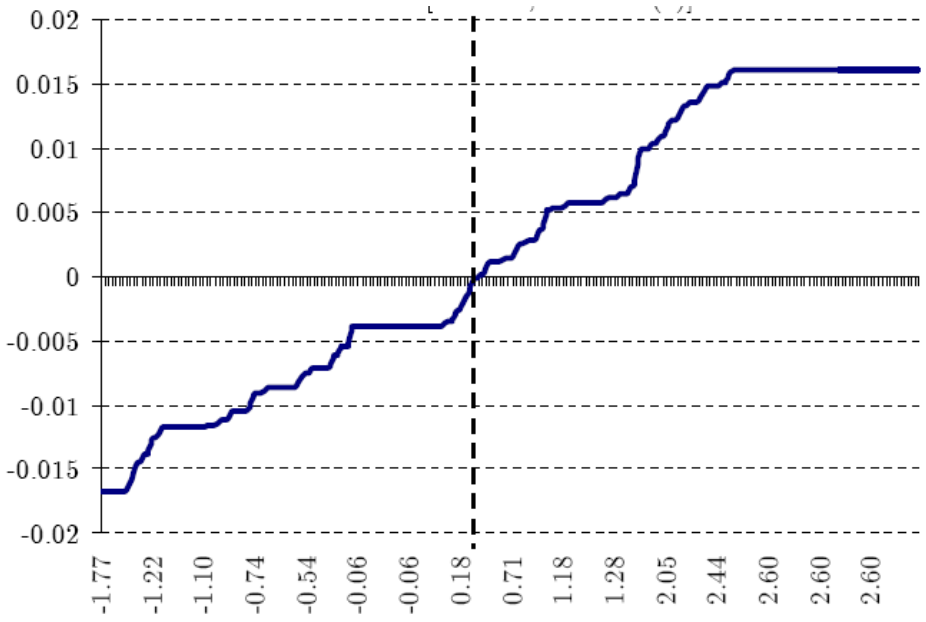

Figure 10: International Financial Integration Threshold in Rich Countries [Table 16, Column (2)]

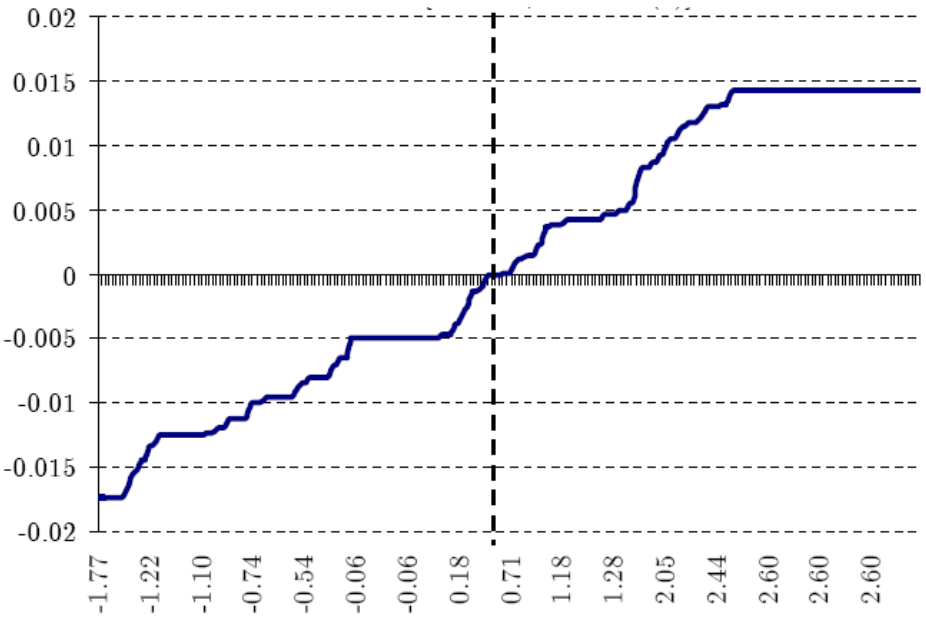

Figure 11: International Financial Integration Threshold in Rich Countries [Table 16, Column (4)]

Table 17: Growth Effects of the Flexibility of Exchange Rate Regimes excluding by Region

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.6993	0.7533	0.7094	0.7300
(log(initial real GDP per capita))	(0.1024)***	(0.1095)***	(0.1018)***	(0.1189)***
Degree of the Exchange Flexibility	-0.0157	-0.0051	-0.0167	-0.0059
(Reinhart and Rogoff classification)	(0.0091)*	(0.0031)*	(0.0101)*	(0.0036)*
D*Degree of the Exchange Flexibility	-0.0139	-0.0043	-0.0073	-0.0044
	(0.0074)*	(0.0021)**	(0.0075)	(0.0022)**
Financial Development	0.1557	0.1991	0.1577	0.2056
(private domestic credit/GDP, in logs)	(0.0660)**	(0.0640)***	(0.0659)**	(0.0620)***
International Financial Integration	0.0124	0.0794	0.0152	0.0981
(Chinn-Ito, capital account variable)	(0.0071)*	(0.0480)*	(0.0080)*	(0.0482)**
D*International Financial Integration	0.0209	0.0192	0.0158	-0.0301
	(0.0094)**	(0.0116)*	(0.0097)#	(0.0135)**
Flexibility*International Financial Integration		0.0076		0.0078
		(0.0041)*		(0.0041)*
D*Flexibility*International Financial Integration		0.0109		0.0118
		(0.0054)**		(0.0072)*
Education	0.1001	0.0620	0.0969	0.0748
(secondary enrollment, in logs)	(0.0671)	(0.0627)	(0.0751)	(0.0691)
Trade Openness	0.0110	-0.0837	0.0096	-0.0772
(exports+imports / GDP, in logs)	(0.1052)	(0.0977)	(0.1060)	(0.0936)
Government Burden	-0.5652	-0.5478	-0.5574	-0.5591
(government consumption/GDP, in logs)	(0.1534)***	(0.1473)***	(0.1597)***	(0.1597)***
Price instability	0.1286	0.1060	0.1141	0.1312
(inflation rate, in log[100+inf.rate])	(0.1974)	(0.1066)	(0.1783)	(0.1208)
Crisis			-0.1579	-0.1732
(banking or currency crisis dummy)			(0.0908)*	(0.1031)*
Implied Lambda	0.0447	0.0354	0.0429	0.0393
($\alpha = \exp(-\lambda t)$)	(0.0183)**	(0.0182)*	(0.0179)**	(0.0203)*
No. Countries	75	73	75	73
No. Observations	382	378	382	378
Specification Tests (p-values)				
(a) Hansen Test:	0.332	0.461	0.229	0.251
(b) Serial Correlation:				
First-Order	0.005	0.019	0.004	0.005
Second-Order	0.896	0.677	0.865	0.665
Exclusion Tests (p-values)				
Ho: Exchange Rate Flexibility Coeff. = 0	0.0301	0.1035	0.0752	0.0448
Ho: International Financial Intergration Coeff. = 0	0.0497	0.0838	0.0633	0.0887
Ho: Flexibility*International Financial Integration Coeff.= 0		0.1046		0.0425

*** means significant at 1%, ** at 5% and * at 10% (# at 11%)
D = 1 if country is categorized as 1 or 2 (poor) by the World Bank and 0 otherwise (rich)

its mean value -in each subsample-, a one standard deviation increase in IFI is associated with a 0.25 percent increase in growth[19]. The equivalent impacts for the poor and the rich samples are 0.28 and 0.20 percent, respectively, something that is consistent with the fact that the whole sample results are a weighted average of the poor and the rich ones[20]. The impact of IFI remains positive and significant both for the poor and the rich countries. In fact, as suggested before, the volatility of the poor sample is higher than that of the whole and the rich samples: in particular, the standard deviation of the whole, the poor and the rich samples are 1.40, 1.97 and 1.45, respectively.

In Table 17 another perspective is taken by using the whole sample and defining an indicator variable D that takes the value of 1 if the country is categorized as 1 or 2 (poor) by the World Bank and 0 otherwise (rich). This dummy variable is then interacted with the degree of exchange rate flexibility, the measure of IFI and the interaction effect. Proceeding this way is an alternative for dividing the whole sample into poor and rich. In fact, the regressions presented in Table 17 proved consistent with the original Table 12 and with Tables 15 and 16 and the main conclusions hold. Furthermore, all terms interacted with the dummy variable are significant with the correct sign. Thus, it is possible to assess the significance of the "reference" category -poor countries- by using exclusion tests. Columns 1-4 from Table 17 show exclusion tests for exchange rate flexibility, IFI and their interaction effect. In all three cases the null hypothesis is rejected usually at the 5% level (although in some cases at 10%) what implies that there is evidence that favors the argument that the effect is sensitive to the choice of country groups. In fact, there is a significant direct effect in the poor countries sample. Thus, the hypothesis that poor countries that need to borrow from international markets affected by the degree of IFI exerts a higher interaction effect point estimate with respect to rich countries is confirmed. For instance, from the exclusion test of the coefficients of $Flexibility \times International\ Financial\ Integration$ and $D \times Flexibility \times International\ Financial\ Integration$ it is concluded they are significant at the 5% level (with a p-value of 0.0425 in Column (4) of Table 17). This implies that the effect of the poor countries is $(0.0078 + 0.0118)$ percentage of annual GDP growth, which

[19] The estimated impact is found to be significant at a 10%.

[20] The estimated impacts are found to be significant at a 5% in the poor sample and at 10% for the rich sample.

compares to the 0.0128 from Column (4) from Table 15.

In Tables 18 and 19, the regressions from Table 13 are repeated for poor and rich countries using the Levy-Yeyati and Sturzenegger (2003) exchange rate regime classification. Similar to the previous exchange rate classification -Reinhart and Rogoff (2004)- in Tables 15 and 16, the results presented in Tables 18 and 19 are consistent with Table 13 and the conclusions hold: the degree of exchange rate flexibility is negative and significant, IFI remains positive and significant and the interaction term between exchange rate flexibility and IFI is also positive and significant. Hence, at lower levels of IFI countries may derive growth benefits from maintaining a rigid exchange rate regime. Also, poor countries face a higher point estimate than rich countries (Columns (2) and (4) from Tables 18 and 19) something that is consistent with and confirms the argument that poor countries, facing credit constraints, need to borrow from international markets influenced by their degree of IFI.

Regarding the threshold effect, in Table 18, Figures 12 and 13 show the entire "poor" distribution where the point estimate proved significant at the 11% and evidences a level in the 90th percentile, consistent with results from Table 15 using the Reinhart and Rogoff (2004) classification. In a similar fashion, Figures 14 and 15 show the "rich" distribution of the IFI measure with the corresponding threshold values of 1.149 and 1.390 at the 54th and 65th percentiles respectively. Finally, Table 20 reports equivalent results consistent with Tables 13, 18 and 19. In fact, it can be concluded that using the indicator variable D to denote a poor country, results show that countries with lower levels of IFI may derive growth benefits from maintaining a rigid exchange rate regime. The exclusion tests give evidence of a differential effect that is sensitive to the choice of country groups consistent with the conclusion from Table 17 in terms of sign and magnitude of the coefficients.

Tables 21 and 22 repeat the regression from Table 14 for poor and rich countries using the *de jure* measure of IFI constructed by Ranciere, Tornell and Westermann (2006). Results once again confirm those from Table 14 and reinforce those from Tables 15 and 16 and Tables 18 and 19. Hence, (i) at lower levels of IFI countries may derive growth benefits from maintaining a rigid exchange rate regime and (ii) poor countries face a higher point estimate than rich countries (Columns (2) and (4) from Tables 21 and 22). Moreover, domestic financial development is strongly positive and significant while government burden is significantly

Table 18: Growth Effects of the Flexibility of Exchange Rate Regimes with LYS Classification in Poor Countries

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.7674	0.7721	0.7969	0.8096
(log(initial real GDP per capita))	(0.0937)***	(0.1122)***	(0.1306)***	(0.0934)***
Degree of the Exchange Flexibility	-0.0302	-0.0249	-0.0250	-0.0194
(Levy-Yeyati and Sturzenegger classification)	(0.0161)*	(0.0151)*	(0.0149)*	(0.0109)*
Financial Development	0.2913	0.1451	0.2992	0.1795
(private domestic credit/GDP, in logs)	(0.0794)***	(0.0543)**	(0.1001)***	(0.0581)***
International Financial Integration	0.0516	0.0492	0.0261	0.0413
(Chinn-Ito, capital account variable)	(0.0206)**	(0.0259)*	(0.0138)*	(0.0252)*
Flexibility*International Financial Integration		0.0308		0.0265
		(0.0149)**		(0.0155)*
Education	0.0744	0.0466	0.0495	0.0482
(secondary enrollment, in logs)	(0.0381)**	(0.0393)	(0.0302)*	-0.0397
Trade Openness	-0.0828	-0.0353	0.1008	-0.1183
(exports+imports / GDP, in logs)	(0.1425)	(0.1015)	(0.1003)	(0.1228)
Government Burden	-0.4834	-0.4856	-0.2521	-0.4684
(government consumption/GDP, in logs)	(0.1904)**	(0.2312)**	(0.1124)**	(0.1594)***
Price instability	0.1451	-0.1000	0.0096	-0.0124
(inflation rate, in log[100+inf.rate])	(0.1264)	(0.0989)	(0.1134)	(0.0668)
Crisis			-0.4910	-0.4171
(banking or currency crisis dummy)			(0.2553)*	(0.1459)***
Implied lambda	0.0331	0.0322	0.0282	0.0262
(d = exp(-λt))	(0.0153)**	(0.0136)**	(0.0163)*	(0.0156)*
No. Countries	43	43	43	43
No. Observations	206	206	206	206
Specification Tests (p-values)				
(a) Hansen Test:	0.401	0.999	0.471	0.989
(b) Serial Correlation:				
First-Order	0.013	0.002	0.004	0.002
Second-Order	0.211	0.238	0.247	0.296
Wald Tests (p-values)				
Ho: Exchange Rate Flexibility Total Effect = 0		0.0862		0.1134
Ho: International Financial Intergration Total Effect = 0		0.0629		0.0326

*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Threshold Analysis				
Growth enhancing effect of exchange rate flexibility:				
IFI variable greater than:		0.8102		0.7588
s.e.		0.4787		0.4670

Table 19: Growth Effects of the Flexibility of Exchange Rate Regimes with LYS Classification in Rich Countries

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.8537	0.8678	0.8647	0.8697
(log(initial real GDP per capita))	(0.1069)***	(0.1249)***	(0.1458)***	(0.1301)***
Degree of the Exchange Flexibility	-0.1215	-0.0319	-0.1606	-0.0275
(Levy-Yeyati and Sturzenegger classification)	(0.0711)*	(0.0187)*	(0.0902)*	(0.0156)*
Financial Development	0.2069	0.1218	0.2246	0.1317
(private domestic credit/GDP, in logs)	(0.0967)**	(0.0579)**	(0.1159)*	(0.0739)*
International Financial Integration	0.0237	0.0293	0.0209	0.0259
(Chinn-Ito, capital account variable)	(0.0129)*	(0.0167)*	(0.0128)#	(0.0147)*
Flexibility*International Financial Integration		0.0292		0.0264
		(0.0143)**		(0.0172)*
Education	-0.0197	-0.0307	0.0170	-0.0337
(secondary enrollment, in logs)	(0.0704)	(0.0685)	(0.0840)	(0.0694)
Trade Openness	-0.1336	-0.0234	-0.0504	-0.0820
(exports+imports / GDP, in logs)	(0.1651)	(0.1338)	(0.1516)	(0.1269)
Government Burden	-0.4374	-0.1419	-0.5271	-0.2327
(government consumption/GDP, in logs)	(0.1994)**	(0.0655)**	(0.2024)**	(0.0879)**
Price instability	-0.2362	-0.1400	-0.2722	-0.2979
(inflation rate, in log[100+inf.rate])	(0.2192)	(0.1753)	(0.1910)	(0.0969)***
Crisis			0.1675	0.0493
(banking or currency crisis dummy)			(0.2736)	(0.1209)
Implied lambda	0.0331	0.0322	0.0282	0.0262
(d = exp(-λt))	(0.0101)*	(0.0102)*	(0.0109)*	(0.0112)
No. Countries	37	37	37	37
No. Observations	187	187	187	187
Specification Tests (p-values)				
(a) Hansen Test:	0.386	0.997	0.369	0.977
(b) Serial Correlation:				
First-Order	0.034	0.007	0.023	0.008
Second-Order	0.463	0.407	0.658	0.449
Wald Tests (p-values)				
Ho: Exchange Rate Flexibility Total Effect = 0		0.1535		0.1347
Ho: International Financial Intergration Total Effect = 0		0.0529		0.0426

*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Threshold Analysis				
Growth enhancing effect of exchange rate flexibility:				
IFI variable greater than:		1.1497		1.3903
s.e.		0.7398		0.8460

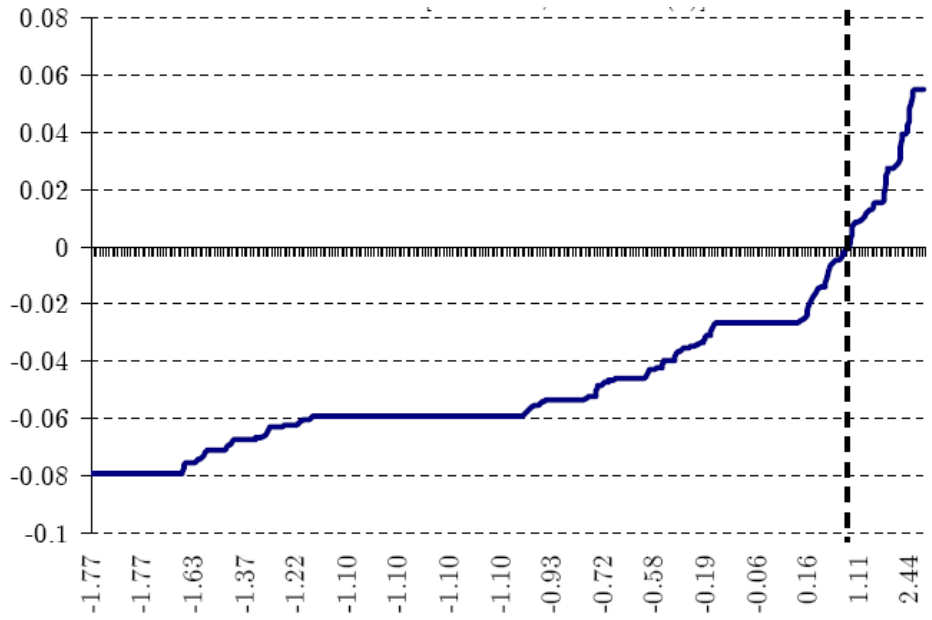

Figure 12: International Financial Integration Threshold in Poor Countries [Table 18, Column (2)]

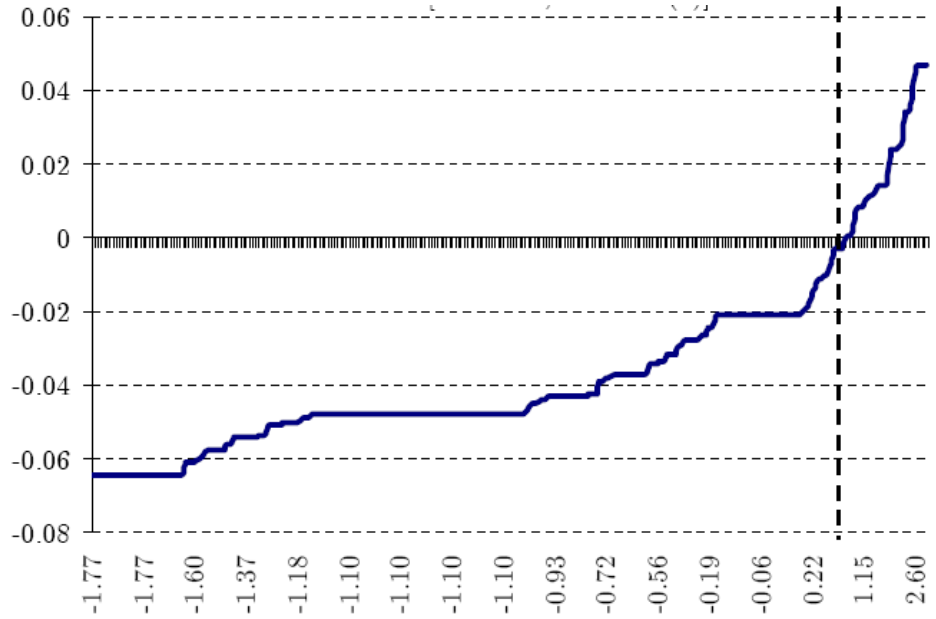

Figure 13: International Financial Integration Threshold in Poor Countries [Table 18, Column (4)]

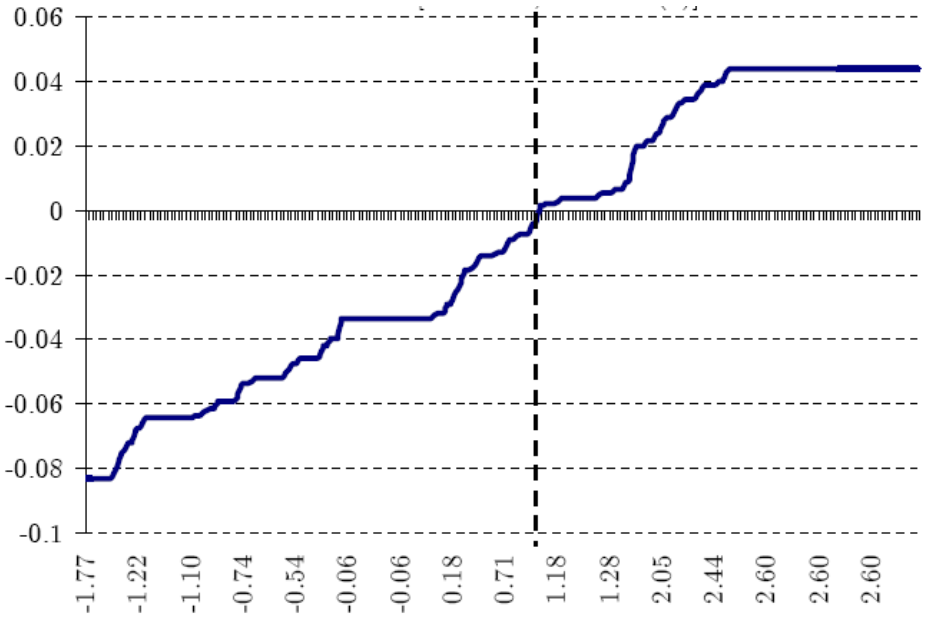

Figure 14: International Financial Integration Threshold in Rich Countries [Table 19, Column (2)]

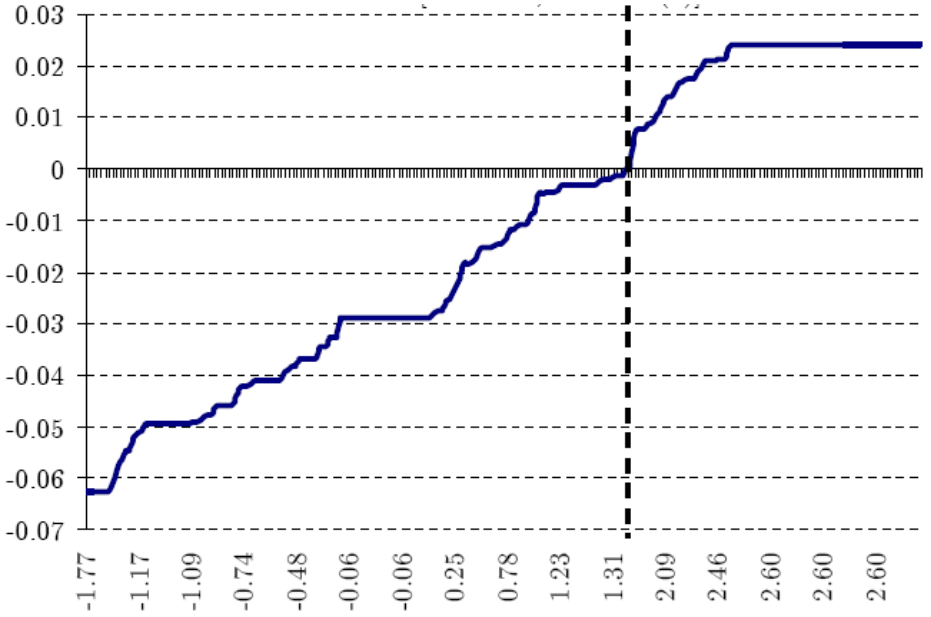

Figure 15: International Financial Integration Threshold in Rich Countries [Table 19, Column (4)]

Table 20: Growth Effects of the Flexibility of Exchange Rate Regimes with LYS Classification excluding by Region

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.6057	0.8972	0.5616	0.8996
(log(initial real GDP per capita))	(0.1590)***	(0.0496)***	(0.1391)***	(0.0572)***
Degree of the Exchange Flexibility	-0.1200	-0.0357	-0.1840	-0.0280
(Levy-Yeyati and Sturzenegger classification)	(0.0724)*	(0.0174)**	(0.0839)**	(0.0171)*
D*Degree of the Exchange Flexibility	0.0869	0.0118	0.1592	0.0126
	(0.0605)	(0.0068)*	(0.0732)**	(0.0062)**
Financial Development	0.3481	0.1838	0.3556	0.1927
(private domestic credit/GDP, in logs)	(0.0883)***	(0.0434)***	(0.0637)***	(0.0451)***
International Financial Integration	0.0229	0.0266	0.0239	0.0268
(Chinn-Ito, capital account variable)	(0.0123)*	(0.0160)*	(0.0117)**	(0.0159)*
D*International Financial Integration	0.0329	0.0199	0.0107	0.0155
	(0.0159)**	(0.0121)*	(0.0145)	(0.0119)
Flexibility*International Financial Integration		0.0256		0.0241
		(0.0122)**		(0.0146)*
D*Flexibility*International Financial Integration		0.0064		0.0058
		(0.0036)*		(0.0035)*
Education	0.1072	0.0141	0.0990	0.0176
(secondary enrollment, in logs)	(0.0493)**	(0.0367)	(0.0510)*	(0.0409)
Trade Openness	-0.1019	-0.0161	-0.1361	-0.0010
(exports+imports / GDP, in logs)	(0.1394)	(0.0537)	(0.1017)	(0.0680)
Government Burden	-0.3040	-0.2748	-0.2749	-0.2599
(government consumption/GDP, in logs)	(0.2404)	(0.1069)**	(0.2202)	(0.1270)**
Price instability	0.0707	-0.0314	0.1191	-0.0455
(inflation rate, in log[100+inf.rate])	(0.0940)	(0.0706)	(0.1074)	(0.0715)
Crisis			-0.0321	-0.2481
(banking or currency crisis dummy)			(0.0899)	(0.1262)*
Implied lambda	0.0627	0.0136	0.0721	0.0132
($a = \exp(-\lambda t)$)	(0.0328)*	(0.0069)*	(0.0310)**	(0.0079)*
No. Countries	80	80	80	80
No. Observations	393	393	393	393
Specification Tests (p-values)				
(a) Hansen Test:	0.422	0.850	0.399	0.836
(b) Serial Correlation:				
First-Order	0.003	0.000	0.005	0.000
Second-Order	0.359	0.288	0.228	0.281
Exclusion Tests (p-values)				
Ho: Exchange Rate Flexibility Coeff. = 0	0.1155	0.1185	0.0627	0.0908
Ho: International Financial Intergration Coeff. = 0	0.0419	0.0705	0.0974	0.0941
Ho: Flexibility*International Financial Integration Coeff.= 0		0.0922		0.0518

*** means significant at 1%, ** at 5% and * at 10% (# at 11%)
D = 1 if country is categorized as 1 or 2 (poor) by the World Bank and 0 otherwise (rich)

Table 21: Growth Effects of the Flexibility of Exchange Rate Regimes with de jure Classification in Poor Countries

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.7093	0.8699	0.7845	0.9125
(log(initial real GDP per capita))	(0.1703)***	(0.0614)***	(0.2876)***	(0.0908)***
Degree of the Exchange Flexibility	-0.0852	-0.0172	-0.0794	-0.0181
(Reinhart and Rogoff classification)	(0.0293)***	(0.0106)#	(0.0320)**	(0.0111)#
Financial Development	0.4068	0.1072	0.4401	0.1730
(private domestic credit/GDP, in logs)	(0.1453)***	(0.0398)**	(0.1931)**	(0.0638)**
International Financial Integration	0.9985	0.2432	0.9893	0.3930
(de jure official equity market liberalization)	(0.6009)*	(0.1426)*	(0.6031)*	(0.2167)*
Flexibility*International Financial Integration		0.0324		0.0305
		(0.0167)*		(0.0185)*
Education	0.0977	0.0719	0.0826	0.0859
(secondary enrollment, in logs)	(0.0936)	(0.0333)**	(0.1018)	(0.0427)*
Trade Openness	-0.0807	-0.0536	-0.1034	-0.0768
(exports+imports / GDP, in logs)	(0.1900)	(0.0470)	(0.2102)	(0.0838)
Government Burden	-0.5206	-0.2408	-0.4761	-0.3228
(government consumption/GDP, in logs)	(0.2453)**	(0.1300)*	(0.2904)	(0.1823)*
Price instability	0.1112	-0.1131	0.1035	-0.0746
(inflation rate, in log[100+inf.rate])	(0.1593)	(0.0794)	(0.1785)	(0.0657)
Crisis			-0.5794	-0.0734
(banking or currency crisis dummy)			(1.8047)	(0.3304)
Implied Lambda	0.0429	0.0174	0.0303	0.0114
($\alpha = \exp(-\lambda t)$)	(0.0259)*	(0.0063)**	(0.0268)	(0.0067)*
No. Countries	39	39	39	39
No. Observations	214	214	214	214
Specification Tests (p-values)				
(a) Hansen Test:	0.989	0.998	0.977	0.972
(b) Serial Correlation:				
First-Order	0.006	0.001	0.030	0.000
Second-Order	0.637	0.230	0.679	0.838
Wald Tests (p-values)				
Ho: Exchange Rate Flexibility Total Effect = 0		0.0698		0.0904
Ho: International Financial Intergration Total Effect = 0		0.0841		0.0501

*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Table 22: Growth Effects of the Flexibility of Exchange Rate Regimes with de jure Classification in Rich Countries

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.7993	0.8161	0.8051	0.8287
(log(initial real GDP per capita))	(0.1409)***	(0.1341)***	(0.1126)***	(0.1665)***
Degree of the Exchange Flexibility	-0.0142	-0.0161	-0.0174	-0.0213
(Reinhart and Rogoff classification)	(0.0085)*	(0.0063)**	(0.0096)*	(0.0080)***
Financial Development	0.1546	0.1825	0.1933	0.1941
(private domestic credit/GDP, in logs)	(0.0849)*	(0.1070)*	(0.0841)**	(0.1136)*
International Financial Integration	0.1864	0.2111	0.2292	0.2611
(de jure official equity market liberalization)	(0.1047)*	(0.1172)*	(0.1261)*	(0.1230)**
Flexibility*International Financial Integration		0.0227		0.0239
		(0.0113)**		(0.0121)**
Education	-0.0462	0.1347	-0.0577	0.1549
(secondary enrollment, in logs)	(0.0681)	(0.0829)	(0.0671)	(0.0911)*
Trade Openness	-0.1505	-0.0867	-0.0387	-0.0992
(exports+imports / GDP, in logs)	(0.0848)*	(0.1212)	(0.1218)	(0.1447)
Government Burden	-0.4275	-0.4202	-0.4432	-0.4622
(government consumption/GDP, in logs)	(0.2284)*	(0.2511)*	(0.2363)*	(0.2695)*
Price instability	-0.1489	0.0568	-0.1782	0.0824
(inflation rate, in log[100+inf.rate])	(0.1481)	(0.3067)	(0.2089)	(0.3057)
Crisis			0.1111	0.0560
(banking or currency crisis dummy)			(0.1967)	(0.1652)
Implied Lambda	0.0280	0.0254	0.0271	0.0235
($\alpha = \exp(-\lambda t)$)	(0.0155)*	(0.0128)**	(0.0164)*	(0.0141)*
No. Countries	36	36	36	36
No. Observations	224	224	224	224
Specification Tests (p-values)				
(a) Hansen Test:	0.902	0.955	0.833	0.917
(b) Serial Correlation:				
First-Order	0.029	0.023	0.020	0.030
Second-Order	0.437	0.252	0.247	0.263
Wald Tests (p-values)				
Ho: Exchange Rate Flexibility Total Effect = 0		0.1292		0.1036
Ho: International Financial Intergration Total Effect = 0		0.0384		0.0274

*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Table 23: Growth Effects of the Flexibility of Exchange Rate Regimes with de jure Classification excluding by Region

Dependent variable: log(Real GDP per capita)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1960 - 2000			
Unit of observation:	Non-overlapping 5-year average			
	(1)	(2)	(3)	(4)
Initial Output per Capita	0.5389	0.7043	0.5124	0.6241
(log(initial real GDP per capita))	(0.1114)***	(0.0970)***	(0.1125)***	(0.1090)***
Degree of the Exchange Flexibility	-0.0160	-0.0102	-0.0182	-0.0228
(Reinhart and Rogoff classification)	(0.0075)**	(0.0061)*	(0.0096)*	(0.0102)**
D*Degree of the Exchange Flexibility	-0.0767	-0.0094	-0.0677	0.0079
	(0.0407)*	(0.0057)*	(0.0414)*	(0.0056)
Financial Development	0.5473	0.2191	0.5396	0.2429
(private domestic credit/GDP, in logs)	(0.1276)***	(0.0881)**	(0.1198)***	(0.0738)***
International Financial Integration	0.2008	0.1976	0.2044	0.2511
(de jure official equity market liberalization)	(0.1052)*	(0.1071)*	(0.1104)*	(0.1166)**
D*International Financial Integration	0.7596	0.0576	0.7437	0.0973
	(0.3555)**	(0.0309)*	(0.4328)*	(0.0453)**
Flexibility*International Financial Integration		0.0212		0.0233
		(0.0105)**		(0.0113)**
D*Flexibility*International Financial Integration		0.0106		0.0104
		(0.0055)*		(0.0063)*
Education	0.0874	0.0587	0.0837	0.0682
(secondary enrollment, in logs)	(0.0995)	(0.0355)*	(0.0988)	(0.0408)*
Trade Openness	-0.2118	-0.1849	-0.2389	-0.1136
(exports+imports / GDP, in logs)	(0.1633)	(0.1264)	(0.1730)	(0.1299)
Government Burden	-0.5823	-0.6029	-0.6814	-0.6535
(government consumption/GDP, in logs)	(0.3355)*	(0.2135)***	(0.3581)*	(0.2281)***
Price instability	0.2485	0.0500	0.2735	0.1173
(inflation rate, in log[100+inf.rate])	(0.1774)	(0.1129)	(0.1849)	(0.1492)
Crisis			0.2104	0.2413
(banking or currency crisis dummy)			(0.1186)*	(0.1238)*
Implied lambda	0.0773	0.0438	0.0836	0.0589
($\lambda = \exp(-x)$)	(0.0411)*	(0.0172)**	(0.0450)*	(0.0218)**
No. Countries	75	75	75	75
No. Observations	438	438	438	438
Specification Tests (p-values)				
(a) Hansen Test:	0.934	0.879	0.943	0.422
(b) Serial Correlation:				
First-Order	0.009	0.003	0.008	0.009
Second-Order	0.382	0.844	0.153	0.678
Exclusion Tests (p-values)				
Ho: Exchange Rate Flexibility Coeff. = 0	0.0255	0.0979	0.0542	0.1432
Ho: International Financial Intergration Coeff. = 0	0.0922	0.0388	0.0186	0.0254
Ho: Flexibility*International Financial Integration Coeff.= 0		0.0778		0.0486

*** means significant at 1%, ** at 5% and * at 10% (# at 11%)
D = 1 if country is categorized as 1 or 2 (poor) by the World Bank and 0 otherwise (rich)

negative across specifications. Finally, results from Table 23 -using the indicator variable *D*- are consistent with the evidence presented before that countries with lower levels of IFI may derive growth benefits from maintaining a rigid exchange rate regime. In fact, the exclusion tests are also giving evidence -although usually at the 10% level- of a differential effect that is sensitive to the choice of country groups.

3.4.5 Exchange Rate Effects Decomposition

Another approach to the endogeneity issue is to rely on the existing literature that tries to explain exchange rate regimes. As also discussed by Aghion, Bacchetta, Ranciere and Rogoff (2006), the literature on the endogeneity of exchange rate regimes is extensive and largely inconclusive. To focus on a recent paper, using the classification of Levy-Yeyati and Sturzenegger (2003), Levy-Yeyati, Sturzenegger and Reggio (2004) find that some political variables can explain the likelihood of adopting a given exchange rate regime. Based on this idea of a "good" instrument, this section will try to isolate the extent to which IFI is affecting the choice of exchange rate regime and the extent to which it is affecting per capita growth.

The effect of IFI on growth will be decomposed into two channels: a direct growth channel and an indirect exchange rate regime channel effect. The latter effect captures the choice of exchange rate regime determinants and will follow the discussion by Levy-Yeyati, Sturzenegger and Reggio (2004). The main advantage of this approach is that it quantitatively allows to compare the expected growth benefits coming from the degree of IFI with a more fixed exchange rate regime with the growth effects arising from a more flexible regime.

The methodology used here consists of a treatment effects model as described by Heckman (1978). This technique, largely used in labor economics, has recently been applied to growth regressions by Ranciere, Tornell, and Westermann (2006). The empirical strategy will consist in adding to a growth regression that includes the degree of IFI a *propensity to peg* dummy that will be described below. Moreover, the propensity to peg variable will be considered endogenous and depending on several variables including the degree of IFI. This

way, the impact of the degree of IFI on growth is composed of two effects: (i) a direct effect on growth conditional on an augmented set of control variables that includes IFI, and (ii) an indirect effect reflecting the growth effects associated with a higher propensity to peg the exchange rate. Letting the subscripts i and t represent country and time period respectively, the equation considered is given by

$$y_{it} = \alpha X_{it} + \beta IFI_{it} + \varphi I_{it}^{peg} + \varepsilon_{it} \tag{3.29}$$

$$I_{it}^{peg} = \begin{cases} 1 & if\ aZ_{it} + bIFI_{it} + \xi_{it} > 0 \\ 0 & otherwise \end{cases} \tag{3.30}$$

where y_{it} is the growth rate of the logarithm of real per capita GDP in country i at time t, X_{it} represents the set of explanatory variables used in the previous sections, IFI_{it} is the measure of international financial integration[21]. I_{it}^{peg} is the propensity to peg dummy variable that takes on a value of 1 if country i is classified as fixed exchange rate regime in period t according to the Reinhart and Rogoff (2004) exchange rate classification and a value of 0 otherwise[22]. Z_{it} is a set of control variables used by Levy-Yeyati, Sturzenegger and Reggio (2004) that reflects the three main approaches to account for the way exchange rate regimes are chosen[23]: (i) the optimal currency area theory, (ii) the financial view and (iii) the political view. To account for the optimal currency area theory the variables included are the GDP per capita, trade openness, and terms of trade shocks to capture the incidence of real shocks. The financial view, which highlights the consequences of international financial integration, is captured by the measure of IFI and a measure of total capital flows (inward and outward flows of portfolio investments and financial derivatives as a share of GDP). Finally, the political view, which stresses the use of exchange rate anchors as credibility enhancers in politically challenged economies is captured by including a variable of the number of years that the incumbent administration has been in office (*years in office*) and a variable of the number of veto points in the political system (*veto points*) as reported in Henisz (2002), which measures directly the constraints on the executive. This last variable represents a measure

[21] Time dummies to account for time-specific effects are also included.

[22] In particular, when the exchange rate regime classification is below or equal to 7, the regime is classified as fixed and the variable I_{it}^{peg} takes the value of 1.When is greater or equal to 8, the regime is classified as flexible and the variable I_{it}^{peg} takes the value of 0.

[23] The reader is referred to Levy-Yeyati, Sturzenegger and Reggio (2004) for a detailed discussion.

of government weakness. Lagged values (indicated by placing a 1 after the variable) were used where endogeneity may be a concern. Moreover, all regressions include year dummies. The detailed description of each variable is presented in Table 10.

3.4.5.1 (Two-Step) Estimation Procedure To complete the treatment effects model description and show how this model can be estimated in a two-step procedure an additional assumption needs to be made: ξ_{it} will be distributed $N(0,1)$ so

$$I_{it}^{peg} = \begin{cases} 1 & with \ \Pr\left(aZ_{it} + bIFI_{it} + \xi_{it} > 0\right) = \Phi\left[aZ_{it} + bIFI_{it}\right] \\ 0 & with \ \Pr\left(aZ_{it} + bIFI_{it} + \xi_{it} \leq 0\right) = 1 - \Phi\left[aZ_{it} + bIFI_{it}\right] \end{cases} \tag{3.31}$$

where Φ is the cumulative distribution function of a standard normal, hence this can be estimated using a *probit* model. Moreover, as shown by Maddala (1983) if it is also assumed that the error terms follow a bivariate normal but not independent distribution this model can be estimated in a two-step procedure[24]. The first step implies the estimation of the probit model (3.31) and the construction of the hazard rate h_{it}[25]. In the second step, the growth regression (3.29) is estimated including, as an additional regressor, the hazard rate h_{it}. Therefore, the total effect of IFI is the sum of a direct effect, β, and an indirect effect due to a change in the probability (*propensity*) to peg.

Finally, although for estimation purposes the annual frequency of the data is convenient, the growth regression does not allow to filter out fluctuations at the business cycle frequency. Hence, a possible solution is to combine a growth regression estimated using five-year averages with a probit propensity to peg model estimated at an annual frequency. In other words, the first step remains the same but, the second step is modified to allow for the possibility of pegging the currency in any given year during the five-year period.

[24] Actually, Heckman (1978) and Maddala (1983) show that the model can also be jointly estimated by a maximum likelihood procedure.

[25] The hazard rate can be written as:

$$h_{i,j} = \begin{cases} \frac{\phi\left(\widehat{a}Z_{it} + \widehat{b}IFI_{it}\right)}{\Phi\left[\widehat{a}Z_{it} + \widehat{b}IFI_{it}\right]} & if \ I_{it} = 1 \\ \frac{-\phi\left(\widehat{a}Z_{it} + \widehat{b}IFI_{it}\right)}{\left\{1 - \Phi\left[\widehat{a}Z_{it} + \widehat{b}IFI_{it}\right]\right\}} & if \ I_{it} = 0 \end{cases}$$

where ϕ is the density function of the standard normal and $\widehat{a}$ and $\widehat{b}$ are the probit estimates.

3.4.5.2 Decomposition Results The main results are presented in Table 24 and can be summarized as follows. First, for the full sample using annual and five-year average data, IFI has a significant direct positive effect on per capita GDP growth with a $\widehat{\beta} > 0$. Second, the propensity to peg, estimated through the probit equation, has a positive and significant impact on growth with a $\widehat{\varphi} > 0$. This implies that moving from a flexible exchange rate regime to a fixed one has a positive impact on per capita GDP growth. Third, due to the fact that $\widehat{b} > 0$, the degree of IFI increases the propensity to peg the currency. Openness to trade and total capital flows are associated with a higher propensity to peg the currency while the number of years in office of the incumbent executive and the veto points have a negative influence.

For the poor and the rich countries samples, in terms of the growth equation, both the IFI and the propensity to peg have a significant direct impact what gives evidence that pegging the currency may be growth enhancing. These last results -both for the whole and the poor and rich samples- were already confirmed by the dynamic panel analysis in the previous section. Regarding the treatment equation, the degree of IFI clearly increases the propensity to peg the currency in both samples.

In order to get some geographic perspective of the different countries involved in the poor and rich subsamples, this section also exploits the division of the sample into regions following the World Bank categories. The results for the five-year average for the different regions are the following. First, for the industrialized countries, Latin America and the Middle East, the degree of IFI has a significant direct positive effect on per capita GDP growth. For Africa and Asia, although the coefficients are positive the showed not significant at a 10%[26]. Second, the propensity to peg has a significant positive impact on growth for all the regions with the exception of the industrialized countries. The latter group, although the impact is positive it is not significant. As before, when $\widehat{\varphi} > 0$, implies that the move from a flexible regime to a fixed one is growth enhancing. Third, the degree of IFI increases the propensity to peg the currency in general. For Africa, Latin America and the Middle East countries, the effect is clearly positive. That is, it generates a higher propensity to peg. For the industrialized countries, although the IFI increases the propensity to peg the effect is not significant at a

[26] At least for Asia, some intuition for this result was coming from the Figure 7.

Table 24: International Financial Integration, Flexibility of Exchange Rate and Growth

Estimation: Treatment Effect Model, Two Step Estimation
(Robust standard errors are presented below the corresponding coefficients)

Period	1960 - 2000	1960 - 2000	1960 - 2000	1960 - 2000	1960 - 2000	1960 - 2000	1960 - 2000	1960 - 2000	1960 - 2000
Sample:	Whole	Whole	Poor Countries	Rich Countries	Industrial	Africa	Asia	Latin America	Middle East
Unit of observation:	Annual	Non-overlapping 5-year average	Non-overlapping 5-year average	Non-overlapping 5-year average	Non-overlapping 5-year average	Non-overlapping 5-year average	Non-overlapping 5-year average	Non-overlapping 5-year average	Non-overlapping 5-year average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Growth Equation									
Dependent variable: Real per capita GDP growth									
Initial Output per Capita	-0.7184	-0.5288	-0.9111	-0.4270	0.2261	0.1939	-2.8425	-0.8019	-1.5450
(log(initial real GDP per capita))	(0.2193)***	(0.2903)*	(0.5363)*	(0.2468)*	(0.4054)	(0.3421)	(2.2251)	(0.8483)	(1.5199)
International Financial Integration	0.2619	0.3090	0.5186	0.2836	0.4353	0.1504	0.2484	0.7085	0.8012
(Chinn-Ito, capital account variable)	(0.1254)**	(0.1508)**	(0.1556)***	(0.1622)*	(0.1995)**	(0.4816)	(0.5238)	(0.4217)*	(0.5661)*
Trade Openness	0.3160	0.5877	0.6303	0.3854	-0.7835	1.6266	2.1251	-0.3422	1.9434
(exports+imports / GDP, in logs)	(0.2334)	(0.3691)	(0.5821)	(0.4410)	(0.6051)	(0.7029)**	(1.5229)	(0.5289)	(1.1200)*
Government Burden	-0.4800	-0.4880	-0.3394	-0.2135	2.3717	-0.7280	0.3646	-0.9464	-0.4403
(government consumption/GDP, in logs)	(0.3000)*	(0.3705)	(0.3826)	(0.2098)	(1.3131)*	(1.1887)	(2.6901)	(0.8957)	(1.3193)
Price instability	-3.4422	-1.6086	-1.7427	-1.4190	-18.0956	-5.8650	-15.9753	-1.6356	8.8841
(inflation rate, in log[100+inf.rate])	(0.9551)***	(0.5085)***	(0.5974)***	(0.6663)**	(6.3651)***	(1.9557)***	(11.3888)	(0.5193)***	(2.8136)***
Crisis	-1.0322	-2.3531	-3.2503	-2.0585	-2.9228	-7.6947	-1.6329	-0.6197	-14.7934
(banking or currency crisis dummy)	(0.5708)*	(0.8340)***	(1.1567)***	(1.0723)*	(0.9471)***	(4.1498)*	(1.8900)	(1.8509)	(3.7103)***
Propensity to Peg	2.1734	2.7911	3.0191	1.9822	0.5417	1.6457	4.7466	2.8325	4.3978
(dummy based on RR classification)	(1.1028)**	(1.3284)**	(1.3729)**	(1.2006)*	(1.3154)	(1.0048)#	(2.3233)**	(1.7542)*	(2.6817)*
First-Step Hazard	1.3213	1.3213	2.6716	-1.1977	-1.3231	-0.8359	-0.2758	1.3070	1.1990
	(0.7004)*	(0.7004)*	(1.4921)*	(0.5781)**	(0.9873)	(0.9806)	(1.1012)	(1.1543)	(1.6874)
Panel B: Treatment (Probit) Equation									
Dependent variable: Propensity to Peg									
Initial Output per Capita1	-0.2797		-0.2001	-0.3305	-0.6001	0.1865	0.1241	0.1280	-1.7933
(log(initial real GDP per capita))	(0.0422)***		(0.0613)***	(0.0859)***	(0.1253)***	(0.0863)**	(0.2315)	(0.1514)	(0.7008)***
Trade Openness1	0.1709		0.2446	-0.1088	1.2949	1.2726	-0.5329	-0.1803	1.4781
(exports+imports / GDP, in logs)	(0.0605)***		(0.0945)***	(0.0882)	(0.1919)***	(0.2580)***	(0.2259)**	(0.1346)	(0.5527)***
Terms of Trade Shocks	-0.1916		-0.9472	0.2218	-3.4063	-1.1917	2.6996	0.7076	-1.3234
(standard deviation of ToT growth)	(0.4541)		(0.5299)*	(0.1321)*	(2.1397)#	(1.0852)	(2.4592)	(1.0586)	(2.6281)
International Financial Integration1	0.2050		0.5521	0.0898	0.0967	0.6630	-0.1257	0.5335	0.7938
(Chinn-Ito, capital account variable)	(0.0300)***		(0.0588)***	(0.0427)**	(0.0802)	(0.1273)***	(0.1073)	(0.0740)***	(0.2347)***
Total Capital Flows1	0.9026		-0.4240	2.3809	1.4756	-1.4167	-1.3281	-0.5300	-1.1969
(Inflows+outflows/GDP, in logs)	(0.3193)**		(0.7145)	(0.4320)***	(0.6317)**	(1.5587)	(1.3333)	(0.7121)	(1.5465)
Years in Office	-0.0250		-0.0292	-0.0533	0.1318	-0.1255	-0.1423	0.1404	0.1782
(number of years)	(0.0139)*		(0.0181)	(0.0278)*	(0.0764)*	(0.0403)***	(0.0608)**	(0.1149)	(0.0796)**
Years in Office squared	0.0006		0.0004	0.0025	-0.0114	0.0030	0.0066	-0.0160	-0.0039
(number of years)	(0.0005)		(0.0005)	(0.0012)**	(0.0059)*	(0.0013)**	(0.0027)**	(0.0105)	(0.0017)**
Veto Points1	-0.1533		-0.0925	-0.2225	-0.0195	-0.5271	-0.2224	-0.0573	-0.5314
(constraints on the executive)	(0.0227)***		(0.0301)***	(0.0409)***	(0.1575)	(0.0697)***	(0.0626)***	(0.0585)	(0.2544)**
Rho	0.275		0.470	-0.305	-0.385	-0.139	-0.146	0.297	0.241
Sigma	4.794		5.690	3.925	3.687	5.996	3.475	4.408	4.969
Lambda	1.321		2.672	-1.198	-1.323	-0.836	-0.276	1.307	1.199
No. Observations	1438	297	162	171	77	66	56	100	35
No. of Countries	82	81	45	36	20	19	13	21	8

*** means significant at 1%, ** at 5% and * at 10%
includes time dummies and constant

10%. Finally, the point estimate for Asia showed negative, something that would reverse the main argument, but not significant. Moreover, openness to trade is usually associated with a higher propensity to peg while the veto points have a negative influence. Interestingly the impact of the variable capturing the institutional setup of the number of years the chief executive has been in office varies and sometimes exerts a negative influence and some other times that influence is positive.

Since the probit model is non-linear, the partial effect of a change in one variable on the propensity to peg depends on the value of the other variables. As a first step, what is interesting is to compute the average partial effect of the degree of IFI on the propensity to peg. Once this step is completed, the indirect growth effect of the degree of IFI on per capita GDP growth can be computed by multiplying the point estimate of the growth effect of the propensity to peg, $\widehat{\varphi}$, by the average partial effect of IFI on the propensity to peg. Table 25 summarizes the decomposition of the effects of IFI on per capita GDP growth. In the first column the annual frequency results are presented while the other columns are for the five-year average. For the entire sample, both at the annual and at the five-year average period, the total growth effect of IFI is below one percentage point of annual GDP growth[27]. In order to have a reference value, Table 26 presents the per capita GDP growth rate. Thus, compared with the 2.21% average growth rate, the total growth effect of IFI computed from the decomposition exercise is on average 36%. In terms of the poor and rich countries samples, the former exhibits a greater direct and indirect growth effect with a total effect of 0.74 percentage points (compared to a 1.74% average per capita GDP growth rate); more than twice than that of the rich countries. This result is giving evidence of the potential effect of IFI on growth and the space that poor countries have to benefit from that impact. In terms of the regions, Latin America and the Middle East countries are exceptions, with the highest total growth effect, around 0.9 percentage point. The latter result gives evidence of the potential growth effect of IFI for regions with an average per capita GDP growth rate of 1.90%, as shown in Table 26. For the remaining results, two groups can be distinguished. For the industrialized, Asia, and Middle East countries, the direct growth effect is much

[27]Previous studies by Ranciere, Tornell, Westermann (2006) and Bekaert, Havery and Lundbland (2005) find a similar one percentage point increase in annual growth due to a higher degree of international financial integration.

Table 25: Decomposition of the Effects of International Financial Integration on Growth

	Whole Sample		Poor Countries	Rich Countries	Industrial	Africa	Asia	Latin America	Middle East
Frequency of the Growth Equation:	Annual	5-year Average	5-year Average	5-year Average	5-year Average	5-year Average	5-year Average	5-year Average	5-year Average
Direct Growth Effect	0.26%	0.31%	0.52%	0.28%	0.44%	0.15%	0.25%	0.71%	0.80%
Indirect Growth Effect	0.14%	0.11%	0.22%	0.03%	0.03%	0.33%	0.06%	0.12%	0.06%
Total Growth Effect	0.40%	0.36%	0.74%	0.31%	0.46%	0.48%	0.31%	0.82%	0.86%
χ^2 - test: Total Growth Effect =0 (p-value)	0.00	0.00	0.04	0.01	0.02	0.00	0.64	0.05	0.01

Table 26: Per capita GDP Growth by Region

	Whole Sample	Poor Countries	Rich Countries	Industrial	Africa	Asia	Latin America	Middle East
Mean	2.21%	1.74%	2.79%	2.84%	1.25%	3.39%	1.71%	2.01%
Standard Deviation	2.90%	2.98%	2.69%	2.63%	3.12%	2.64%	2.76%	2.85%

greater than the indirect effect, it approximately accounts for 90% of the total effect and compares to the 2.75% average per capita GDP growth of those regions. On the other hand, in Africa and Latin America, the indirect effect plays a more important role in the total growth effect. For the African countries, this indirect effect reflects more than 70% of the total growth effect while in Latin America this number is slightly above the 80%. Finally, it is worth noting that the estimates in this analysis for Asia showed not significant at a 10%, something that might be giving evidence of the presence of other factors to consider when analyzing the Asian region.

3.5 CONCLUSION

This paper examines the relationship between exchange rate regimes, the degree of IFI and economic growth from 1960 to 2000, paying particular attention to potential endogeneity issues. In particular, it is argued that it is important not only to look at the effect of the exchange rate regime but also at the interaction between the exchange rate regime and the degree of IFI. The paper generalizes Aghion, Bacchetta, Ranciere and Rogoff (2006) by focusing not only on the domestic market structure but also on the degree of completeness of international financial market. Hence, in the theoretical model, a more flexible exchange rate can reduce average growth, especially in countries with low financially developed domestic credit markets and low degrees of international financial integration. When confronting the predictions of the theoretical model with the cross-country panel data, the main hypothesis is confirmed suggesting the importance of the degree of IFI for how the choice of exchange rate regime affects growth. Results proved robust to different samples and measurement of the variables IFI and exchange rate classification. A final exercise shows that when explicitly considering the endogeneity of exchange rate regime determination, the degree of IFI still leads to faster average long run growth.

The results obtained run contrary to the standard exchange rate models. This is important from a policy perspective, since it indicates that the exchange rate regime needs to be considered in the light of the development of domestic credit markets and the degree of international financial integration of a country.

4.0 THE POLITICAL ECONOMY OF EXCHANGE RATES IN LATIN AMERICA

4.1 INTRODUCTION

All prices in any economy are in one way or another affected by the exchange rate, but what really influences the choice of exchange rate? The traditional explanations tend to focus on purely economic factors like the theory of optimal currency areas and the financial integration approach, but in the last decade there has been a growing scholarly interest from economics, finance and political science in the political economy view of exchange rate determination[1]. In other words, without denying the importance of economic factors, their importance depend on the preferences and positions of political actors. Government intervention in managing the exchange rate is controversial since it is inevitably conditioned by the preferences of its constituents. Hence, the ultimate decision over the form of the exchange rate regime adopted has roots in not just purely economic, but also political motivations[2]. The political economy of exchange rate policy involves a process where governments face pressure from different social groups that reflect their preference, the conflict among them, and eventually how strong they are. This conflict has certainly been a defining factor in Latin America's economic history, and it has on occasion erupted in the form of a massive runs on the

[1]For the theory of optimal currency areas the choice of regime is related to the geographical and trade aspects. This approach weights the trade and welfare gains from a stable exchange rate vis à vis the country's main trade partners, against the benefits of exchange rate flexibility as a shock adjuster in the presence of nominal rigidities. The financial view is based on the incidence of the impossible trinity (the fact that policymakers can choose at most two out the three vortexes of the trinity -capital mobility, monetary policy and a fixed exchange rate-) and balance sheet effects.

[2]For example, Calvo and Reinhart (2002) show that conflicting policymaker objectives induce a time inconsistency problem with regard to the response of the central bank to exchange risk premia shocks; the "fear of floating" phenomenon. Another example is Caballero and Krishnamurthy (2004) who study a setup where the credibility to conduct monetary policy is undermined by liquidity shortages in the event of a crisis.

currencies, imposing real costs and economic stress on the country involved. The literature on the appropriate currency policy is vast but unlike the case of trade or fiscal policy, there is no simple welfare benchmark; so the debates typically involve different weightings of the trade-offs associated with the exchange rate policy choices.

Two relevant currency decisions confront policymakers, and each has distributional consequences: the regime by which the currency is managed, and the level of the currency. The regime decision involves choosing whether to float or fix the exchange rate, or to adopt a system in between a hard fix and a pure float. The level decisions, assuming the currency is not fixed, involve choosing the desired level of the real exchange rate. In short, the government must decide whether it prefers a relatively high or relatively low international value for its currency. Regime decisions involve trade-offs among desired national goals, whose benefits and costs fall unevenly on actors within countries. In an open economy, fixed rate regimes have two main national benefits: first, they promote trade and investment by reducing exchange rate risk. Second, fixed rates promote domestic monetary stability. The cost of fixing the exchange rate is that the government sacrifices its capacity to run an independent monetary policy.

The distributional effects of regime choice depend largely on the extent to which the economic actors are engaged in international economic activity. For example, those agents involved in foreign trade and investment tend to favor exchange rate stability, since currency volatility makes their business riskier and more costly. By contrast, groups whose economic activity is confined to the domestic economy benefit from floating regimes[3]. Scholars like Hefeker (1996), Eichengreen (1995), Frieden (1997), Frieden, Ghezzi and Stein (2001), Leblang (2003) and Frieden, Leblang and Valev (2008) have examined empirically the role of interest groups in exchange rate regime determination in a variety of contexts[4].

As with the regime decision, the choice of the level of the exchange rate has distributional and electoral implications. The choice of having a relatively appreciated or a relatively depreciated currency involves a basic political economy trade-off between competitiveness

[3]In fact, Frieden (2002) finds that special interests have a significant influence on both exchange rate depreciation as well as exchange rate volatility.

[4]Furthermore, the regime choice has electoral implications which vary with the structure of political institutions (Bernhard and Leblang, 1999).

and purchasing power. Group currency preferences are affected by economic factors, and the degree to which groups can turn these preferences into policy is affected by political institutions. In fact, some of the regularities about preferences over the currency level are related to points made above about the regime preferences. It is clear that political institutions affect the impact of special interests on economic policy, including exchange rate policy. By the same reasoning, exchange rate policies are affected by electoral institutions and the timing of elections[5].

This paper involves two stages. In the first stage, a theoretical stylized model will be laid out in order to address how the political economy of exchange rate policy is driven. The political game follows a simplified version of Baron's (1994) and Persson's (1998) and models the interaction between special interest groups and policymakers and eventually how this translates to pressures on the size of the change of the exchange rate. In the analysis of how actors participate in the policymaking process and affect outcomes it should be kept in mind that the analysis will be based only on Olson's (1965) "organized" groups which can eventually become political players, that is, special interest groups[6]. As suggested before, the economic structure is crucial for defining potential actors, that is, the share and type of tradable goods produced in an economy should be important for defining preferences and strategies for special interest groups. These groups will be assumed to use traditional mechanisms of policy influence, such as lobbying legislators and ministers, making explicit political alliances (or making short-term contributions in money or manpower to political parties), or helping the government in policy implementation and coordination[7].

The special feature of the theoretical model is that it adapts a model of electoral competition to a political game where the exchange rate is subject to political competition by special interest groups that pressure -based on their preferences- to influence policymakers.

In the second stage of this project, an empirical analysis will be conducted taking the model to the data. In particular, the determinants of the choice of exchange rate regime

[5] Another issue to consider is that interest group activity on the level of the exchange rate may vary over time and across countries, and its impact on policy is a function of national political institutions.

[6] It is know since Olson (1965) that the organizational advantages of special interest groups give them special influence on government policy and that this influence might have damaging effects on the economy as a whole.

[7] See Grossman and Helpman (2001) for an abstract account of the mechanisms used by special interest groups to influence the policymaking process and hence, policy outcomes.

and level in Latin America will be analyzed, placing special emphasis on the political, institutional and interest-group explanations. The appropriate technique when working with multinomial discrete dependent variables, when one has reasons to expect a certain ordering of the groups, is ordered logit or probit. Furthermore, to account for the panel data structure, two additional estimators are used: (i) a random-effects ordered probit and (ii) a probit panel data model with an AR(1) error component.

4.2 THE MODEL

4.2.1 Policymakers

Government policymakers are benevolent and possess objective functions that seek to maximize the welfare of all groups in the economy

$$E_s U_s^i = E_s \int_{i \in I} V_s^i \left(g_s \right) di = E_s \int_{i \in I} V_s^i \left(\varepsilon_s \right) di \tag{4.1}$$

where $E_s U_s^i$ is a vector that corresponds to the welfare of all groups in the country, V^i is the net welfare of a group i -net of contributions received at time s, and g is the redistributive policy vector. In this case the policy will be ε, the exchange rate. Note, that since the government policymakers are benevolent and do not impose personal preferences the redistributive policy vector is entered into the government objective function.

4.2.2 Special Interest Groups

There are J organized lobbying groups, which constitute a subset of the population I, such that for a particular lobbying group $i \in J \subseteq I$[8] that overcome collective action problems and organize themselves as organized special interests. That is, it will be assumed that groups may or may not be organized in a lobby. In fact, only members from group J will be able organize. Special interest groups may undertake a variety of activities to further

[8] Here the characterization of special interests follows Grossman and Helpman's (2001) and is broad enough to include tradable-nontradable distinctions.

their political ends[9]. That includes but is not limited to the collection and dissemination of information. In general, contributions can be interpreted both as in cash and in kind. It will be assumed that special interest groups have access to information that in principle could allow the policymakers to make better policy decisions. But, the policymakers cannot easily verify the claims the special interest groups may have. These groups can offer contributions according to a schedule, $L^i(g)$, with the aim of influencing policy outcomes, i.e. government transfers. Hence, as stated above, the net welfare of a group is then welfare, minus any contributions

$$E_s V_s^i(g) = E_s U_s^i(g) - \frac{1}{2} L_s^i(g)^2 \tag{4.2}$$

The contribution schedule will be assumed to be globally truthful, continuous, differentiable, and non-negative, and is the outcome of the program that maximizes (4.2). That is,

$$L_s^i\left(g, \vartheta^i\right) = \min\left\{\overline{L}_s^i(g), \max\left[0, E_s U_s^i(g) - \vartheta^i\right]\right\} \tag{4.3}$$

where $\overline{L}_s^i(g) = \sup\left\{L_s^i(g) \,|E_s V_s^i(g) \geq 0\right\}$ is the upper limit of feasible contributions that group i is willing to undertake, and ϑ^i is a constant that may be regarded as the reservation utility of the ith lobbying group.

4.2.3 Political Equilibrium

To fully understand the nature and importance of the economic equilibrium, the political dynamics need to be addressed. What matters here is to understand how is the process that ends in the decision regarding an exchange rate change. In fact, after the policymakers announce a change in the exchange rate, either a more depreciated or more appreciated currency, agents in this economy will respond since these types of policies have differential impacts on the sectors of the economy, i.e. tradable and nontradable sectors. The special interest groups have information about the policy environment and will try to persuade the policymakers to take decisions that they consider best. But, in this framework of "opposite bias", in the Grossman-Helpman notation, each group's ideal points for a given state of the

[9]The members of an interest group accumulate knowledge about certain policy issues in the course of performing their everyday activities. Also, they may have the incentive to conduct research on issues of concern to their members.

world lie on opposite sides of the policymakers' ideal. One group prefers a "higher" exchange rate than the politicians, while the other prefers a "lower" one. This pits the special interest groups against one another.

The timing of events within a period can be summarized as follows.

1. Policymakers announce the policy they prefer for the exchange rate. This implies a more devaluated or a more appreciated currency. This announcement is done with no or little knowledge about the true state of the economy.

2. The special interest groups offer their lobbying contributions to influence the regime choice.

3. The monetary authority chooses the exchange rate policy according to a preset exchange rate rule. Furthermore, this selection of exchange rate policy is made with some probability Φ. Hence, there will be a probability Φ^D of a *devaluation* and a probability Φ^R of a *revaluation*.

4. Finally, the exchange rate policy is realized.

The focus will be on the subgame perfect Nash equilibrium concept of this setup and hence it is possible to solve it by backward induction. In the final stage of the game, the monetary authority chooses whether to revalue or devalue the currency. Following Persson and Tabellini's (2000) suggestion to facilitate a simple closed-form solution, the monetary authority's preferences will be considered to be mainly a random variable $\widehat{\gamma} \sim U\left[-\frac{1}{2}, \frac{1}{2}\right]$. with a uniform distribution. Hence,

$$\gamma_s = \widehat{\gamma}_s + h\left(L_s^R - L_s^D\right) \tag{4.4}$$

where $L^l = \int_{i \in J} L^{il} di$ is the aggregate contributions received from all lobbying groups in favor or regime k and h is the degree of influence in the monetary authority from the lobbying groups. In other words, it is a measure of the effectiveness of the lobbying. It is straightforward to see that whenever the special interest groups have the same contributions the second term will be close to zero and hence the monetary authority will decide based on the realization of the random variable $\widehat{\gamma}$.

In this type of environment the general rule that the monetary authority follows to set the regime is one that equate the marginal utility from a revaluation with the marginal utility from a devaluation, adjusted by its own preferences

$$U^i\left(\varepsilon_s^D\right) = U^i\left(\varepsilon_s^R\right) + \gamma_s \tag{4.5}$$

where $i \in J$. Therefore, the probability that the monetary authority decides for a devaluation is given by:

$$\begin{aligned} \Phi^D &= \text{Prob}\left[\widehat{\gamma} \leq \left(U^i\left(\varepsilon_s^D\right) - U^i\left(\varepsilon_s^R\right) + h\left(L_s^D - L_s^R\right)\right)\right] \\ &= \frac{1}{2} + \left[U^i\left(\varepsilon_s^D\right) - U^i\left(\varepsilon_s^R\right) + h\left(L_s^D - L_s^R\right)\right] \end{aligned} \tag{4.6}$$

what implies that the monetary authority has limited independence over exchange rate outcomes. Moreover, the last term reflects the contribution's influence on the expected policy outcome.

Next, in the penultimate stage, special interest groups choose their contributions with respect to each regime. As stated in expression (4.2), the objective of the lobbying groups is to maximize the expected utility of its members net of contributions:

$$\begin{aligned} E_s V_s^i &= E_s U_s^i - \frac{1}{2} L_s^{i\,2} \\ &= \Phi^D U^i\left(\varepsilon_s^D\right) + \Phi^R U^i\left(\varepsilon_s^R\right) - \frac{1}{2}\left[\left(L_s^{iD}\right)^2 + \left(L_s^{iR}\right)^2\right] \end{aligned} \tag{4.7}$$

where $\Phi^R = \left(1 - \Phi^D\right)$ and hence the first two terms refer to the expected utility for the special interest groups from either a devaluation or a revaluation of the currency. The last term ensures the convexity of contributions. For example, if contributions are made in cash then the fact that different member of the group may differ in their willingness to give makes this cost convex. In general, these contributions reflect some sort of disutility and that is reflected in the form of the equation. With no ideology playing a role in the lobbying groups objective function, the first order conditions with respect to L^{iD} and L^{iR} are

$$\frac{\partial EV_s^i}{\partial L^{iD}} = \frac{\partial \Phi^D}{\partial L^{iD}}\left[U^i\left(\varepsilon^D\right) - U^i\left(\varepsilon^R\right)\right] - L^{iD} \quad \leq 0 \tag{4.8}$$

and

$$\frac{\partial EV_s^i}{\partial L^{iR}} = \frac{\partial \Phi^D}{\partial L^{iR}}\left[U^i\left(\varepsilon^D\right) - U^i\left(\varepsilon^R\right)\right] - L^{iR} \quad \leq 0 \tag{4.9}$$

respectively, where $\frac{\partial \Phi^D}{\partial L^{iD}} = h$, follows from (4.6). To solve for the optimal contribution it will be assumed, following Bernheim and Whinston (1986), that these schedules are locally truthful[10]. The latter implies that a contribution in the neighborhood of the equilibrium has the property that $\frac{\partial L^{iP}}{\partial \varepsilon^P} = \frac{\partial U^i}{\partial \varepsilon^P}$ for any P. That is, the slope of the contribution for a devaluation or a revaluation is equal to the true impact of this change on a lobbying group's welfare. Thus the optimal truthful contribution schedules of the lobbying groups are given by:

$$\begin{aligned} L^{iD} &= \max\left[0, h\left(U^i\left(\varepsilon_s^D\right) - U^i\left(\varepsilon_s^R\right)\right)\right], \\ L^{iR} &= -\min\left[0, h\left(U^i\left(\varepsilon_s^D\right) - U^i\left(\varepsilon_s^R\right)\right)\right] \end{aligned} \tag{4.10}$$

where it was assume that equation (4.10) implies that the special interest groups contribute only toward the specific policy -devaluation or revaluation- that gives the group the highest utility; but never will they contribute to more than one. Summing (4.10) across all lobbies gives

$$L^{iD} - L^{iR} = h \int_{i \in J} \left[U^i\left(\varepsilon^D\right) - U^i\left(\varepsilon^R\right)\right] di \tag{4.11}$$

which implies that contributions go, on average, to the policy that is more successful in pleasing the special interest groups.

Turning to the first stage, the policymakers optimize the welfare of all groups in the economy as established by (4.1)

$$\begin{aligned} EU_s^i &= E \int_{i \in I} V_s^i\left(g_s\right) di \\ &= \Phi^D \int_{i \in I} U^i\left(\varepsilon_s^D\right) di + \Phi^R \int_{i \in I} U^i\left(\varepsilon_s^R\right) di \end{aligned} \tag{4.12}$$

Taking the first order conditions of (4.12) and using the fact that both the utility function and its derivative are continuous, the equilibrium allocation can be defined by the following

[10] Actually, when applying the common agency model of Grossman and Helpman (1994,1995) and Bernheim and Whinston (1986), the set up extended by Persson (1998) will be followed since it is more appropriate to study group-specific government policies.

expressions:

$$\begin{aligned}
\frac{\partial EU^i}{\partial \varepsilon^D} &= \frac{\partial \Phi^D}{\partial \varepsilon^D}\int_{i\in I}\left[U^i\left(\varepsilon^D\right)-U^i\left(\varepsilon^R\right)\right]di+\Phi^D\frac{d}{d\varepsilon^D}\int_{i\in I}U^i\left(\varepsilon^D\right)di=0 && (4.13)\\
&= \frac{\partial \Phi^D}{\partial \varepsilon^D}\int_{i\in I}\left[U^i\left(\varepsilon^D\right)-U^i\left(\varepsilon^R\right)\right]di+\Phi^D\int_{i\in I}\frac{\partial U^i\left(\varepsilon^D\right)}{\partial \varepsilon^D}di=0 && (4.14)\\
&= \left[\frac{\partial U^i\left(\varepsilon^D\right)}{\partial \varepsilon^D}+h^2\int_{i\in J}\frac{\partial U^i\left(\varepsilon^D\right)}{\partial \varepsilon^D}di\right]\int_{i\in I}\left[U^i\left(\varepsilon^D\right)-U^i\left(\varepsilon^R\right)\right]di+\Phi^D\int_{i\in I}\frac{\partial U^i\left(\varepsilon^D\right)}{\partial \varepsilon^D}di=0
\end{aligned}$$

and

$$\begin{aligned}
\frac{\partial EU^i}{\partial \varepsilon^R} &= \frac{\partial \Phi^D}{\partial \varepsilon^R}\int_{i\in I}\left[U^i\left(\varepsilon^D\right)-U^i\left(\varepsilon^R\right)\right]di+\Phi^D\frac{d}{d\varepsilon^R}\int_{i\in I}U^i\left(\varepsilon^R\right)di=0 && (4.15)\\
&= \frac{\partial \Phi^D}{\partial \varepsilon^R}\int_{i\in I}\left[U^i\left(\varepsilon^D\right)-U^i\left(\varepsilon^R\right)\right]di+\Phi^D\int_{i\in I}\frac{\partial U^i\left(\varepsilon^R\right)}{\partial \varepsilon^R}di=0 && (4.16)\\
&= -\left[\frac{\partial U^i\left(\varepsilon^R\right)}{\partial \varepsilon^R}+h^2\int_{i\in J}\frac{\partial U^i\left(\varepsilon^R\right)}{\partial \varepsilon^R}di\right]\int_{i\in I}\left[U^i\left(\varepsilon^D\right)-U^i\left(\varepsilon^R\right)\right]di+\Phi^D\int_{i\in I}\frac{\partial U^i\left(\varepsilon^R\right)}{\partial \varepsilon^R}di=0
\end{aligned}$$

It is conspicuous the symmetry between the two conditions and thus a Nash equilibrium involves identical policies, that is, a revaluation or devaluation of the same degree, $\varepsilon^D=\varepsilon^R$. To simplify notation, let $\Lambda^J=\int_{i\in J}\frac{\partial U^i\left(\varepsilon^R\right)}{\partial \varepsilon^R}di$, $\Lambda^I=\int_{i\in I}\frac{\partial U^i\left(\varepsilon^R\right)}{\partial \varepsilon^R}di$ and $U^i\left(\varepsilon^D\right)=-U^i\left(\varepsilon^R\right)$, hence, the optimal exchange rate in the political equilibrium can be expressed as

$$\begin{aligned}
\varepsilon^* &= \varepsilon^D\left(\mathbf{q},\Lambda^J,\Lambda^I,h\right) && (4.17)\\
&= -\varepsilon^R\left(\mathbf{q},\Lambda^J,\Lambda^I,h\right)
\end{aligned}$$

that is, the optimal exchange rate is eventually determined by $\mathbf{q}$ -to be explained below-, the distribution of agents and special interest groups $\left(\Lambda^I,\Lambda^J\right)$, and the extent to which policymakers are influenced by special interest groups, h. Parameter $\mathbf{q}$ includes economic variables associated with welfare or an indirect utility function of each agent. As a result of contributions, special interest groups pressure policymakers and eventually affect the determination of an exchange rate regime and general welfare.

4.2.4 Main prediction and discussion

The main prediction of (4.17) is that the optimal exchange rate will be determined by the economic parameters -such as interest rate, productivity, money demand-, the distribution of agents and special interest groups in the economy $\left(\Lambda^I, \Lambda^J\right)$, and the capacity of special interest groups to influence policymakers as measured by h [11]. This has at least two more implications. The first one is that agents are differentially affected after a change in the exchange rate: this is in fact relevant for non-traded goods producers that are consuming traded goods and whose price will be distorted by any change in the exchange rate. The second one is that since the impact on the tradable and non-tradable goods sector is clear and differential, then the exchange rate became a policy variable that is the subject of political competition through special interest groups potentially associated with those sectors.

To understand how policymakers need to account for the exchange rate regime preferences of their constituents, in particular, for those agents with substantial political influence, it is key to explore the policy preferences of major economic actors. Many economic agents can be expected to have clear preferences over the exchange rate regime: the trade-off between flexible and fixed regimes, already discussed, brings two broad groups against one another, based on how highly they value the two conflicting goals. To stylize the choice, it can be expected that the tradable goods sector -agriculture and industry- are more prone to a flexible regime that can help them by having a depreciated currency. On the other hand, it is expected that those with cross-border economic interests to be more favorable toward a fixed regime. Although this may mask a more complex situation, it gives rise to clear empirically relevant predictions.

4.3 EMPIRICAL STRATEGY

Rather than formally "testing" the model, several implications that seem to shed light on some aspects of institutional and economic choices that affect the exchange rate arrangement are highlighted. The empirical analysis relies on the assumption that governments do have

[11] Moreover, it can be shown from (4.17) that the change in the exchange rate will be larger, the greater the influence of special interest groups in policymakers.

Table 27: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Degree of Exchange Rate Flexibility - RR Classification	703	3.199	1.444	1.000	5.000
M2/Reserves	703	6.410	12.183	0.000	140.134
Real GDP per capita	703	7.718	0.636	6.449	9.070
Real Interest Rate	589	1.886	14.203	-1.158	157.808
Price Instability	699	0.307	0.580	-0.012	4.775
High250	703	0.047	0.212	0.000	1.000
Agricultural Sector/GDP	703	14.186	7.090	3.833	37.702
Industrial Sector/GDP	703	32.298	7.270	16.409	60.561
Private Credit/GDP	633	0.286	0.148	0.029	0.973
Foreign Liabilities/M2	691	0.244	0.328	0.000	3.224
Openness to Trade	684	3.856	0.517	2.336	5.001
Political Risk	456	3.576	0.864	1.233	5.650
Democracy	703	3.936	6.154	-9.000	10.000
Years in Office	607	4.030	4.609	1.000	35.000
Years Left in Current Term	557	1.962	1.463	0.000	7.000
Government Seats in the Legislature	553	68.545	60.432	8.000	300.000
Executive Special Interest	608	0.058	0.233	0.000	1.000
Degree of Exchange Rate Flexibility - LYS Classification	627	3.633	1.264	1.000	5.000
Agricultural Employment/Total Employement	513	22.299	13.593	1.700	58.700
Industrial Employment/Total Employement	513	22.549	4.138	12.900	34.000
International Financial Integration	698	-0.076	1.503	-1.798	2.540
Portfolio Flows/GDP	525	1.400	3.564	0.001	42.273
Vetoplayers	582	2.806	1.470	1.000	7.000
Terms of Trade Shocks	453	0.101	0.069	0.003	0.355
Central Bank Governor Stability	671	0.782	0.341	0.000	1.000
Real Exchange Rate Overvaluation	703	0.000	0.866	-5.011	7.298

Table 28: Sources

Variable	Definition and Construction	Source
Degree of Exchange Rate Flexibility - RR Classification	Exchange rate classification where 1=fully fixed and 5=fully flexible	Author s construction based on Reinhart and Rogoff (2004)
M2/Reserves	Ratio of Broad Money to International Reserves	Author s construction based on International Financial Statistics (IFS) from the IMF
Real GDP per capita	Log of the ratio of total real GDP to total population	Author s construction based on International Financial Statistics (IFS) from the IMF
Real Interest Rate	Lending nominal interest rate minus inflation	Author s construction based on International Financial Statistics (IFS) from the IMF
Price Instability	Log of 100 plus inflation rate	Author s construction based on the World Development Indicators of the WorldBank
High250	Dummy variable that equals 1 if inflation in t-1 is greater than 250	Author s construction based on the World Development Indicators of the WorldBank
Agricultural Sector/GDP	Share of Agriculture in the total GDP	Author s construction based on the World Development Indicators of the WorldBank
Industrial Sector/GDP	Share of Industry in the total GDP	Author s construction based on the World Development Indicators of the WorldBank
Private Credit/GDP	Private credit as a share of total GDP	Beck, Demirgüç-Kunt and Levine (2000)
Foreign Liabilities/M2	Ratio of foreign liabilities to broad money	Author s construction based on International Financial Statistics (IFS) from the IMF
Openness to Trade	Ratio of exports and imports to GDP	Author s construction based on the World Development Indicators of the World Bank
Political Risk	Composite index of government stability, corruption, democractic accountability, bureaucracy quality and law and order	Author s construction based on the International Country Guide Risk (ICRG) of the Political Risk Service Group.
Democracy	Polity IV index of democracy	Marshall and Jaggers (2002) Polity IV Project
Years in Office	Number of years the chief executive has been in office	Beck, Clarke, Groff, Keefer, and Walsh s (2006) Database of Political Institutions from the World Bank
Years Left in Current Term	Years left in current term, where a 0 is an election year and n-1 is the year after the election (n=length of term)	Beck, Clarke, Groff, Keefer, and Walsh s (2006) Database of Political Institutions from the World Bank
Government Seats in the Legislature	Total number of seats held by all government parties	Beck, Clarke, Groff, Keefer, and Walsh s (2006) Database of Political Institutions from the World Bank

Table 29: Sources (cont.)

Variable	Definition and Construction	Source
Executive Special Interest	Dummy variable equals 1 if executive is identified as nationalist, rural, regional or religious.	Beck, Clarke, Groff, Keefer, and Walsh s (2006) Database of Political Institutions from the World Bank
Degree of Exchange Rate Flexibility - LYS Classification	Exchange rate flexibility classification where 1 = inconclusive and 5 = fix	Levy-Yeyati-Sturzenegger (2003)
Agricultural Employment/Total Employement	Share of Agricultural employment in the total employment	Author s construction based on the World Development Indicators of the World Bank
Industrial Employment/Total Employement	Share of Industry employment in the total employment	Author s construction based on the World Development Indicators of the World Bank
International Financial Integration	Index that measures a country□s degree of capital account openness	Chinn and Ito (2006)
Portfolio Flows/GDP	Ratio of inward and outward flows of portfolio investments and financial derivatives to GDP	Author s construction based on the World Development Indicators of the World Bank
Vetoplayers	Number of veto players (actors) whose approval is necessary for a shift in policy from the status quo.	Beck, Clarke, Groff, Keefer, and Walsh s (2006) Database of Political Institutions from the World Bank
Terms of Trade Shocks	Log of the standard deviation of the terms of trade changes over the previous five years	Author s construction based on the World Development Indicators of the World Bank
Government Burden	Log of the ratio of government consumption to GDP	Author s construction based on the World Development Indicators of the World Bank
Foreign Direct Investment	Log of net foreign direct investment	Author s construction based on the World Development Indicators of the World Bank
Central Bank Governor Stability	Normalization between 0 and 1 of the turnover rate of central bank governors for each country	Author s construction based on Dreher, Sturm, deHaan (2008)
Real Exchange Rate Overvaluation	Log difference between the real effective exchange rate and estimated equilibrium (PPP) value for each country	Author s construction based on the World Development Indicators of the World Bank

the ability to affect the regime and level of the real exchange rate, at least in the short and medium term, through the use of exchange rate policy[12]. As stated before, regime decisions involve trade-offs among desired national goals, whose benefits and cost fall unevenly on actors within countries and the distributional effects of regime choice depend largely on the extent to which the economic actors are engaged in international economic activity. In other words, the benefits and costs of exchange rates regimes depend on the characteristics of the country in question. Given the history of high inflation in Latin America, the trade-off is between credibility and competitiveness: that is, between a fixed or a flexible exchange rate arrangement. Actually, the regime classifications used are flexible enough to allow the regime variable to vary along the fixed-flexible dimension.

The empirical analysis is based on a panel of 19 Latin American countries for the period 1975-2006[13]. The period was selected based on data availability. It is indeed, to some extent, possible, to divide the data used in three groups. First, the exchange rate regime classification group that constitutes the dependent variable in the analysis. Second, the economic variables that attempt to capture some of the basic economic determinants of the exchange rate regimes. In that sense, the analysis starts considering variables suggested in the model to then move farther as to include a more broad set of variables. Finally, interest-group, political and institutional variables are discussed. These variables will be of central interest for the analysis to try capturing the political economy process of exchange rate regimes determination. Tables 27, 28 and 29 contain respectively descriptive statistics and the sources of the variables used.

4.3.1 Exchange Rate Regime Classification

Classifying a country's exchange rate regime is not a trivial issue. Although the textbook answer is simple: either fixed or flexible, the richness of real world regimes belies this elegant dichotomy because most governments try to reach some compromise between the different

[12]This assumption comes from the findings of the literature on purchasing power parity that shows that deviations die out very slow.

[13]The countries considered are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Paraguay, Peru, Suriname, Uruguay and Venezuela.

elements of the so-called "impossible trinity", that is, independent monetary policy, rigidly fixed exchange rates, and complete capital mobility[14]. Moreover, popular regimes run the array from currency board and traditional pegs to crawling pegs to crawling pegs, target zones, and floats, with varying degrees of intervention. In their survey, Ghosh, Gulde and Wolf (2003) provide an extensive and detailed description of the different classifications as well as a discussion about what should be relevant for this issue. Hence to pursue this empirical section it is important to decide upon the methodology for classifying regimes.

Two measures to capture the flexibility of exchange rate regime were used in this paper. First, the Reinhart and Rogoff (2004) (RR) classification extended until 2006. This measure is based on the verification of the de facto regime, reclassifying the regimes where the exchange rate behavior does not match what is expected from the stated policy. This annual broad classification orders regimes from the most rigid to the most flexible in 15 categories[15]. To make it more operational, an index of exchange rate flexibility based on 5 categories is constructed, such that the classification of the exchange rate regimes is equally distributed (within each category)[16]. Second, the classification of Levy-Yeyati and Sturzenegger (2003) (LYS) also extended until 2006. This measure, available since 1974, is based on a comparison of exchange rate movements and foreign exchange intervention. Actually it has two different classifications, one is a three-way and the other is five-way. For the purposes of the estimations in this paper I will use the five-way classification.

[14] A key ingredient of the Mundell-Fleming framework is the assumption of perfect capital mobility. This implies international arbitrage across countries in the form of uncovered interest parity. From this model it follows that it is impossible to simultaneously achieve the three goals: exchange rate stabilization, capital market integration and independent monetary policy. This is usually referred to as "impossible trinity". The currency crises in Mexico, Asia, Brazil and Russia, and increasing capital mobility brought the "impossible trinity" hypothesis to the forefront and resulted in a more "bipolar view" of exchange rate regimes. According to this approach, high capital mobility made intermediate regimes less viable in financially open economies. Since monetary policy in financially open economies cannot be aimed simultaneously at maintaining a stable exchange rate and at smoothing cyclical output fluctuations, these countries should move to the corner solutions, i.e. pure float or hard peg.

[15] From Reinhart and Rogoff (2004): 1-No separate legal tender, 2-Pre announced peg or currency board arrangement, 3-Pre announced horizontal band that is narrower than or equal to +/-2%, 4-De facto peg, 5-Pre announced crawling peg, 6-Pre announced crawling band that is narrower than or equal to +/-2%, 7-De factor crawling peg, 8-De facto crawling band that is narrower than or equal to +/-2%, 9-Pre announced crawling band that is wider than or equal to +/-2%, 10-De facto crawling band that is narrower than or equal to +/-5%, 11-Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time), 12-Managed floating, 13-Freely floating, 14-Freely falling and 15-Dual market in which parallel market data is missing.

[16] Figure 16, shows the distribution within categories of the new RR classification.

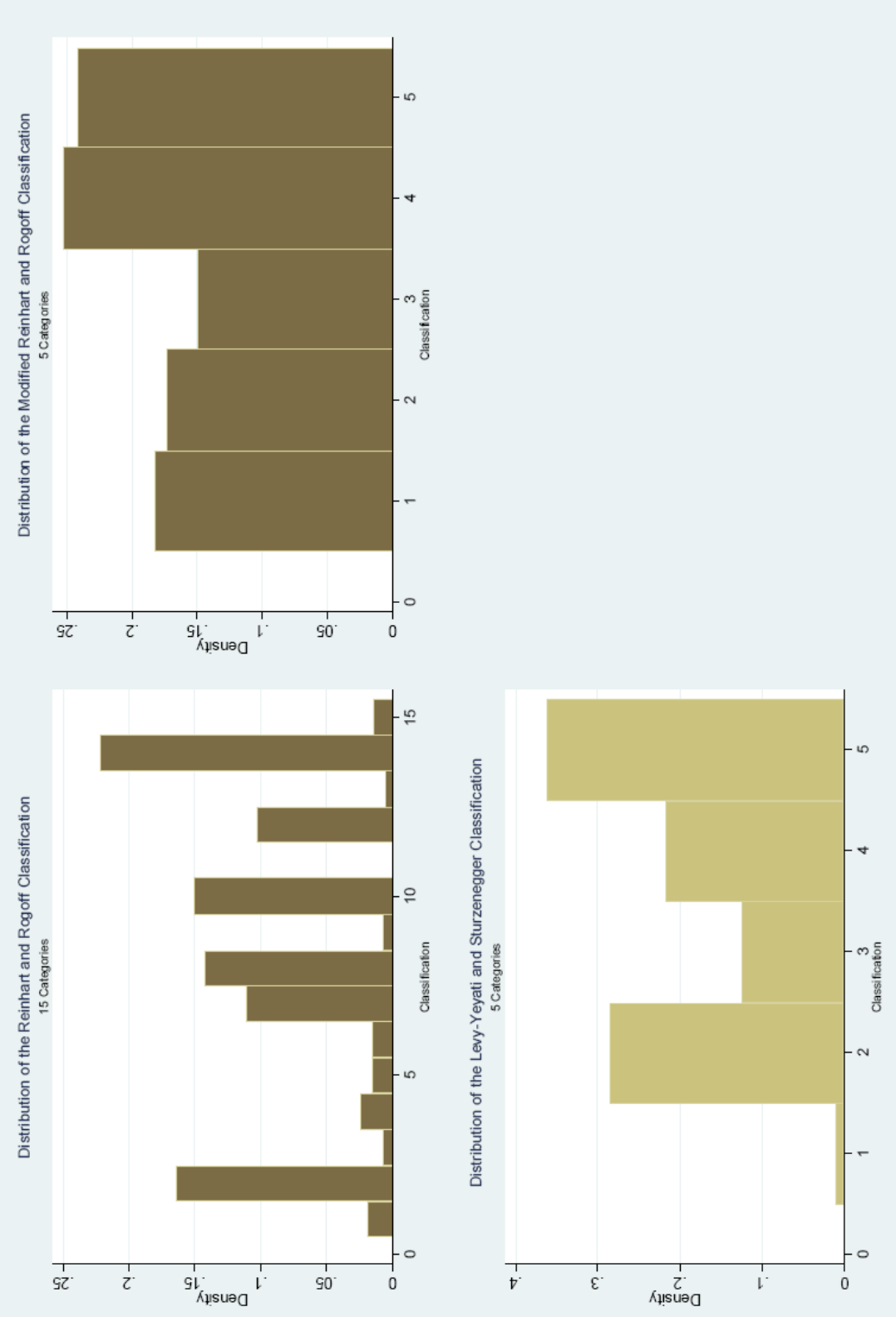

Figure 16: Exchange Rate Regime Classifications

Finally, it is worth noting that the Reinhart and Rogoff (2004) classification offers the advantage that it corrects for multiple exchange rates, a practice that, while common among developing countries until the early 1970s, diminished steadily to less than 10 percent of cases during the post Bretton Woods period. The two classifications have in common the fact that they look at what countries actually do rather than what they say they do. Both classifications have their own merits, but for our purposes the RR classification is more appropriate. The main reason is that the key difference between RR and LYS is that RR look at actual exchange rates, while LYS base their algorithm on the official exchange rates. Furthermore, the algorithm used by LYS includes (besides the exchange rate) reserves and base money and, as Calvo and Reinhart (2002) note, using reserves has considerable limitations. In any case, the findings reported in the robustness section, will indicate that the basic results of this paper- the role of institutions and special interests factors in the exchange rate regime choice- remains essentially unchanged when using the LYS classification as the measure of exchange rate regime.

4.3.2 Economic Variables

One of the variables considered in the empirical analysis is money, but to include such a measure it is preferred to have it expressed in terms of foreign reserves: that is, the ratio of money supply (M2) over central bank international reserves (*M2/Reserves*). Since the availability of international reserves can sustain a fixed exchange rate regime, a high value of this ratio is expected to be associated with more flexible arrangements. To avoid potential endogeneity issues, this variable is lagged in the regressions (indicated by placing a 1 after the variable). Another variable that derives from the model is the *real interest rate*. This measure is constructed using information from the countries' lending rates, the U.S. discount rate, and the expected inflation rate. For a given growth rate of money supply, higher money demand will imply lower inflation, hence, if the government enjoys credibility, domestic interest rates– even in countries with a history of high inflation- fall immediately to the world level. For a variety of reasons–including interest rates that are set by the authorities rather than being determined by the market–the greater confidence that pegged exchanges can bring may not

be fully reflected in the observed domestic interest rate. In other words, it is expected that a lower real interest rate will be reflecting a pegged exchange rate regime.

Inflation is another important variable that affects the exchange rate regime choice. As Vegh (1992), Calvo and Vegh (1999) and Frieden, Ghezzi and Stein (2001) argue, countries with moderate to high inflation have incentives to use the exchange rate as an anchor. This may be due to institutional incapacity of governments -inability to convince the public of their commitment to price stabilization- or a simple way of gaining credibility. However, inflation increases the probability of incurring in political costs of abandoning a peg and decreases the likelihood of choosing a fixed regime[17]. Hence to account for possible differential effect between moderate and high inflation a "high inflation dummy" was constructed. *High250* is a variable equal to one whenever the inflation rate in the previous year exceeds 250% and is expected to be negative implying the need of a quick credibility enhancement (possibly the need to adopt a peg) whenever this threshold is passed.

According to the optimal currency areas theory, two key country characteristics that favor a more stable (or fixed) exchange rate are openness (which enhances, to some extent, the trade gains from stable exchange rates) and the size of the economies (since small economies are likely to trade internationally and with limited impact of its own currency abroad). Furthermore, Frieden, Leblang and Valev (2008) argue that more open economies tend to adopt more stable exchange rates, for several reasons. Nevertheless, it is important to note that fixed exchange rates benefit groups with significant cross-border interests. So, ultimately, this measure of trade openness, indicates how important cross-border trade is for the country's economic agents and thus how significant will be these interests in fixing the exchange rate. Therefore, *openness,* measured as the GDP share of exports plus imports is expected to have a negative sign, while, *output per capita,* measured as the logarithm of the country's GDP per capita in US dollars is expected to have a positive sign. Lagged values are used where an endongeneity problem may be a concern.

Two other economic variables are included in the regressions. Obstfeld and Taylor (2002), based on the "impossible trinity", argue that as financial globalization deepened in the last

[17] Again, this variable is lagged one period to avoid potential endogeneity problems.

decades, monetary policy became increasingly at odds with fixed exchange rates[18]. In other words, a higher level of financial development is expected to reduce the likelihood of fixing the exchange rate since monetary policy will be less effective. Hence, *financial development*, measured as the GDP share of private credit, is expected to have a positive effect[19]. Finally, the recent literature has stressed that currency mismatches in financially dollarized economies may also be critical to the choice of exchange rate regimes[20]. In particular, individuals, firms and countries with dollar liabilities may be more prone of fixed exchange rate regimes, due to the fact that sharp nominal depreciations of the currency can have a considerable impact on the solvency of balance sheets with currency mismatches[21]. Hence, *foreign liabilities*, defined as the ratio of foreign liabilities to money stocks is considered and is expected to have a negative sign. In the regressions, this variable is lagged to account for endogeneity.

4.3.3 Interest Groups, Political and Institutional Variables

One of the implications from the model is the importance of interest groups on the exchange rate regime choice. In other words, that groups have different preferences regarding exchange rate policy and that these preferences play a role in the choice of regime. Special interest groups tend to concentrate their demands on specific measures that involve compensation if affected by the exchange rate policy. It is always difficult to find good variables that capture the influence that these groups may have on policymakers. In other words, it will be assumed that the lobbying power of the tradable goods sector on policymakers is proportional to its share in the country's GDP. The fact that this tradable goods sector in Latin America is basically structured by producers of commodities and manufactures entails that it is very sensitive to the level of exchange rate and hence a flexible exchange rate regime reflects its preferences. In this line of reasoning, the non-traded goods sector favors a peg schedule. Hence, for the empirical analysis two measures are used that capture the size of the *agricultural sector* and the size of the *industrial sector* to proxy for the importance of the tradable

[18] In fact, many countries lack the infrastructure necessary for monetary authorities to conduct domestic open market operations.

[19] To account for possible endogeneity this variable is lagged one period in the regressions.

[20] See for example, Eichengreen, Hausmann and Panizza (2003) and Kamil (2006).

[21] In fact, this argument is behind the "fear of floating" phenomenon of Calvo and Reinhart (2002).

sectors[22]. The first measure is the *value added* for each sector as a percentage of GDP, while the second one is the *employment* in each sector as a percent of the overall employment in the economy. Although the employment measure captures more precisely how broad-based the importance of a sector is, due to data availability the baseline regressions use the value added measure[23]. To some extent, these group-strength variables are capturing L from the previous model. Following the line of the discussion above, the agricultural sector and the industrial sector are expected to decrease the likelihood of a peg schedule. Due to concerns about endogeneity, these variables are lagged one period.

To capture the institutional and political quality of Latin American systems a political risk measure is used. This measure comes from the PRS Group's International Country Risk Guide (ICRG) and comprises of four subindices such as government stability, corruption, democratic accountability and bureaucracy quality[24]. Each of these subcomponents are scored and aggregated into a cumulative political risk rating. It is expected that when institutions are not reliable, more political risk (more unstable political systems) increase the likelihood of a pegged regime -i.e. a negative sign- since governments facing unstable situations might not care much about the long-term sustainability of the policies they follow. Another institutional variable included is *democracy*. This measure comes from the Polity IV dataset and ranges from -10 for autocratic regimes to 10 for fully developed democracies. For the period considered, the average score for Latin America is 5, which reflects the fact that after 1985 almost all countries considered in the sample were democracies. Although it is not clear what is the impact of democracy in the exchange rate regime choice, Hall (2006) argue that democracies are more likely to commit to a floating exchange rate regime[25]. Hence, a positive sign is expected in the regressions.

Based on the World Bank's Database of Political Institutions, another set of control variables to reflect political and institutional characteristics, and indicators of political strength is used. The first variable is related to the composition of the legislature and measures the

[22] On average for Latin America, the tradable sector (agriculture and industry) accounts for 40% of total GDP.

[23] In the robustness checks the employment measure is used.

[24] The assessments of the ICRG are made on the basis of subjective analysis of the available information.

[25] In fact, the number of veto players or the regular use of open, competitive elections encourage commitments to float.

strength of the executive: *government seats in the legislature*. This variable is expected to have a negative sign mainly because a higher share of seats means that the government faces less political competition, so a readjustment may be less costly. Although indirectly this variable captures the degree of fragmentation of the party system[26]. The other three variables are related to the executive: the *number of years left in the current term*, the *number of years that the incumbent administration has been in office* and a dummy variable that accounts for the *support that the executive might have from special interests*. In the first case, this variable is capturing the institutional setup, represented by h in the model. This variable will score a 0 in an election year and n-1 in the year after an election, where n is the length of the term. Therefore it is expected to have a positive sign since the shorter the horizon until the next election, the less prone the executive would be to pursue a change in policy, such as moving to a more flexible exchange rate, with its potential political costs. The latter variable - *support that the executive might have from special interests*- refers to characteristics such as nationalist, rural, regional or religious. In those cases where the executive is linked, by the party system, to some special interest the dummy variable will take the value of 1. The expected sign of this variable is not clear. On the one hand, there are cases where the nationalist characteristic determines a more flexible regime, while there are other cases where regional issues make special interests to pressure to sustain a fix regime.

Finally, another institutional variable that could potentially have an effect on the exchange rate regime is the degree of central bank independence. Nevertheless, there are at least three reasons why it is not clear in which direction central bank independence should affect the regime choice. First, on the one hand, a central bank that pursues price stability may be more prone to tie its hands by adopting a fixed exchange rate regime. Second, on the other hand, central bank independence may be seen as an alternative to a peg as means to provide credibility. Third, the measure itself is a matter of great debate. The most widely employed legal index of central bank independence is from Cukierman (1992) and Cukierman et al. (1992) although there are some other alternative measures. However, as pointed out by Forder (1996) and Mangano (1998), legal measures of central bank independence

[26] As it is standard in the literature, the effective number of parties measures the fragmentation of the party system. So more (number of) parties would imply a small share for the government what determines a negative correlation.

may not reflect the true relationship between the central bank and the government. In fact, Walsh (2005) argues that in countries where the rule of law is less strongly embedded in the political culture, there can be wide gaps between the formal, legal institutional arrangements and their practical impact; something particularly likely in Latin America. Therefore, Cukierman (1992) suggests for those cases, that the turnover rate of central bank governors is a better proxy for central bank independence than measures based on central bank laws. The turnover rate is based on the presumption that, at least above some threshold, a higher turnover of central bank governors indicates a lower level of independence[27]. For the empirical analysis, central bank governor stability is a normalized version of the turnover rate[28].

4.3.4 Empirical Methodology

As previously stated in the introduction, the benchmark for the empirical analysis is an ordered probit regression model where the dependent variable captures the exchange rate regime according to the *adjusted* RR de facto classification[29]. That is, the dependent variable takes the values from 1 (fixed) to 5 (free falling). Later in the paper the results of additional estimations where the classification of regimes vary are discussed. One of the concerns with this methodology is that underscores the importance of the underlying correlation structures of a panel. The ordered probit regression pools the data into a single continuous set, and this may lead to an efficiency problem, in terms of the standard errors. To allow for a panel data structure and thus for individual specific effects when analyzing limited dependent variables a random-effects ordered probit is also considered and described below. Furthermore, although popular in panel data ordered probits, the random-effects models allow modeling a type of unobserved heterogeneity meeting relatively strong assumptions. Hence, as it will be described below, to relax some of the assumptions, a limited dependent panel data model with an AR(1) error components is finally estimated.

[27] Even this measure is disputed. Haan and Kooi (2000) and Sturm and Haan (2001) argue that the turnover rate of central bank governors is only relevant when properly accounting for inflation suggesting that causality may be an issue, at least for developed countries.

[28] This variable is a normalization, between 0 and 1, of the number of turnovers of central bank governors for each country. More details are given in Table B.

[29] All the regressions include year dummies.

4.3.4.1 Random-Effects Ordered Probit In general it is possible to write the random-effects ordered probit model in terms of a latent-response formulation. That is,

$$\begin{aligned} y_{it}^{*} &= X_{it}\beta + \epsilon_{it} \qquad i = 1, \ldots, N \quad t = 1, \ldots, T \\ \epsilon_{it} &= v_{it} + u_i \end{aligned} \tag{4.18}$$

with

$$\begin{aligned} Var(\epsilon_{it}) &= \sigma_v^2 + \sigma_u^2 = 1 + \sigma_u^2 \\ Corr(\epsilon_{it}, \epsilon_{is}) &= \rho = \frac{\sigma_u}{1 + \sigma_u} \end{aligned}$$

where X_{it} denotes a vector of exogenous explanatory variables, y_{it}^{*} is unobserved and is related to y_{it} via the threshold model

$$y_{it} = \begin{cases} 0 & if \quad y_{it}^{*} \leq \mu_0 \\ 1 & if \quad \mu_0 < y_{it}^{*} \leq \mu_1 \\ 2 & if \quad \mu_1 < y_{it}^{*} \leq \mu_2 \\ \vdots & \\ J & if \quad \mu_{J-1} < y_{it}^{*} \end{cases} \tag{4.19}$$

Conditional on the two random effects, v_{it} and u_i, and X_{it}, the probability function for a single observation of the dependent variable can be written as

$$f\left(y_{it} | X_{it}, v_{it}, u_i\right) = \Phi\left(\mu_{y+1} - X_{it}\beta - v_{it} - u_i\right) - \Phi\left(\mu_y - X_{it}\beta - v_{it} - u_i\right)$$

where Φ is the cumulative density function of the standard normal distribution, $\mu_{-1} = -\infty$ and $\mu_J = \infty$. The remaining J threshold parameters are freely estimated together with β.

Define $a_{it} = \mu_{J-1} - X_{it}\beta$ and $b_{it} = \mu_J - X_{it}\beta$ if $y_{it} = J$, then following Butler and Moffitt (1982) the likelihood function is

$$\begin{aligned} P\left(y_{i1}, y_{i2}, \ldots, y_{iT}\right) &= \int_{a_{i1}}^{b_{i1}} \cdots \int_{a_{iT}}^{b_{iT}} f\left(\epsilon_{i1}, \epsilon_{i2}, \ldots, \epsilon_{iT}\right) d\epsilon_{iT}, \ldots, d\epsilon_{i2}, d\epsilon_{i1} \\ &= \int_{a_{i1}}^{b_{i1}} \cdots \int_{a_{iT}}^{b_{iT}} \int_{-\infty}^{\infty} \prod_{t=1}^{T} f\left(v_{it} | u_i\right) f\left(u_i\right) du_i dv_{iT}, \ldots, dv_{i1} \\ &= \int_{-\infty}^{\infty} \prod_{t=1}^{T} \left[F\left(b_{it} | u_i\right) - F\left(a_{it} | u_i\right)\right] du_i \end{aligned}$$

in which $f(.)$ and $F(.)$ represent the *pdf* and *cdf* of the normal distribution function, respectively. Based on the latter expression the maximization problem takes place[30].

4.3.4.2 Probit Panel Data Model with AR(1) Error Component As said in the first part of this section, random-effects models allow modeling a type of unobserved heterogeneity meeting relatively strong assumptions. Basically two: (i) the unobserved heterogeneity has to be independent of explanatory variables and (ii) it has to be constant over time. The specification used relaxes the second assumption but not the first one. Just as observed covariates can change over time, so can unobserved influences and determinants of the outcomes. In particular, following Heiss (2007), unobserved heterogeneity is modeled as a stationary AR(1) process. Consider again a latent random model like (4.18):

$$\begin{aligned} y_{it}^{*} &= X_{it}\beta + u_{it} + e_{it} \qquad i = 1, \ldots, N \quad t = 1, \ldots, T \\ u_{it} &= \rho u_{it-1} + v_{it} \end{aligned}$$

where X_{it} denotes a vector of strictly exogenous explanatory variables, y_{it}^{*} is unobserved and is related to y_{it} via a threshold model like (4.19). The random variables u_{it} are independent of the exogenous explanatory variables and the *i.i.d.* error term e_{it}. They are normally distributed with zero mean and variance σ^2 and follow a stationary AR(1) process where v_{it} are *i.i.d.* shocks with variance $(1-\rho^2)\,\sigma^2$. Note that from this general model a standard ordered probit model follows in the special case $\rho = 0$ and a standard random-effects ordered probit model follows in the case $\rho = 1$.

In order to derive a parametric expression of conditional outcome probabilities, it is needed to assume that the *i.i.d.* error terms e_{it} are *i.i.d.* with a normal distribution. This parametric assumption leads to a standard ordered probit specification except that the latent process u_{it} is present. It is now possible to write the probability of the observed realization y_{it} conditional on X_{it}, u_{it}, as

$$f\left(y_{it}|X_{it}, u_{it}\right) = \Phi\left(\mu_{y+1} - X_{it}\beta - u_{it}\right) - \Phi\left(\mu_{y} - X_{it}\beta - u_{it}\right)$$

[30] The estimation of parameters by maximum likelihood is done once the integral has been evaluated, and the resulting estimator is consistent, efficient, and approximately normally distributed. Estimations were performed in Stata 9.

To complete the model, the joint distribution of the u_{it} has to be specified. Following Heiss's (2007) notation, $\Phi\left(.;\mu,\sigma^2\right)$ is the normal pdf. with mean μ and variance σ^2, then the marginal distribution is

$$f\left(u_{it}|X_{it}\right)=\Phi\left(u_{it};0,\sigma^2\right)$$

with a conditional distribution of

$$f\left(u_{it}|X_{it},u_{it-1}\right)=\Phi\left(u_{it};\rho u_{it-1},\left(1-\rho^2\right)\sigma^2\right)$$

This completes the model to be estimated. Heiss (2007) describes the estimation procedure implemented such that sequential Gaussian quadrature is used.

4.4 EMPIRICAL RESULTS

In this section the estimation results are presented. First the results of testing the hypothesis that political economy factors play a significant role in shaping exchange rate policy in Latin America are presented followed by a robustness analysis. Then, a discussion regarding the *level* and the *regime* of the exchange rate policy will be presented.

4.4.1 The Choice of Exchange Rate Regimes

Tables 30, 31 and 32 present the results for the ordered probit model, the random-effects ordered probit model and the probit panel data model with the AR(1) error component, respectively. In each table columns (1) -(4) represent different specifications beginning from the most basic to the most complex one where the rationale is the following: column (1) is the specification that tries to capture the implications from the theoretical model as good as possible. Column (2) is an extended version that includes two key political variables: political risk and democracy. Column (3) is an even more extended version that includes potential determinants of exchange rate regimes according to traditional theories, already discussed, as the optimal currency area and the financial view of exchange rates. Finally column (4) aggregates all variables and includes a more political economy perspective by

Table 30: Determinants of Exchange Rate Regimes in Latin America (OP)

Dependent variable: Degree of Exchange Rate Flexibility (Reinhart and Rogoff classification)
Estimation: Ordered Probit Regression
(Robust standard errors, clustered by country, are presented below the corresponding coefficients)

Period:	1975 - 2006			
Unit of observation:	Annual			
	(1)	(2)	(3)	(4)
Money Supply to International Reserves1	0.0128***	0.0139**	0.0102*	0.0150**
(M2/Reserves)	(0.0048)	(0.0055)	(0.0057)	(0.0067)
Output per Capita	0.1751*	0.5280***	0.6165***	0.8019***
(real GDP per capita, in logs)	(0.1077)	(0.1308)	(0.1485)	(0.1628)
Real Interest Rate	0.0239	0.0697***	0.1638***	0.1556***
(based on lending rates)	(0.0350)	(0.0143)	(0.0268)	(0.0269)
Price instability1	2.0913***	2.2373***	3.4981***	3.2745***
(inflation rate, in log[100+inf.rate])	(0.2230)	(0.2879)	(0.4291)	(0.4263)
High Inflation	-1.6525***	-2.1026***	-2.9395***	-2.4952***
(dummy =1 if inflation in t-1>250)	(0.3825)	(0.4371)	(0.6004)	(0.5999)
Agricultural Sector1	0.0139#	0.0353**	0.0375**	0.0601***
(share of agriculture in GDP)	(0.0085)	(0.0150)	(0.0156)	(0.0158)
Industrial Sector1	0.0239***	0.0364***	0.0330***	0.0418***
(share of industry in GDP)	(0.0084)	(0.0095)	(0.0104)	(0.0102)
Financial Development1			1.2636***	0.9558**
(private domestic credit/GDP, in logs)			(0.3836)	(0.4015)
Foreign Liabilities1			0.2965	0.6250
(foreign liabilities/M2)			(0.3245)	(0.4041)
Trade Openness1			-0.1658#	-0.2981*
(exports+imports / GDP, in logs)			(0.1014)	(0.1663)
Political Risk		-0.3700***	-0.4717***	-0.4648***
(ICRG composite index)		(0.0835)	(0.0988)	(0.1001)
Democracy		0.0352***	0.0815***	0.0390*
(Polity2 index)		(0.0162)	(0.0186)	(0.0212)
Years in Office				0.0058
(number of years)				(0.0138)
Years Left in Current Term				0.1262***
(number of years left)				(0.0401)
Government Seats in the Legislature				-0.0024*
(number of seats)				(0.0005)
Executive Special Interest				1.0258***
(dummy =1 if the executive is linked to interests)				(0.3269)
Central Bank Governor Stability				0.3563**
(normalized numbers of governor turnovers)				(0.1766)
No. Countries	19	19	19	19
No. Observations	589	456	435	428

All regressions include time dummies and constant
Lagged values of variable x are denoted x1.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Table 31: Determinants of Exchange Rate Regimes in Latin America (RE)

Dependent variable: Degree of Exchange Rate Flexibility (Reinhart and Rogoff classification)
Estimation: Random-Effects Ordered Probit Regression
(Robust standard errors are presented below the corresponding coefficients)

Period:	1975 - 2006			
Unit of observation:	Annual			
	(1)	(2)	(3)	(4)
Money Supply to International Reserves1	0.0183***	0.0215***	0.0116*	0.0171**
(M2/Reserves)	(0.0055)	(0.0063)	(0.0070)	(0.0073)
Output per Capita	0.1920*	0.8181***	1.5848***	1.0353***
(real GDP per capita, in logs)	(0.1155)	(0.1456)	(0.1863)	(0.1711)
Real Interest Rate	0.0689*	0.0532***	0.0109***	0.0113***
(based on lending rates)	(0.0359)	(0.0150)	(0.0027)	(0.0023)
Price instability1	2.0792***	1.7973***	2.8483***	2.6803***
(inflation rate, in log[100+inf.rate])	(0.2274)	(0.2768)	(0.4307)	(0.4199)
High Inflation	-1.4025***	-1.2959***	-2.2764***	-2.4335***
(dummy =1 if inflation in t-1>250)	(0.3978)	(0.4423)	(0.6350)	(0.6409)
Agricultural Sector1	0.0404***	0.1956***	0.2132***	0.1791***
(share of agriculture in GDP)	(0.0126)	(0.0228)	(0.0234)	(0.0202)
Industrial Sector1	0.0443***	0.0479***	0.0287***	0.0510***
(share of industry in GDP)	(0.0093)	(0.0102)	(0.0110)	(0.0111)
Financial Development1			1.7364***	1.6683***
(private domestic credit/GDP, in logs)			(0.4461)	(0.4242)
Foreign Liabilities1			-0.5848*	-0.80817*
(foreign liabilities/M2)			(0.3362)	(0.416)
Trade Openness1			-0.7019***	-0.8635***
(exports+imports / GDP, in logs)			(0.1642)	(0.1849)
Political Risk		-0.4857***	-0.5910***	-0.6247***
(ICRG composite index)		(0.0899)	(0.1040)	(0.1059)
Democracy		0.0639***	0.0444**	0.0416*
(Polity2 index)		(0.0184)	(0.0192)	(0.0226)
Years in Office				-0.0004
(number of years)				(0.0144)
Years Left in Current Term				0.0764*
(number of years left)				(0.0424)
Government Seats in the Legislature				-0.0043***
(number of seats)				(0.0007)
Executive Special Interest				1.0357**
(dummy =1 if the executive is linked to interests)				(0.4203)
Central Bank Governor Stability				0.4415**
(normalized numbers of governor turnovers)				(0.1808)
No. Countries	19	19	19	19
No. Observations	589	456	435	428

All regressions include time dummies and constant
Lagged values of variable x are denoted x1.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Table 32: Determinants of Exchange Rate Regimes in Latin America (OP with AR(1))

Dependent variable: Degree of Exchange Rate Flexibility (Reinhart and Rogoff classification)
Estimation: Ordered Probit Regression with an AR(1) error component
(Robust standard errors are presented below the corresponding coefficients)

Period:	1975 - 2006			
Unit of observation:	Annual			
	(1)	(2)	(3)	(4)
Money Supply to International Reserves1	0.0176***	0.0184***	0.0131*	0.0120*
(M2/Reserves)	(0.0058)	(0.0069)	(0.0079)	(0.0072)
Output per Capita	0.1824*	1.1393**	0.9900*	1.0868**
(real GDP per capita, in logs)	(0.1118)	(0.5390)	(0.5975)	(0.4752)
Real Interest Rate	0.0489*	0.0581***	0.1036*	0.1006*
(based on lending rates)	(0.0298)	(0.0225)	(0.0626)	(0.0604)
Price instability1	2.0224***	1.8960***	2.4031***	2.5261***
(inflation rate, in log[100+inf.rate])	(0.7452)	(0.5574)	(0.8854)	(0.8831)
High Inflation	-1.4318**	-1.3554**	-2.0614**	-2.1778**
(dummy =1 if inflation in t-1>250)	(0.5738)	(0.6151)	(0.9055)	(0.9504)
Agricultural Sector1	0.0378**	0.1668***	0.1913***	0.1997***
(share of agriculture in GDP)	(0.0191)	(0.0426)	(0.0575)	(0.053)
Industrial Sector1	0.0433***	0.0386**	0.0325*	0.0326*
(share of industry in GDP)	(0.0165)	(0.0184)	(0.0198)	(0.0193)
Financial Development1			2.2066***	1.9911***
(private domestic credit/GDP, in logs)			(0.8171)	(0.7374)
Foreign Liabilities1			-0.5689#	-0.9059*
(foreign liabilities/M2)			(0.3475)	(0.4837)
Trade Openness1			-0.6770	-0.6575**
(exports+imports / GDP, in logs)			(0.4349)	(0.3191)
Political Risk		-0.5205***	-0.5849***	-0.6102***
(ICRG composite index)		(0.0944)	(0.1196)	(0.1137)
Democracy		0.0428*	0.0469*	0.0382
(Polity2 index)		(0.0232)	(0.0251)	(0.0309)
Years in Office				-0.0058
(number of years)				(0.021)
Years Left in Current Term				0.1239*
(number of years left)				(0.064)
Government Seats in the Legislature				-0.0037**
(number of seats)				(0.0014)
Executive Special Interest				0.6696*
(dummy =1 if the executive is linked to interests)				(0.4063)
Central Bank Governor Stability				0.4442
(normalized numbers of governor turnovers)				(0.2813)
No. Countries	19	19	19	19
No. Observations	589	456	435	428

All regressions include time dummies and constant
Lagged values of variable x are denoted x1.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

including institutional and political variables. Therefore, as already discussed in the previous section, the estimations are more accurate as one goes from Table 30 to Table 32.

The coefficient for the ratio M2/Reserves is significant and positive, thus confirming the prior that a high value of this ratio is associated with more flexible arrangements. In fact, this empirical finding confirms results by Hausmann, Panizza and Stein (2002) obtained using the another exchange rate regime classification that countries that tend to have a more flexible exchange rate regime do so keeping a large stock of reserves. Output per capita, a measure of the size of the economies, turns out also strongly significant and with a positive sign what confirms the optimal currency areas theory that small countries choose a more fixed exchange rate regime. The real interest rate is significant in all specifications except in Column (1) from Table 30. In any case, as expected, a lower real interest rate is reflecting a fixed exchange rate regime. Nevertheless, this result needs to be interpreted with caution since for some periods countries had interest rates that were not market-determined but government-determined. This may be hiding a more complex policymaking process where lending and deposits rates are also subject to political competition. Regarding the variables that capture price instability, results are strong and show a very significant effect. In fact, the first variable, *Price instability*, is reflecting the fact that inflation decreases the likelihood of choosing a fixed regime. The high inflation dummy, which is negative in all the specifications indicates that whenever faced with a high inflation period, the probability of adopting a more fixed regime increases.

The variables representing interest groups, *agricultural sector* and *industrial sector,* in all three estimation techniques and even after controlling for many aspects, are positive and exhibit a strong significance -around the one percent level-. Although, these might be imperfect measures of lobbying power of the tradable sector, results show a nonnegotiable and consistent significance[31].Therefore, economies with more lobbying power of tradable sectors tend to choose more flexible regimes.

The coefficient associated with the degree of *financial development* is always positive and significant as a determinant of the exchange rate regime. This is consistent with the view

[31]It might be the case that in some countries, the tradable sector is heterogeneous and with limited capacity to be organized as a pressure group. Still, results came out strong enough.

that a higher level of financial development is expected to reduce the likelihood of observing a fixed exchange rate regime. The variable *foreign liabilities* enters negative and significant in all the specifications accounting for the fact that in countries with dollar liabilities a more fixed exchange rate regime is likely to be chosen. The coefficient for *trade openness* is also negative and significant in all the regressions, indicating that more open economies, as expected, are more likely to adopt fixed exchange rate regimes.

When including a measure of *political risk* in the regressions, it turns out to be negative and significant, at a one percent level, across all specifications and techniques. This implies that situations where institutions are not reliable with a high political risk (more unstable systems) are associated with more pegged regimes, something that confirms Alesina and Wagner's (2006) results. The *democracy* variable is also significant in all specifications except in Column (3) of Table 32; that is when estimated the specification with the probit panel data model with an AR(1) error component. The positive coefficient confirms the prior that democracies are more likely to commit to a floating exchange rate regime. Because of the specifications in Columns (2) and (3), this result seems not to be bias by the coinciding trends toward more democracy that is observed in Latin American countries in the nineties.

The *number of years in office*, one of the measure of political strength, turns out not significant in all the specifications. Nevertheless, the other two measures of political strength have a significant impact in all regressions. As expected, the *years left in current term* and the *government seats in the legislature* have a significant positive and negative coefficient respectively. This implies, in the first case, that the closer to the next election the more prone would be the government to fix the exchange rate. In the other case, a stronger government, with less fragmentation, tends to pursue a more fix regime. The variable that accounts for the *support that the executive might have from special interest* appears always positive and significant. This result is giving evidence of the fact that the executive may be influenced by special interest groups representing the tradable goods sector, since the positive sign implies a lobbying effect for a more flexible exchange rate regime.

Finally, the *central bank governor stability* variable has a positive and significant sign in all regressions from Tables 30, 31 and 32 except in Column (3) from Table 32. This result suggests that the stability of central bank governors works as a substitute for fixed exchange

rates as a way to provide credibility.

4.4.2 Dynamic Panel Model

A concern from the previous results is the potential endogeneity of the regressor to the exchange rate. Hence, to avoid the potential bias associated with the maximum likelihood estimator of the probit models it is possible to use an estimator based on the generalized method of moments (GMM) developed for dynamic panel data introduced by Holtz-Eakin, Newey, and Rosen (1990), Arellano and Bond (1991), and Arellano and Bover (1995). The GMM dynamic panel estimator that will be used, controls for the potential endogeneity of all explanatory variables by using "internal instruments", that is, instruments based on lagged values of the explanatory variables[32]. This method does not allow to control for full endogeneity but for a weak type of it. To be precise, it is assumed that the explanatory variables are only "weakly exogenous", which means that they can be affected by current and past realizations of the exchange rate regime but must be uncorrelated with the future realizations of the error term. In the notation of Arellano and Bond (1991), the weak exogeneity assumption implies that future innovations of the exchange rate regime do not affect current values of the regressors[33]. Eventually, the validity of the weak exogeneity assumption will be tested. To stay in the Arellano and Bond (1991) and Arellano and Bover (1995) assumption of $T > n$ the data is averaged over non-overlapping, three-year periods, for the period 1985-2006.

Table 33 presents the results using the system dynamic panel estimator. In general, the estimates suggest that the conclusions from Tables 30, 31 and 32 hold. That is, the exogenous component of the regressors exerts a significant impact on the change of the exchange rate regime. For instance, the economic variables such as the ratio M2/Reserves, output per capita, the real interest rate, the measure of price instability, the degree of financial integration, and trade openness have a positive impact on the change of the exchange rate regime. This implies that has a more flexible regime. In terms of the institutional and

[32] In this type of specification, the dependent variable is now the change in the degree of exchange rate flexibility.

[33] More details about this estimator can be found in Arellano and Bond (1991) and Arellano and Bover (1995).

Table 33: Determinants of Exchange Rate Regimes in Latin America (Arellano-Bond)

Dependent variable: Change in the Degree of Exchange Rate Flexibility (Reinhart and Rogoff classification)
Estimation: 2-step system GMM estimation with Windmeijer (2004) small sample robust correction and time effects
(Robust standard errors are presented below the corresponding coefficients)

Period:	1985 - 2006			
Unit of observation:	Non-overlapping 3-year average			
	(1)	(2)	(3)	(4)
Money Supply to International Reserves1	0.0842**	0.0788***	0.0711*	0.0716*
(M2/Reserves)	(0.0385)	(0.0225)	(0.0404)	(0.0425)
Output per Capita	0.2441	0.3898**	0.4894**	0.7720***
(real GDP per capita, in logs)	(0.1806)	(0.1943)	(0.2308)	(0.2941)
Real Interest Rate	0.0167	0.0329*	0.0733**	0.0794*
(based on lending rates)	(0.0123)	(0.0197)	(0.0332)	(0.0448)
Price instability	1.1665*	1.5995*	1.6839**	2.6191***
(inflation rate, in log[100+inf.rate])	(0.6283)	(0.7650)	(0.7471)	(0.8809)
High Inflation	-1.3233***	-1.3844***	-2.0281**	-2.3611**
(dummy =1 if inflation in t-1>250)	(0.4588)	(0.5152)	(0.9148)	(0.9935)
Agricultural Sector	0.3221*	0.4737*	0.6984**	0.6848*
(share of agriculture in GDP)	(0.1699)	(0.2303)	(0.2855)	(0.3318)
Industrial Sector	0.2552*	0.3563*	0.3365*	0.3995*
(share of industry in GDP)	(0.1349)	(0.1805)	(0.2020)	(0.2344)
Financial Development			0.6798*	0.8325*
(private domestic credit/GDP, in logs)			(0.3825)	(0.4122)
Foreign Liabilities			-1.0782*	-1.2130**
(foreign liabilities/M2)			(0.6316)	(0.5599)
Trade Openness			0.3601	0.2136
(exports+imports / GDP, in logs)			(0.2468)	(0.2561)
Political Risk		-0.7597***	-0.9297*	-0.9809*
(ICRG composite index)		(0.3224)	(0.5304)	(0.5465)
Democracy		0.2795**	0.3369**	0.3949***
(Polity2 index)		(0.1086)	(0.1282)	(0.1332)
Years in Office				-0.2717
(number of years)				(0.1924)
Years Left in Current Term				0.2720*
(number of years left)				(0.1542)
Government Seats in the Legislature				0.0514
(number of seats)				(0.0741)
Executive Special Interest				0.4926*
(dummy =1 if the executive is linked to interests)				(0.2853)
Central Bank Governor Stability				0.1187
(normalized numbers of governor turnovers)				(0.1199)
No. Countries	19	19	19	19
No. Observations	114	114	114	114
Specification Tests (p-values)				
(a) Hansen Test:	0.989	0.832	0.816	0.876
(b) Serial Correlation:				
First-Order	0.001	0.007	0.004	0.009
Second-Order	0.540	0.459	0.442	0.495

All regressions include time dummies and constant
Lagged values of variable x are denoted x1.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

political variables, although results are equivalent as in Tables 30, 31 and 32, some variables lose significance. Specifically, the number of years in office, the government seats in the legislature, and the stability of central bank governors although they have the expected sign, consistent with the previous ordered probit estimations, they are no longer significant.

To assess the validity of the instruments two specification tests were used. The first Hansen's (1982) J test of over-identification restrictions, tests the exogeneity assumption of the instruments. The null hypothesis of the Hansen's J test should not be rejected and indeed in all cases it is not. The second test examines the hypothesis that the error term is not serially correlated. In all regressions, the null hypothesis of no first order serial correlation test is rejected and there is no evidence of second order serial correlation.

4.4.3 Robustness Analysis

Tables 34 -36 present the robustness analysis where the benchmark equation specification is Column (2) from Tables 30-33. In each table, Column (1) reports the results of the ordered probit model, Column (2) reports the results of the random-effects ordered probit and Column (3) the results of the ordered probit panel data model with an AR(1) error component. The first robustness check implies analyzing whether the main results are robust to a different exchange rate classification. Specifically, in Table 34 the LYS exchange rate classification was used. All variables with the exception of the real interest rate and inflation are significant. In fact, it can be concluded that results hold in general, with the exception of the real interest rate and inflation, which lose significance. In particular, the lobbying power of the tradable sectors enters strongly significant increasing the likelihood of a flexible exchange rate regime.

Going back to the RR classification, Table 35 presents the results when using sectorial employment instead of value added. That is, the measure used to approximate to the share of each tradable sector and hence, its lobbying power is labor-based: the amount of employment as a share of total employment. To be more specific the variables used are agricultural employment and industrial employment, both as a share of total employment. This measure captures more precisely how broad-based the importance of the sector is. The drawback

Table 34: Robustness: Levy-Yeyati and Sturzenegger classification

Dependent variable: Degree of Exchange Rate Flexibility (Levy-Yeyati and Sturzenegger classification)
(Robust standard errors are presented below the corresponding coefficients)

Period:	1975 - 2006		
Unit of observation:	Annual		
	(1)	(2)	(3)
Money Supply to International Reserves1	0.0128***	0.0113**	0.0100**
(M2/Reserves)	(0.0042)	(0.0045)	(0.0047)
Output per Capita	0.3455***	0.7205***	0.5627*
(real GDP per capita, in logs)	(0.1315)	(0.1621)	(0.3055)
Real Interest Rate	0.0126	0.0112	0.0117
(based on lending rates)	(0.0015)	(0.0016)	(0.0039)
Price instability1	0.0731	0.0711	0.0304
(inflation rate, in log[100+inf.rate])	(0.0955)	(0.1004)	(0.0999)
Agricultural Sector1	0.0391***	0.0524***	0.0459*
(share of agriculture in GDP)	(0.0146)	(0.0172)	(0.0264)
Industrial Sector1	0.0294***	0.0268***	0.0303**
(share of industry in GDP)	(0.0088)	(0.0102)	(0.0149)
Foreign Liabilities1	-0.4413**	-0.3815**	-0.3967**
(foreign liabilities/M2)	(0.1813)	(0.1904)	(0.1873)
Political Risk	-0.1994***	0.1143***	-0.1448***
(ICRG composite index)	(0.0800)	(0.0873)	(0.0913)
Democracy	0.0388**	0.0891***	0.0927***
(Polity2 index)	(0.0161)	(0.0185)	(0.0191)
No. Countries	19	19	19
No. Observations	456	456	456

(1) Ordered Probit Regression
(2) Random-Effects Ordered Probit Regression
(3) Ordered Probit Regression with an AR(1) error component
All regressions include time dummies and constant
Lagged values of variable x are denoted x1.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Table 35: Robustness: Employment by Sector

Dependent variable: Degree of Exchange Rate Flexibility (Reinhart and Rogoff classification)
(Robust standard errors are presented below the corresponding coefficients)

Period:	1975 - 2006		
Unit of observation:	Annual		
	(1)	(2)	(3)
Money Supply to International Reserves1	0.0140**	0.0177**	0.0180***
(M2/Reserves)	(0.0058)	(0.0071)	(0.0062)
Output per Capita	0.1838*	0.2993#	0.4473#
(real GDP per capita, in logs)	(0.1109)	(0.1829)	(0.2736)
Real Interest Rate	0.0568***	0.0582***	0.0564**
(based on lending rates)	(0.0148)	(0.0163)	(0.0272)
Price instability1	1.4284***	1.5332***	1.5181***
(inflation rate, in log[100+inf.rate])	(0.2270)	(0.2411)	(0.5727)
Agricultural Employment1	0.0144***	0.0156*	0.0195*
(share of agricultural employment)	(0.0051)	(0.0092)	(0.0117)
Industrial Employment1	0.0426***	0.0518***	0.0505**
(share of industrial employment)	(0.0149)	(0.0190)	(0.0211)
Foreign Liabilities1	-0.4609*	-0.5459*	0.4909
(foreign liabilities/M2)	(0.2425)	(0.2918)	(0.3102)
Political Risk	-0.3828***	-0.5492***	-0.5347***
(ICRG composite index)	(0.0836)	(0.0977)	(0.0860)
Democracy	0.0306*	0.0366*	0.0319*
(Polity2 index)	(0.0165)	(0.0208)	(0.0190)
No. Countries	19	19	19
No. Observations	456	456	456

(1) Ordered Probit Regression
(2) Random-Effects Ordered Probit Regression
(3) Ordered Probit Regression with an AR(1) error component
All regressions include time dummies and constant
Lagged values of variable x are denoted x1.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Table 36: Robustness: No Free-Falling Category

Dependent variable: Degree of Exchange Rate Flexibility (Reinhart and Rogoff classification)
(Robust standard errors are presented below the corresponding coefficients)

Period:	1975 - 2006		
Unit of observation:	Annual		
	(1)	(2)	(3)
Money Supply to International Reserves1	0.0089	0.0228**	0.0197*
(M2/Reserves)	(0.0094)	(0.0101)	(0.0115)
Output per Capita	0.7903***	1.6102***	1.5477**
(real GDP per capita, in logs)	(0.1640)	(0.1909)	(0.6340)
Real Interest Rate	0.0121***	0.0044	0.0030
(based on lending rates)	(0.0038)	(0.0044)	(0.0081)
Price instability1	1.8335***	2.5165***	2.6176***
(inflation rate, in log[100+inf.rate])	(0.5048)	(0.8479)	(0.9578)
Agricultural Sector1	0.1030***	0.2670***	0.2678***
(share of agriculture in GDP)	(0.0195)	(0.0261)	(0.0621)
Industrial Sector1	0.0907***	0.0790***	0.0789***
(share of industry in GDP)	(0.0145)	(0.0153)	(0.0294)
Foreign Liabilities1	-0.7151*	-0.2819	-0.4233
(foreign liabilities/M2)	(0.4016)	(0.4090)	(0.6593)
Political Risk	-0.3900***	-0.5167***	-0.5553***
(ICRG composite index)	(0.0990)	(0.1052)	(0.1176)
Democracy	-0.0073	0.0456*	0.0540*
(Polity2 index)	(0.0228)	(0.0239)	(0.0286)
No. Countries	19	19	19
No. Observations	345	345	345

(1) Ordered Probit Regression
(2) Random-Effects Ordered Probit Regression
(3) Ordered Probit Regression with an AR(1) error component
All regressions include time dummies and constant
Lagged values of variable x are denoted x1.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

is that sample is reduced due to data availability. All regressors are significant with the expected sign, thus, results hold in general, with the only exception of the high inflation periods in Column (3), which loses significance.

Table 36 reports the results of the benchmark equation, using the RR classification, but excluding the "free-falling" exchange rate regimes. These are the years when the exchange rate is in a downward spiral during a financial crisis or during price liberalization. Therefore, the sample is reduced even more to 345 observations. With the exception of the real interest rate and the high inflation dummy that lose significance when using more accurate estimators -Columns (2) and (3)-, the results imply that the conclusions remain the same as before.

In summary, Tables 34-36 suggest that the results are robust to changes in the specification of the model.

4.4.4 Additional Effects

To account for a more broad analysis of the exchange rate regime determinants the specification will need to include variables related to the international financial integration situation of each country. In other words a more systematic analysis to capture the financial linkages on the choice of regime. In particular, since a rapid process of financial deepening and innovation has gradually reduced the effectiveness of capital controls, with the same consequences in terms of the monetary policy-exchange rate stability dilemma. The financial variables to be included in the specification are *international financial integration* and *portfolio flows.* The variable *international financial integration* is Chinn and Ito's (2006) measure of de jure capital account openness, usually referred as *KAOpen.* This measure is available for 185 countries since 1970 and it is based on four binary dummy variables reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* with a higher number indicating a lower overall level of restrictions. *Portfolio flows* is the sum of the absolute value of inward and outward flows of portfolio investments and financial derivatives as a share of GDP: in other words, a measure of de facto capital account openness. Moreover, these two variables are expected to enter the regressions with a negative sign, implying that a greater degree of international financial integration decreases the likelihood of choosing a more flex-

Table 37: Additional Effects: Accounting for Other Exchange Rate Determinants Theories

Dependent variable: Degree of Exchange Rate Flexibility (Reinhart and Rogoff classification)
(Robust standard errors are presented below the corresponding coefficients)

Period:	1975 - 2006		
Unit of observation:	Annual		
	(1)	(2)	(3)
Money Supply to International Reserves1	0.0418**	0.0217	0.0532**
(M2/Reserves)	(0.0169)	(0.0177)	(0.0211)
Output per Capita	1.0858***	1.2920***	1.7417***
(real GDP per capita, in logs)	(0.2006)	(0.2216)	(0.6558)
Real Interest Rate	0.0091*	-0.0073	-0.0009
(based on lending rates)	(0.0049)	(0.0058)	(0.0078)
Price instability1	0.5891	2.0922**	1.8933**
(inflation rate, in log[100+inf.rate])	(0.8081)	(0.9068)	(0.9444)
Agricultural Sector1	0.1131***	0.2046***	0.3014***
(share of agriculture in GDP)	(0.0230)	(0.0291)	(0.0739)
Industrial Sector1	0.0800***	0.1090***	0.0964***
(share of industry in GDP)	(0.0167)	(0.0206)	(0.0288)
Financial Development1	2.8366***	3.6097***	3.7852***
(private domestic credit/GDP, in logs)	(0.5314)	(0.6072)	(0.8903)
Foreign Liabilities1	-0.9247*	-1.3190**	-1.2263*
(foreign liabilities/M2)	(0.4991)	(0.5406)	(0.6652)
Trade Openness1	-0.6617***	-0.6830***	-0.7589*
(exports+imports / GDP, in logs)	(0.1928)	(0.2232)	(0.4625)
International Financial Integration	-0.3251***	-0.2461***	-0.2019**
(Chinn-Ito, capital account variable)	(0.0561)	(0.0643)	(0.0889)
Portfolio Flows1	-0.0148	-0.0398**	-0.0247
(Inflows+outflows/GDP, in logs)	(0.0183)	(0.0199)	(0.0236)
Terms of Trade Shocks	-1.3518*	-1.4039	-1.5059
(standard deviation of the 5-year window of ToT)	(0.7610)	(0.8990)	(0.9425)
Political Risk	-0.6881***	-0.6918***	-0.7092***
(ICRG composite index)	(0.1328)	(0.1403)	(0.1709)
Democracy	0.1060***	0.1841***	0.1706***
(Polity2 index)	(0.0356)	(0.0381)	(0.0583)
Years in Office	0.0026*	0.0025*	0.0021
(number of years)	(0.0014)	(0.0013)	(0.0025)
Veto Players1	0.0135	0.0147	-0.0307
(number of veto players)	(0.0603)	(0.0664)	(0.0772)
No. Countries	19	19	19
No. Observations	294	294	294

(1) Ordered Probit Regression
(2) Random-Effects Ordered Probit Regression
(3) Ordered Probit Regression with an AR(1) error component
All regressions include time dummies and constant
Lagged values of variable x are denoted x1.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

ible exchange rate system. These results are expected since Latin American countries are highly dollarized economies that are more prone to fix their currency due to the potentially negative effect of sharp depreciations.

For this last specification two more variables are included to balance the inclusion of more financial variables: *terms of trade shocks* and *veto players. Terms of trade shocks* is computed as the standard deviation of terms of trade changes over the previous five years and captures the incidence of real shocks. *Veto players* is a variable of the number of veto players, actors whose approval is necessary for a shift in policy from the status quo. The higher the score, the greater is the policy constraints. This variable is included as a measure of political constraints of the executive and hence as another institutional variable of the model.

The results are shown in Table 37 and are in line with the previous findings. That is, for the variables already analyzed in previous specifications. Regarding the new variables included *international financial integration* and *portfolio flows* they appear with the expected negative sign implying that the propensity to peg is higher in countries with high levels of financial linkages. Again, this might be a result that characterizes a highly dollarized region. *Terms of trade* exhibits the expected sign but only significant in the first specification -Column (1)-, hence this variable turns out relatively uninformative. Finally, *veto players* is not significant in any regression implying that this variable is not incorporating any relevant information to this specification.

4.4.5 Persistence and the Dynamic Ordered Probit Framework

It can be argued that many of the variables used in the analysis are only meaningful in relation to the status-quo. In other words, that whatever regime you have on time $t-1$, you will be likely to have at t. This type of behavior may occur for several reasons inherent in the institutional framework. Besides the reasons why, the specification should take into account the persistent nature of exchange rate regimes. This allows for correlation between the individual effects and the means of the regressors. For this purpose, a dynamic ordered probit will be estimated. This particular specification will include previous exchange

rate states in order to capture the state dependence and the model can be interpreted as a first-order Markov process. Hence, the dynamic ordered probit model will allow for state dependence and account for the initial conditions problem as discussed by Heckman (1981) and Wooldridge (2005). In fact, the procedure suggested by Wooldridge (2005) to deal with the problem of initial conditions will be adopted. This problem is due to the generic feature of the panel that individuals (countries) inherit different unobserved and time-invariant characteristics which affect outcomes in every period. The general dynamic specification estimated can be written as:

$$y_{it}^{*} = X_{it}\beta + \gamma y_{it-1} + \delta y_{i0} + \alpha_i + \epsilon_{it}$$

where y_{it-1} is a vector of lagged values of the dependent variable and y_{i0} is the initial period value. α_i is an individual-specific and time invariant component and ϵ_{it} is the disturbance term[34].

Table 38 presents the results from the estimations. Using category 2 -which refers to regimes that vary from a pre announced horizontal band that is narrower than or equal to +/-2% to a de factor crawling peg- as the reference category, lagged dummies are introduced to account for the fact that exchange rate regimes may exert autocorrelation. The results show that the estimates are similar to those reported in the previous section in the following respects: all variables retain their signs and significance as in the previous specifications. The lagged categories of the dependent variable -included to formally test for state dependence- are highly statistically significant. As stated before, if a country has a certain exchange rate regime in $t-1$ most likely it will remain in that category in period t. In fact, the coefficients on lagged exchange rate regime show a clear gradient in the magnitude of the coefficients as one moves from an exchange rate category of 5 to 1. The estimated coefficients for the initial period observations are significant and imply a positive gradient (slope) in the estimated effects as one moves from the fixed to the more flexible initial category. This implies that there is a positive correlation between the initial period observations and unobserved latent exchange rate classification.

[34]Time dummies are also included in the specification.

Table 38: Robustness: Dynamic Ordered Probit with Wooldridge Solution for the Initial Condition

Dependent variable: Degree of Exchange Rate Flexibility (Reinhart and Rogoff classification)
(Robust standard errors are presented below the corresponding coefficients)

Period:	1983 - 2006	
Unit of observation:	Annual	
	(1)	(2)
Money Supply to International Reserves1	0.0109*	0.0164***
(M2/Reserves)	(0.0056)	(0.0063)
Output per Capita	0.3463**	0.3244**
(real GDP per capita, in logs)	(0.1423)	(0.1461)
Real Interest Rate	0.0279**	0.0258*
(based on lending rates)	(0.0135)	(0.0155)
Price instability1	0.0321*	0.0598***
(inflation rate, in log[100+inf.rate])	(0.0164)	(0.0178)
Agricultural Sector1	0.0244**	0.0441***
(share of agriculture in GDP)	(0.0104)	(0.0115)
Industrial Sector1	0.0294***	0.0268***
(share of industry in GDP)	(0.0088)	(0.0102)
Foreign Liabilities1	-0.4248*	-0.4724*
(foreign liabilities/M2)	(0.2560)	(0.2663)
Political Risk	-0.2811***	-0.3814***
(ICRG composite index)	(0.0907)	(0.0943)
Democracy	0.0333*	0.0314*
(Polity2 index)	(0.0178)	(0.0186)
Exchange Rate Flexibility1	-1.1134***	-1.0559***
(category=1)	(0.2391)	(0.2439)
Exchange Rate Flexibility1	0.9666***	0.6179***
(category=3)	(0.1899)	(0.2021)
Exchange Rate Flexibility1	1.8214***	1.5085***
(category=4)	(0.1801)	(0.1914)
Exchange Rate Flexibility1	2.1231***	1.6975***
(category=5)	(0.2191)	(0.2348)
Exchange Rate Flexibility0	-0.1850*	-0.2016*
(category=1)	(0.1091)	(0.1184)
Exchange Rate Flexibility0	0.2319*	0.2696*
(category=3)	(0.1404)	(0.1595)
Exchange Rate Flexibility0	0.4331*	0.5310*
(category=4)	(0.2596)	(0.2800)
Exchange Rate Flexibility0	0.4314*	0.7986***
(category=5)	(0.2357)	(0.2602)
No. Countries	19	19
No. Observations	456	456

(1) Ordered Probit Regression
(2) Random-Effects Ordered Probit Regression
All regressions include time dummies and constant
Lagged values (t-1) of variable x are denoted x1.
Initial period observations of variable x are reported as x0.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

To sum up, results confirm the evidence presented in the previous section that agricultural and industrial *lobbying* increase the likelihood of choosing a more flexible exchange rate regime. Furthermore, allowing for the persistence of exchange rate regimes by estimating the model in a dynamic ordered probit setting, resulted in highly significant lagged variables reinforcing the beliefs that previous exchange rate regimes help "predicting" current regimes.

4.4.6 Relevance of the Results

Although the previous estimations give information regarding the sign of the impact on the exchange rate regime, it is important to extend the analysis to account for the nonlinear effects of the different regressors. In fact, these effects can vary depending on the value of the explanatory variables at which they are measured. Figures 17 and 18 address this point by computing the cumulative probabilities for the different regimes spanning the support of each explanatory variable. This exercise is conducted based on the estimates reported in Column (4) of Table 32 computing the cumulative probability for each independent variable that vary over a specified range while the others are held constant at their means.

From Figure 17, the size of the countries plays a significant role where small countries are more likely to choose a fixed exchange rate regime. The probability of adopting a fixed exchange rate decreases with the real interest rate, the M2/Reserves ratio, inflation and financial development where nonlinearities seem to play a significant role. In other words, moving to a higher real interest rate, a higher M2/Reserves ratio, a higher inflation and a higher degree of financial development, decrease the probability of choosing a fixed exchange rate regime. Moving to the key variables regarding the lobbying pressure of the agricultural sector and industrial sector, it can be concluded that the greater the sector is, the greater the reduction in the probability of choosing a fixed regime. It is remarkable how similar both graphs are.

From Figure 18, the probability of fixing the exchange rate increases with the amount of foreign liabilities, the degree of openness, political risk, and the number of government seats in the legislature. On the other hand, the level of democracy, the number of years left for the executive in the current term and the measure of stability of central bank governors

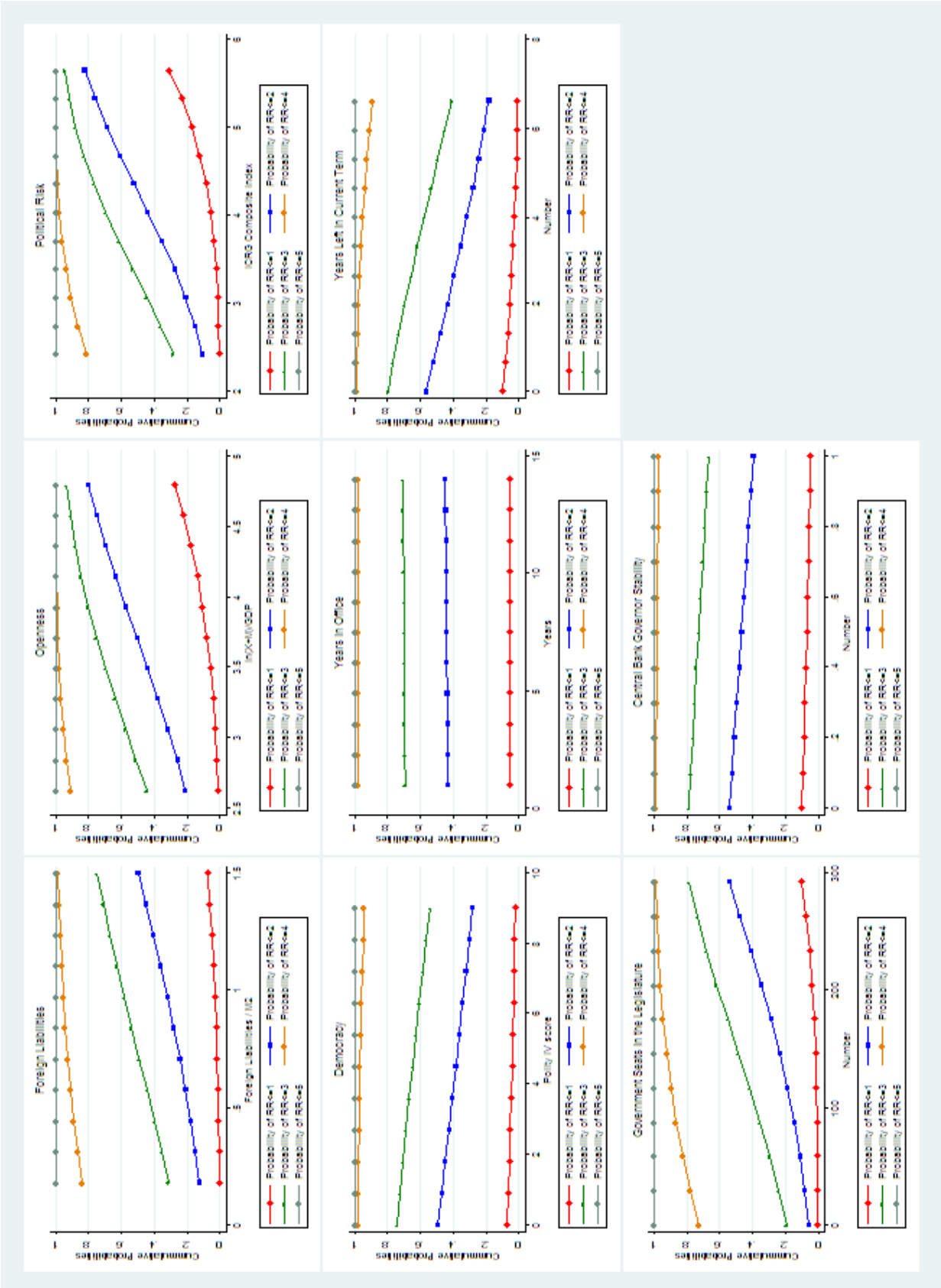

Figure 17: Effects on the Choice of Exchange Rate Regime

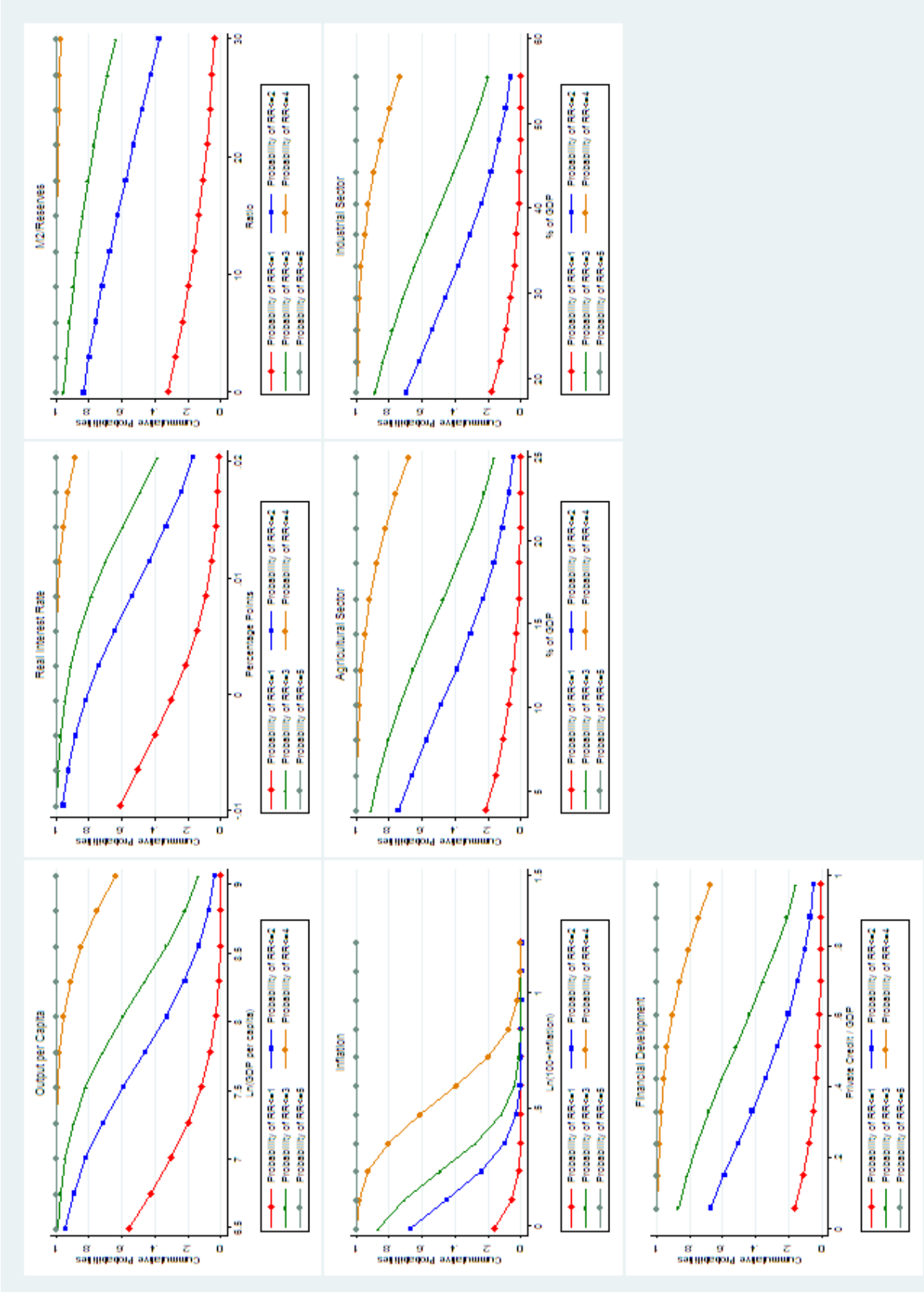

Figure 18: Effects on the Choice of Exchange Rate Regime (cont.)

decrease the probability of choosing for a fixed exchange rate regime. In all these cases, there are no clear nonlinearities affecting the regime. Finally, as expected from the regressions, the variable years in office seems to be negligible since it does not have a clear effect on the choice of exchange rate regime.

4.5 REGIME VS LEVEL DECOMPOSITION DISCUSSION

Until this section the discussion has been centered in the exchange rate regime. As with the regime decision, the choice on the level of the exchange rate has distributional and electoral implications. In fact, governments cannot directly set the real exchange rate, but they can affect trends in the real exchange rate over a period long enough to be of political and economic significance.

In principle, there is no clear economic guideline as to the appropriate level of the real exchange rate: having a more depreciated or appreciated currency have domestic distributive consequences where some of the implications are nested with the discussion about the regime choice. The currency preferences of agents in an economy are affected by economic factors, and their ability to turn these preferences into policy is affected by political institutions. Moreover, it is the combination of interests around the level of the exchange rate that make political institutions within which they are expressed, particularly important to explaining policy outcomes. This is because the real exchange rate affects broad aggregates like national income, prices, growth rates, etc.

Since the literature on theoretical models of real exchange rate determination is abundant, in this section the focus will be on the empirical application of these models and its connection with special interest groups. In other words, this empirical exercise consists of estimating an equation on the relationship between the real exchange rate and a limited number of fundamentals which have a theoretical influence on the level of real exchange rate. The recent empirical literature on real exchange rates in Latin America suggests that only a restricted number of variables seem to influence the level of real exchange rate[35].

[35] See for example, Edwards (1989), Gay and Pellegrini (2003), Alberola (2003), Garegnagni and Escude (2005) and Carrera and Restout (2008).

These variables include a Balassa-Samuelson effect, government spending, terms of trade, the degree of openness and capital inflows. Based on the previous discussion, the empirical approach of this section will include as another determinant of the level of real exchange rate the special interest groups variables, the *size* of the tradable sectors.

The most common definition of the real exchange rate is the nominal exchange rate adjusted by price levels:

$$e_s = \frac{\varepsilon_s P_s^*}{P_s}$$

where ε is the nominal exchange rate, P^* is the foreign price level and P is the domestic price level. Under the assumption that the law of one price holds for tradable goods -i.e. prices of the tradables will be equal all around the world-, the real exchange rate defined on the basis of tradable and non-tradable goods distinction can be mathematically represented as:

$$e_s = \frac{P_{T,s}}{P_{N,s}} = \frac{\varepsilon_s P_{T,s}^*}{P_{N,s}}$$

where P_T and P_T^* are the domestic and foreign prices of tradable goods and P_N is the price of the non tradable goods[36]. This definition is called the internal real exchange rate and is appropriate for developing countries whose exports are predominantly primary products subject to the law of one price. As noted by Edwards (1989), this definition provides a consistent index of the country's tradable sector competitiveness and also guides the resource allocation since an increase in e_s causes a shifting of resources away from the non tradable sector to the tradable one. Hence, in this definition, the decline of e_s indicates the real appreciation of the domestic currency. In the Balassa-Samuelson model the real exchange rate depends entirely on productivity differentials between the tradable and non tradable goods sectors[37]. The effect claims that an increase in traded sector productivity relative to non traded sector implies a real appreciation of the domestic currency. Thus a negative sign is expected. The impact of public demand on the real exchange rate is traditionally linked to the hypothesis that government spending is mainly focus on non tradable goods. Hence,

[36] This measure of real exchange rate may have some flaws: mainly the fact that purchasing power parity might not hold and differences in incomes might not be thoroughly taken into account. On the other hand it has the great advantage of data availability without relying on weighting wholesale prices in a country by country basis.

[37] That is why the Balassa-Samuelson effect refers to the productivity effect.

an increase in public consumption will raise total demand for non traded goods and thus raising its relative price. Therefore, a decline in the real exchange rate level is expected. The terms of trade effect on the level of real exchange rate is ambiguous since an improvement of the terms of trade generates two contrary effects: income versus substitution[38]. Since a greater degree of openness to trade is expected to generate a real appreciation of the domestic currency since in a more open economy there is a convergence of international prices which limits pressure on the real exchange rate, a positive sign is expected. Finally, it is expected that capital inflows will have an appreciation effect on the domestic currency. The intuition is the following: a foreign capital surge affects the economy by raising the domestic absorption which leads to an increase in consumption demand for both tradable and non tradable goods. Thus, on non tradable goods, this excess demand has to match to a proportional increase of non tradable supply in order to ensure market equilibrium leading to a rise of its price.

Some regularities about preferences over the currency level are related to preferences about the regime. The fact that the tradable goods sector in Latin America is basically structured by producers of commodities and manufactures entails that it is very sensitive to the level of exchange rate and hence a flexible exchange rate regime and a tendency for a depreciated currency reflects its preferences. Thus, a positive coefficient should be expected.

Furthermore, the effect of the exchange rate regime on the real exchange rate level depends highly on the region of interest. In particular, in Latin America, after a history of hyperinflation and exchange rate-based stabilization programs, the stylized facts documented by Calvo and Vegh (1993) -after a non credible (fixed) exchange rate regime stabilization, a boom of consumption of non tradable goods follows-.implies that fixed exchange rate regimes will lead to an increase of the real exchange rate and hence a positive sign.

4.5.1 Decomposition Exercise

This section will decompose the effect of the special interest groups on the level of real exchange rate into two channels: a direct channel and an indirect exchange rate regime channel effect. The latter effect captures the choice of exchange rate regime determinants discussed

[38] Therefore, the overall impact of terms of trade depends on which of these effects dominates.

in the previous sections. The main advantage of this approach is that it quantitatively allows comparing the expected total effect coming from a direct effect over the level of real exchange rate and an indirect effect through the exchange rate regime. The assumption behind this exercise is that the lobbying groups can pressure enough not only on the policymaking process of the exchange rate regime but on the discussion about the level.

The methodology used here consists of a treatment effects model as described by Heckman (1978). This technique, largely used in labor economics, has recently been applied to growth regressions by Ranciere, Tornell, and Westermann (2006) and Rodriguez (2008). The empirical strategy will consist in adding to a real exchange rate determinants regression -that includes the special interest groups variables- a *propensity to float* dummy[39]. Moreover, the propensity to float variable will be considered endogenous and depending on the specification of Columns (4) from Tables 1-3. This way, the impact of the lobbying power of the tradable sectors on the level of real exchange rate is composed of two effects: (i) a direct effect conditional on an augmented set of control variables that includes the agricultural sector and the industrial sector, and (ii) an indirect effect reflecting the effects associated with a higher propensity to float the exchange rate. A more detailed description of how this methodology fits in this type of exercise can be found in Rodriguez (2008).

4.5.1.1 (Two-Step) Estimation Procedure As described in Maddala (1983), this setup can be estimated in a two-step procedure[40]. The first step implies the estimation of a probit model and the construction of the hazard rate h_{it}[41]. The hazard rate, or inverse mills ration in the notation of Greene (2002), is a measure of the impact of the self-selection. In the second step, the real exchange rate regression is estimated including, as a additional regressor, the estimated hazard rate h_{it}. Therefore, the total effect of special interest groups measured by the size of the tradable sectors is the sum of a direct effect -the coefficients associated with these variables in the second step-, and an indirect effect due to a change in

[39] The *propensity to float* dummy variable takes on a value of 1 if country i is classified as greater or equal to 8 in period t according to the Reinhart and Rogoff (2004) exchange rate classification. Furthermore, when the exchange rate regime classification is below or equal to 7, the regime is classified as fixed and the variable takes the value of 0.

[40] Actually, Heckman (1978) and Maddala (1983) show that the model can also be jointly estimated by a maximum likelihood procedure.

[41] For more details, see Rodriguez (2008).

the probability (*propensity*) to float.

4.5.2 Decomposition Results

The main results are presented in Columns (1)-(4) from Tables 39 and 40 and can be summarized as follow. First, from the real exchange rate level equation, all variables are significant and have the expected sign. The only exception is government spending that has the correct sign but appears not significant in all four specifications. In particular, the positive sign of the agricultural and industrial sector variables can be interpreted in the following way: an increase in the lobbying power of the tradable sectors tends to depreciate the domestic currency by increasing the real exchange rate level. Second, the propensity to float, estimated through the first stage probit equation, has a positive and significant impact on the real exchange rate level. In other words, moving from a fixed exchange rate regime to a flexible one has a depreciation effect on the domestic currency by increasing the real exchange rate level. Third, as it was concluded in the previous sections, the agricultural and the industrial sectors increase the propensity to have a flexible regime. There are some variables, like the ratio of M2/Reserves, foreign liabilities, the number of years left in the current term, and the government seats in the legislature that lose significance in this framework. Finally, the hazard rate, which measures the impact of self-selection, is significant, implying that self-selection plays a role and the method is the appropriate.

From the advantages and disadvantages of both having a more fixed or flexible exchange rate, as a practical matter, in many countries this effect has resulted in overvaluation of the real exchange rate. To account for this aspect -and for robustness- a measure of overvaluation of the real exchange rate is constructed. Choosing a base year for each country such that purchasing power parity (PPP) holds, log deviations from the effective exchange rate are computed[42]. The results are presented in Columns (5)-(8) from Tables 39 and 40. With a few exceptions, all variables considered in the second stage are significant and with the expected sign across all different specifications[43]. Note than a positive sign implies an overvaluation

[42] That is for each country: $[e_s - e^*]$. More details are provided in Tables 28 and 29.

[43] Output per capita is the exception that while still being significant its sign changed reversing our argument.

Table 39: Determinants of the Real Exchange Rate Level in Latin America

Estimation: Treatment Effect Model, Two Step Estimation
(Robust standard errors are presented below the corresponding coefficients)

Period:	1975 - 2006				1975 - 2006			
Unit of observation:	Annual				Annual			
Dependent variable:	Real Effective Exchange Rate				Real Exchange Rate Overvaluation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Real Exchange Rate Equation								
Government Burden	-0.3845	-0.1947	-0.1862	-0.2555	-0.0094	-0.0126	-0.0164*	-0.0164*
(government consumption/GDP, in logs)	(0.4713)	(0.4857)	(0.4686)	(0.4739)	(0.0074)	(0.0083)	(0.0085)	(0.0086)
Output per Capita	-2.2714***	-2.4633***	-2.3835***	-2.8114***	2.1572***	1.7845**	2.3217***	2.7482***
(real GDP per capita, in logs)	(0.4505)	(0.4738)	(0.4248)	(0.4225)	(0.6711)	(0.7912)	(0.7933)	(0.7677)
Terms of Trade1	-3.0859***	-2.3786***	-2.5628***	-2.8405***	-0.9656***	-0.7261***	-0.7414***	-0.6222***
(terms of trade index, in logs)	(0.5713)	(0.6912)	(0.7054)	(0.7734)	(0.1892)	(0.1171)	(0.1294)	(0.1408)
Trade Openness1	1.4721***	1.1966***	1.6562***	1.5777***	1.7251***	1.7352***	1.5645**	1.6745***
(exports+imports / GDP, in logs)	(0.3464)	(0.3492)	(0.3460)	(0.3442)	(0.5431)	(0.5947)	(0.6455)	(0.6259)
Foreign Direct Investment1	-1.5246**	-0.9771	-1.3518*	-1.6069**	-0.2343*	-0.1639	-0.2768**	-0.2515*
(net foreign direct investment, in logs)	(0.7715)	(0.7833)	(0.7440)	(0.7554)	(0.1221)	(0.1347)	(0.1363)	(0.1383)
Portfolio Flows1	-0.7203*	0.4903	-0.7081*	-0.7953**	-0.5122*	-0.5097	-0.5123	-0.6125*
(Inflows+outflows/GDP, in logs)	(0.3985)	(0.3832)	(0.3676)	(0.3728)	(0.3062)	(0.3165)	(0.3267)	(0.3368)
Agricultural Sector1	0.5954	1.2773**	1.4862***	1.8953***	0.4110	1.1043**	1.2267***	1.4221***
(share of agriculture in GDP)	(0.5393)	(0.5572)	(0.4849)	(0.4824)	(0.3781)	(0.4693)	(0.4790)	(0.5288)
Industrial Sector1	0.4383	0.7309*	0.9822***	1.3103***	0.3019	0.4027*	0.4123*	0.4570*
(share of industry in GDP)	(0.4140)	(0.3739)	(0.2951)	(0.2842)	(0.2262)	(0.2312)	(0.2515)	(0.2652)
Propensity to Float	3.0762***	3.3925***	2.6821***	2.1225***	1.2893***	1.6906***	1.0924***	1.1476***
(dummy based on RR classification)	(0.9743)	(0.9591)	(0.9610)	(0.7681)	(0.2623)	(0.2282)	(0.1791)	(0.1603)
First-Step Hazard	-1.4540**	-1.9524**	-0.8076*	-0.6791*	-0.1968*	-0.2877**	0.2276**	0.1696*
	(0.7152)	(0.6608)	(0.4893)	(0.4018)	(0.1201)	(0.1392)	(0.1123)	(0.1025)

Table 40: Determinants of the Real Exchange Rate Level in Latin America (cont.)

Period:	1975 - 2006				1975 - 2006			
Unit of observation:	Annual				Annual			
Dependent variable:	Real Effective Exchange Rate				Real Exchange Rate Overvaluation			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel B: Treatment (Probit) Equation								
Dependent variable: Propensity to Float								
Money Supply to International Reserves1	0.0148	0.0132	-0.0037	-0.0003				
(M2/Reserves)	(0.0118)	(0.0130)	(0.0153)	(0.0161)				
Output per Capita	0.3828**	0.6924***	0.8820***	1.0200***				
(real GDP per capita, in logs)	(0.1553)	(0.1786)	(0.2091)	(0.2255)				
Real Interest Rate	0.0226	0.0200	0.0256**	0.0230*				
(based on lending rates)	(0.0254)	(0.0300)	(0.0131)	(0.0141)				
Price instability1	1.0694***	0.9472**	2.4789***	2.1847***				
(inflation rate, in log[100+inf.rate])	(0.3799)	(0.4083)	(0.8058)	(0.8340)				
High Inflation	-0.8689	-1.2009**	-2.0412**	-1.4993*				
(dummy =1 if inflation in t-1>250)	(0.5627)	(0.6030)	(0.8800)	(0.8961)				
Agricultural Sector1	0.0400**	0.0408*	0.0485**	0.0644**				
(share of agriculture in GDP)	(0.0181)	(0.0214)	(0.0232)	(0.0252)				
Industrial Sector1	0.0462***	0.0600***	0.0542***	0.0541***				
(share of industry in GDP)	(0.0129)	(0.0147)	(0.0168)	(0.0180)				
Financial Development1			1.7074***	1.2342**				
(private domestic credit/GDP, in logs)			(0.5611)	(0.5957)				
Foreign Liabilities1			0.3949	0.0514				
(foreign liabilities/M2)			(0.5422)	(0.6266)				
Trade Openness1			0.2196	-0.4120*				
(exports+imports / GDP, in logs)			(0.1948)	(0.2372)				
Political Risk		-0.3561***	-0.4398***	-0.3998***				
(ICRG composite index)		(0.1237)	(0.1414)	(0.1435)				
Democracy		0.0138	0.0133	0.0550**				
(Polity2 index)		(0.0240)	(0.0293)	(0.0273)				
Years in Office				0.0208				
(number of years)				(0.0220)				
Years Left in Current Term				0.0022				
(number of years left)				(0.0569)				
Government Seats in the Legislature				0.0015				
(number of seats)				(0.0020)				
Executive Special Interest				1.3601***				
(dummy =1 if the executive is linked to SIG)				(0.4609)				
Central Bank Governor Stability				0.3286**				
(normalized numbers of governor turnovers)				(0.1627)				
Rho	-0.467	-0.633	-0.298	0.178	-0.428	-0.561	0.449	0.347
Sigma	3.113	3.084	2.707	2.692	0.460	0.513	0.507	0.489
Lambda	-1.454	-1.952	-0.807	-0.679	-0.197	-0.288	0.227	0.170
No. Observations	421	380	359	352	421	380	359	352

All regressions include time dummies and constant
Lagged values of variable x are denoted x1.
*** means significant at 1%, ** at 5% and * at 10% (# at 11%)

Table 41: Decomposition Effects of the Tradable Sectors on the Exchange Rate Level

(Based on the Results from Table 39)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Agriculture								
Direct Effect	0.60%	1.28%	1.49%	1.90%	0.41%	1.10%	1.23%	1.42%
Indirect Effect	0.05%	0.09%	0.11%	0.13%	0.05%	0.09%	0.11%	0.13%
Total Effect	0.65%	1.37%	1.60%	2.03%	0.46%	1.20%	1.34%	1.55%
χ^2 test - Total Effect = 0								
(p-value)	0.09	0.04	0.04	0.05	0.05	0.04	0.06	0.08
Industry								
Direct Effect	0.44%	0.73%	0.98%	1.31%	0.30%	0.40%	0.41%	0.46%
Indirect Effect	0.08%	0.17%	0.18%	0.18%	0.08%	0.17%	0.18%	0.18%
Total Effect	0.52%	0.90%	1.17%	1.49%	0.39%	0.58%	0.60%	0.64%
χ^2 test - Total Effect = 0								
(p-value)	0.01	0.00	0.00	0.00	0.12	0.08	0.04	0.07

where the effective exchange rate is greater than its PPP value implying a more depreciated domestic currency. Even in terms of magnitude, results are similar to using real effective exchange rate level. Thus, results regarding the level and regime hold even when using the real exchange rate overvaluation measure. Table 41 reports the decomposition effects of the tradable sectors on the real exchange rate level and overvaluation where each column corresponds to the different specifications from Tables 39 and 40. Since the probit model is non-linear, the partial effect of a change in one variable on the propensity to float depends on the value of the other variables. The focus of this exercise it to analyze the agricultural and industrial sectors variables while the rest of the variables are hold at their means. For the different specifications, the total *lobbying* effect of the agricultural sector is on average 1.41% of the annual real exchange rate level (1.14% for the overvalution measure), while the same effect from the industrial sector is on average 1.0% (0.6% for the overvaluation measure). It is worth noting that there is considerable variation between specifications: for the real exchange rate level, in Column (1) the total effect is, on average 0.7% while in Column (4) it is, on average, 2.0%.

4.6 CONCLUSIONS

In this paper the political economy of exchange rate policy in Latin America is analyzed. From the political model, the main implication is that the optimal exchange rate will be determined by the economic parameters -such as interest rate, productivity, money demand-, the distribution of agents and special interest groups in the economy, and the capacity of special interest groups to influence policymakers. This has at least two more implications. The first one is that agents are differentially affected after a change in the exchange rate: this is in fact relevant for non-traded goods producers that are consuming traded goods and whose price will be distorted by any change in the exchange rate. The second one is that since the impact on the tradable and non-tradable goods sector is clear and differential, then the exchange rate became a policy variable that is the subject of political competition through special interest groups potentially associated with those sectors.

In the second part of the paper, the main implications from the model are tested empirically for Latin America. The data suggest that political economy factors have played a role in shaping exchange rate policy. In fact, special interests also appear to affect currency policy, especially as the tradable goods sectors, represented by the agricultural and manufacturing sectors, promote more flexible exchange rate regimes to maintain the competitiveness of locally produced tradables. Furthermore, there is also evidence that less stable central bank governors and less fragmented governments with political power tend to fix the exchange rate. The results are robust for different specifications, methodologies and variables.

Finally, a decomposition exercise was performed to analyze the interaction between the regime and the level of the exchange rate. Results confirmed the importance of the tradable sector in the determination of not only the regime but the level of the exchange rate.

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