Review of International Economics, 12(3), 412–434, 2004

Capital Controls, Risk, and Liberalization Cycles

*Laura Alfaro and Fabio Kanczuk**

Abstract

The paper presents an overlapping-generations model where agents vote on whether to open or close the economy to international capital flows. Political decisions are shaped by the risk over capital and labor returns. In an open economy, the capitalists (old) completely hedge their savings income. In contrast, in a closed economy, the workers (young) partially insulate wages from the productivity shocks. There are three possible equilibrium outcomes: economies that eventually remain open; those that eventually remain closed; and those that cycle between open and closed. In line with the stylized facts, cycles are more common in economies with intermediate development levels.

1. Introduction

In this paper, we present a model with stochastic technology to characterize different capital control liberalization patterns observed across countries. We address, in particular, the phenomenon of capital liberalization cycles. We focus on the distributive effects of capital flows, and analyze how the decision to impose capital controls is shaped by risk and insurance considerations.

Since the 1960s, most developed nations have been eliminating capital controls monotonically, although with differences in the pace of liberalization. The United States and Germany, for example, removed all controls in the early 1970s. In 1979, under the Thatcher government, Britain abolished controls. Japan started dismantling controls that same year and continued throughout the 1980s. Australia and New Zealand removed controls in 1983, France in 1989, and Portugal and Ireland in 1993.[1]

Among the developing countries, however, as documented by Eichengreen et al. (1998), there is no clear capital-control-policy time pattern. Some countries always have maintained few or no restrictions—for example, Singapore, Hong Kong, Panama, and Liberia. In East Asia, major steps towards liberalization started in the 1970s and accelerated in the 1990s. In contrast, over the last 30 years, most African countries have kept high level of controls. Finally, some countries have been cycling between imposing and lifting controls. For example, after being relatively open during the 1960s, a number of Latin American countries imposed controls during the early 1970s. A new wave of liberalization in the late 1970s—mostly in the Southern Cone—was interrupted by the increased use of restrictions in the early 1980s that came after the debt crisis when countries tried to restrict capital outflows. Restrictions began to decline in the late 1980s after most of the highly indebted countries in the region rescheduled their debts and liberalized their economies. Other countries that have repeatedly changed their policies include Israel, Malaysia, and Turkey.

Figures 1 and 2 plot a measure of capital control policy change against the log of average real GDP per capita from 1966 to 1970 and against the log of the average real

* Alfaro: Harvard Business School, Boston, MA 02163, USA. Tel: (617) 495-7981; Fax (617) 496-5985; E-mail: lalfaro@hbs.edu. Kanczuk: Univ. de Sao Paulo, Brazil, 55-11-31419678. E-mail: kanczuk@usp.br. We are grateful to Luisa Lambertini, Costas Azariadis, and Carlos Végh for helpful discussions and suggestions, and LACEA, RES, UCLA's seminar participants, and two anonymous referees for valuable comments.

GDP per capita from 1966 to 1994. The capital-control-policy change index was constructed by counting the number of times a country changed its capital control policy as defined by the International Monetary Fund's survey of Exchange Arrangements and Exchange Restrictions over the period 1966–94.[2] The capital-control-policy change index seems to have an inverted U-shape relationship with the income measures. Both rich and poor countries change capital control policies less often than middle-income countries.

How can we understand this portrayal? In general, in a one-good intertemporal model of trade, an economy gains from borrowing or lending abroad, so opening the economy improves welfare. As Obstfeld (1998) puts it:

> "Economic theory leaves no doubt about the potential advantages of global financing trading. International financial markets allow residents of different countries to pool various risks, achieving more effective insurance than purely domestic arrangements would allow. Furthermore, a country suffering a temporary recession or natural disaster can borrow abroad. Developing countries with little capital can borrow to finance investment, thereby promoting economic growth without sharp increases in savings rates. At the global level, the international capital market channels world savings to their more productive uses, irrespective of location."

Reinhart and Smith (2002) point out one possible departure from this paradigm.[3] They show that a counter-cyclical capital control policy against temporary shocks to the international interest rate could have welfare benefits. However, as they mention, restrictions on capital controls must be highly restrictive to have significant effects, otherwise the potential benefits of such counter-cyclical policies are quite small. Additionally, capital controls are usually left in place longer than the temporary shock, thus offsetting any benefit from the policy. This suggests that there might be reasons, other than to increase overall society's welfare, for the observed temporary capital control policies.

Another possible explanation for why economies opt to control capital flows, the one pursued in this paper, is based in distributive conflict. Whereas an economy as a whole can benefit from opening up to international markets, some groups within an economy may lose in the absence of necessary compensating transfers. Following this line, we depart from models in which policymaking is viewed as the optimal outcome of a social planner who wishes to maximize the welfare of the representative agent. Our view is that the heterogeneity in the population and distributive consequences of policies provide additional insights towards understanding why temporary policies are implemented.

Our approach relates to a large body of the political economy literature that explains delay in stabilization and adoption of temporary policies. In Alesina and Drazen (1991), for example, the process leading to stabilization is described as a war of attrition between different socioeconomic groups. Each group waits for another group to give in. The most anxious group will give in and adjustment takes place, thus explaining delays in stabilization. In Fernandez and Rodrik (1991), the uncertainty about the consequences of policy changes could prevent a rational risk-neutral electorate from favoring a reform that, if implemented, would benefit a majority of voters. According to their model, the political system is biased toward the status quo. In research more closely related to our analysis, Rodrik and van Ypersele (1999) address the issue that capital mobility might be politically unsustainable even though it enhances efficiency. They require, in a one-period model, that no group be a net loser. This constraint admits

the possibility that compensatory adjustments in national tax rates might not be feasible in the absence of coordination among countries.

In contrast to these contributions, we explain and provide a rationale for short-lived, temporary policies. In an environment with productivity shocks in which capital flows potentially are welfare-improving for society as a whole, we focus on the distributive effects that result from opening and closing an economy to international capital movements. In particular, we use an overlapping-generations model (OLG)—where individuals work, receive wages and consume when young, and enjoy yields from savings and consume when old—which allows for a dynamic setup where workers and capitalists are naturally identified with the young and old generations, respectively.[4] If capital is mobile and labor immobile, opening the economy will have different effects across agents. Capital exports, due to international rates being higher than autarky rates, help capitalists and hurt workers because lower capital levels imply lower wages; capital imports produce the opposite results.

Since capital mobility can create sharp political divisions, we model an open economy as the outcome of a non-cooperative game between players who wish to maximize their own utility where compensatory schemes are not present. Rather than impose a social welfare function, we allow the economy's "political representative," worker or capitalist, to decide in every period whether to open to the international capital market.

Because the production function has a stochastic component, political decisions are shaped by the risk over capital and labor returns. If the economy is open, the capitalist's return will be the international interest rate. If the economy is closed, both the capitalist's and the worker's payoff will fluctuate with the internal productivity shocks. In an open economy, a capitalist will completely hedge his risk; for the worker, however, capital flows increase wage variability. By closing the economy, a worker is forcing domestic assets to stay inside the economy, partially mitigating the effect of productivity shocks on wages.

We study decision rules that imply in *pure Markov perfect equilibria*. For that, we define a certain asset accumulation level for which the median voter is indifferent about whether or not to open or close the economy. If the asset accumulation level were to exceed this critical value, a worker representative would decide to keep the economy closed, whereas a capitalist representative would open it. In contrast, if the critical value were not exceeded, the worker would open the economy and the capitalist would keep it closed.

We characterize three kinds of equilibrium outcomes that define three possible types of observed liberalization policies: economies that always choose to open, economies that always remain closed, and economies that cycle between closed and open policies. The introduction of productivity shocks thus generates endogenous liberalization over a range of values of the ratio of international to autarkic interest rate and the variance of the productivity shocks.

These productivity shocks should be generally understood to be any perturbation in the economic system, such as political instability, default risk, or crisis contagion, that affects capital and labor remuneration. For example, the threat of a currency attack due to an inconsistent fiscal policy is, in fact, a reduction in the capital return and should be interpreted, in our simple environment, as a negative productivity shock. A sudden massive capital outflow, which many times precedes capital controls, should be seen as a consequence of a drop in expected capital returns. Sometimes, this drop in capital returns is due to negative confidence shocks, panics, herding behavior, animal spirits,

or contagion. In other instances, it is due to bad government policies. A productivity shock, in a broad sense, can accommodate all of these interpretations.

Our main result is that economies subject to higher variability of shocks, with more political instability, and with autarkic rates closer to the international rate revise liberalization policies more often. Additionally, as we argue in precise terms, countries with intermediate development levels are more likely to classify as these cycling economies, because they tend to be more volatile than developed countries and they tend to have interest rates closer to the international rate than less developed countries.

In section 2, we estimate the observed relation between capital controls and development, which is consistent with our model results. Section 3 develops the model, solves for the economic equilibrium, and discusses the equilibrium concept. Section 4 solves for the political equilibrium. Section 5 analyzes the risk effects associated with the productivity shocks on the political decision. Section 6 solves for the dynamics of the model. Finally, section 7 concludes.

2. Stylized Facts

Following Alesina et al. (1994), Grilli and Milesi-Ferretti (1995), and Bartolini and Drazen (1997), we constructed a capital-control index using information from the International Monetary Fund's Survey of Exchange Arrangements and Exchange Restrictions.[5] Since 1966, this survey describes whether a country has adopted any of the following distortions: restriction on payments for current transactions; restriction on payments for capital transactions; enforcement of multiple exchange rates; restrictions to repatriation of export proceeds.

For each country and each year, we constructed a dummy variable that took the value of 1 if all four types of controls were used; 0.75 if any three types of controls were used; 0.50 if any two controls were used; 0.25 if any control was used; and zero if no control was used. The studies mentioned earlier acknowledge the limitations of using these data to measure the intensity or effectiveness of capital controls. However, it is difficult to find another measure that is comparable across countries and available for sufficiently long periods of time.[6]

In order to quantify the *change* in the capital control policy, we constructed another index by counting the number of times a country changed its capital control policies—the number of times the capital control index changed—over the period 1966–94. Albeit unsophisticated and simple, this measure allows for cross-country comparisons.[7] Figure 1 plots the capital-control-policy change index (CI) against the log of the average real gross domestic product per capita at international prices between 1966 and 1970. The data are taken from the Penn World Tables and World Bank Development Indicators. An inverse U-shape relationship between the index and log of real GDP per capita is readily observed. Figure 2 plots the index against the log of the average real GDP between 1966 and 1994. The same pattern is observed.

The first column in Table 1 reports the results of a simple OLS regression of the number of changes in the capital control policy against the log of the average real GDP per capita from 1966 to 1970—labeled log (initial GDP)—its quadratic term, and a constant. The income terms are highly significant and have the right sign. The results under column 2 in Table 1, from the same regression run using the log of the average real GDP per capita for the period 1966 to 1994, were robust to the choice of the income variable. In order to control for regional differences, Table 2, column 1 includes

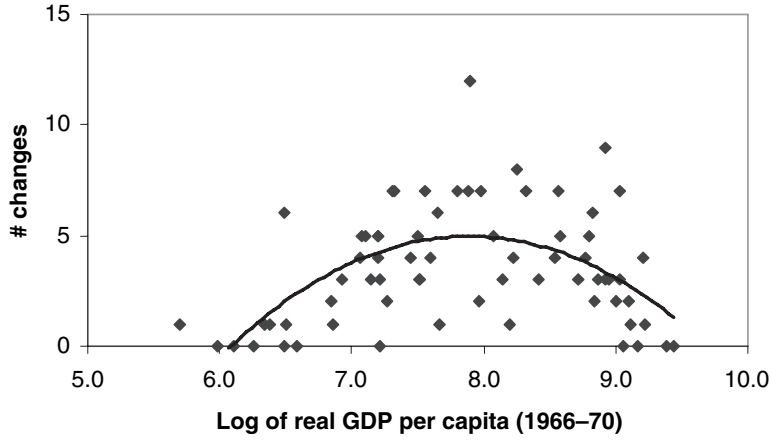

Figure 1. Capital-Control-Policy Change Index and Initial Development Level

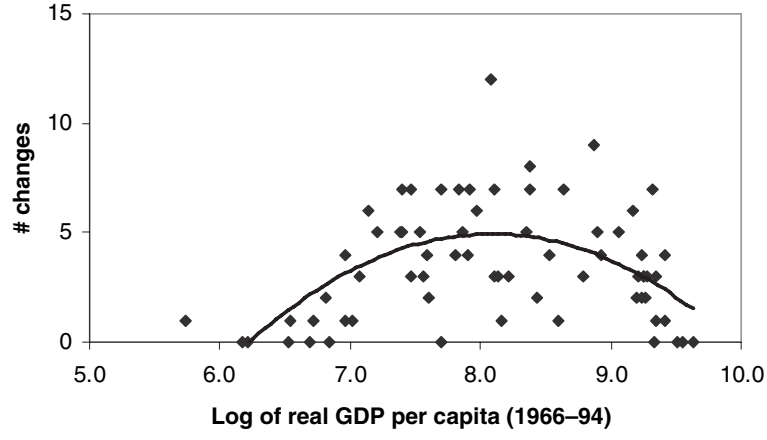

Figure 2. Capital-Control-Policy Change Index and Average Development Level

regional dummies. Although the OECD dummy is significant, the quadratic relationship remains significant as well. The results were similar when other variables were included (Table 2, column 2) to control for political risk (political instability) as well as macroeconomic volatility (inflation).

The model presented in the next section addresses the dissimilarities in capital control liberalization policies across countries and, more specifically, the liberalization cycles observed in the data and the relation against the income level.

3. The Model

Our model is constructed around a standard overlapping-generations model (OLG). As in Diamond (1965), we consider an economy composed of generations that live for only two periods. Each generation is populated by a continuum of households with unit mass. At each point in time, agents from two consecutive generations are alive, the young and the old, that we identify with workers and capitalists, respectively.

Table 1. Determinants of the Capital-control-policy Change Index

Dependent variable: capital-control-policy change index	(1)	(2)
Log(*Initial GDP*)	25.811***	
	(4.495)	
Log(*Initial GDP*)^2	–1.637***	
	(0.288)	
Log(*Average GDP*)		24.950***
		(4.960)
Log(*Average GDP*)^2		–1.544***
		(0.307)
Constant	–96.737***	–95.814***
	(17.254)	(19.707)
Adjusted *R*-squared	0.328	0.327
Included observations	68	68

Notes: Heteroskedastic consistent standard errors in parenthesis. Log (*Initial GDP*) represents the log of the average real GDP per capita at international prices from 1966–70. Log(*Average GDP*) represents the log of the average real GDP per capita at international prices from 1966–94. *** denotes significance at 1%; ** denotes significance at 5%.

Young individuals are endowed with one unit of labor, which they supply in exchange for a wage w_t. They consume part of their wage income during the first period of life and save the rest. These savings bear an interest rate factor $R_{t+1} = 1 + r_{t+1}$. When old, individuals consume the returns and the principal from their savings.

In addition, in each period t, the economy's political representative decides whether to open or close the economy to international capital markets. The representative, a member of the generation with the political power, can be thought of as the economy's median voter in a democratic environment. But, more generally, the representative can correspond to the interest group to which the government in power is responding. The group to which he or she belongs depends on the particular political institutions, voter eligibility, and the participation rules of the economy. We look at two possible cases: when the representative is a worker (young) and when he or she is a capitalist (old).

We consider production to be a stochastic process. Productivity factor (A_t) is an independently distributed random variable with support $[a_L, a_H]$. Political decisions are shaped by the risk over capital and labor returns. We denote international variables by the superscript i; and autarky variables by the superscript a. We restrict the analysis to dynamic efficient economies.

Timing

In each period t, actions take place according to the following time line (see Figure 3).

- At the beginning of the period, the available level of assets (owned by the old) is z_t.
- The political representative makes a political decision (π_t) to open (O) or close (C) the economy; i.e., $\pi_t \in \{O, C\}$.

Table 2. Determinants of the Capital-control-policy Change Index

Dependent variable: capital-control-policy change index	(1)	(2)
Log(*Initial GDP*)	17.510***	17.697***
	(4.582)	(4.564)
Log(*Initial GDP*)^2	–1.032***	–1.044***
	(0.300)	(0.298)
OECD dummy	–2.466**	–2.257**
	(0.918)	(0.944)
Latin American dummy	1.140	1.598
	(0.820)	(0.938)
African dummy	0.729	1.224
	(0.697)	(0.809)
East Asian dummy	0.242	1.310
	(1.436)	(1.808)
Political Instability		–1.353
		(3.316)
Inflation		–0.001
		(0.002)
Constant	–69.102***	–70.006***
	(19.054)	(17.367)
Adjusted *R*-squared	0.424	0.417
Included observations	68	64

Notes: Heteroskedastic consistent standard errors in parenthesis. Log (*Initial GDP*) represents the log of the average real GDP per capita at international prices from 1966–70. The regional dummies include the OECD countries, Latin America, African countries, and the East-Asia countries. The *Political Instability* variable is an index of political instability based on the number of political assassinations and revolutions. The *Inflation* variable is the average change in consumer price index. *** denotes significance at 1%; ** denotes significance at 5%.

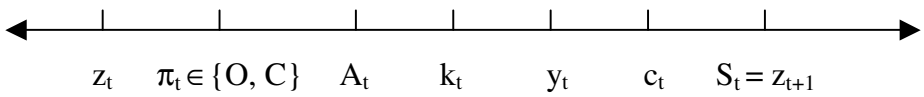

Figure 3. Time Line

- Nature plays, revealing the production productivity factor A_t.
- If the economy is open, capital flows in or out, making k_t, the domestic capital level, equal to k_t^i. Otherwise, if the economy is closed, $k_t^a = z_t$.
- Production takes place, leading to an output of $A_t k_t^a$.
- Consumption takes place. The old consume all their income; the young consume a fraction of their wage income and save the rest.
- Savings of the young become the next level of assets, z_{t+1}.

Technology and Preferences

The production function is given by $f(k_t) = A_t k_t^{\alpha}$, where $\alpha \in (0, 1)$ and A_t are independently distributed random variables with support $[a_L, a_H]$, $0 < a_L \leq a_H$. Depreciation is assumed to be equal to one ($\delta = 1$). Agents from the generation born at t maximize their lifetime utility from consumption:

$$U_t = \mathrm{E}[\ln c_t^t + \beta \ln c_{t+1}^t], \tag{1}$$

where c_t^t denotes consumption when young and c_{t+1}^t consumption when old.[8] They are subject to the budget constraint

$$c_t^t + c_{t+1}^t / R_{t+1} = w_t. \tag{2}$$

The combination of the CES production function with the logarithmic utility function provides a very simple framework to study political questions. As we shall see, household economic decisions do not depend on future interest rates, which greatly facilitate the solution of a stochastic model such as this. Moreover, each realization of A_t defines a unique and stable positive steady-state value for capital.

International Capital Flows

For simplicity, we assume a "small-open economy" setup and perfect capital markets. This implies that, if open, our economy takes the international interest rate factor, R^i, as given by the world economy. The domestic capital level immediately adjusts to conform to this interest rate with no adjustment costs, becoming

$$k_t^i = (\alpha A_t / R^i)^{1/1-\alpha}. \tag{3}$$

We additionally assume R^i to be constant over time.[9]

Economic Equilibrium

As usual, the economic equilibrium concept is "Walrasian equilibrium." In each period, firms maximize profits and households maximize utility taking the prices, $w(k_t)$ and $R(k_t)$, as given. Market clearing implies that the next level of capital equals the young's savings. The resulting prices and law of motion are:

(a) Firm's optimization problem:

$$w(k_t) = f(k_t) - kf'(k_t) = (1-\alpha) A k_t^{\alpha}, \tag{4}$$

$$R(k_t) = 1 - \delta + kf'(k_t) = \alpha A k_t^{\alpha-1}. \tag{5}$$

(b) Households' optimization problem:

$$c_t^t = w(k_t)/(1+\beta), \tag{6}$$

$$c_{t+1}^t = \beta R(k_{t+1}) w(k_t)/(1+\beta). \tag{7}$$

(c) Market clearing:

$$z_{t+1}^t = \beta w(k)_t/(1+\beta). \tag{8}$$

These allocations imply the following indirect utility function:

$$U_t = (1+\beta)\mathrm{E}[\ln w_t] + \beta \mathrm{E}[\ln R_{t+1}] + \beta \ln \beta - (1+\beta)\ln(1+\beta). \quad (9)$$

It is crucial to note that the economic decisions are completely disjoined from political decisions. Once the wage is given, the first period's consumption and savings are determined independently of the next period's interest rates (R_{t+1}), and, therefore, independently of political decisions.

4. Political Equilibrium

In contrast with the economic decisions, the political decision to open or close the economy to international capital markets is made, in every period, by a single representative household. This decision thus has a measurable and acknowledged influence on other agents' payoffs. In other words, representatives do not behave "competitively." To analyze political decisions, one should approach this problem as a game among consecutive representatives.

In order to formalize the game, we need first to define the history and strategies. The history of the game is a complete description of all the actions chosen in the past for all players, particularly in the beginning of period t, $h_t = (z_1, \pi_1, A_1, k_1, \ldots, z_{t-1}, \pi_{t-1}, A_{t-1}, k_{t-1}, z_t)$. Now, a pure strategy for the representative of time t is a function that maps h_t into an action $\pi_t \in \{O, C\}$. This general formulation, often used in the study of repeated games, allows for strategies that influence future strategies not because they have a direct effect on the environment, but rather because players believe that past plays matter.

In this paper, we restrict our focus to Markov or "state-space" strategies, for which the past influences the current play only through its effect on a state variable that summarizes the direct effect of the past on the current environment.[10] In particular, we assume that a strategy for the time t representative is a map from z_t into an action $\pi_t \in \{O, C\}$. The equilibrium concept, *pure Markov perfect equilibrium*, is a profile of pure Markov strategies that yields a Nash equilibrium in every proper subgame.

There are two basic approaches to aggregating society's preferences. One is to consider the capital control policy as the outcome of majority voting, as in Mayer (1984).[11] As argued by Helpman (1995), although there are few instances in which direct democracy is applied to a broad range of issues, there exists a view that in a representative democracy policy outcomes are reasonably close to what is supported by the majority of voters. Hence, a simple analysis of majority voting can serve as a good approximation. One approach, therefore, is simply to assume that implemented policies are the result of majority voting and reflect the preferences of the median voter. Since we have a unidimensional issue space and single-peaked preferences, we can appeal to the median voter theorem.

A second approach is to assume that the government designs policies to satisfy special interest groups or, in the absence of a democratic system, the ruling group.[12] In this case, one should consider the policies chosen by the "median contributor."

In order to reconcile these approaches, we analyze the preferred policies of the "representative" who could be either the median voter or median contributor, depending on political institutions and country's eligibility rules, as well as voter participation.

The Capitalist (Old) Representative

In this section, we solve for the political equilibrium, considering first the case in which the representative is a capitalist (old) and then the case in which he or she is a worker (young).

An old individual makes the political decision having worked in the last period and has already earned wages. The only term in the utility function that would be affected by his or her decisions is $\mathrm{E}[\ln R_{t+1}]$. Therefore, he or she maximizes his or her utility by choosing the status of the economy that maximizes expected interest rates. This is precisely the reason an old individual can be associated with a capitalist. The problem of the capitalist representative can be written as

$$\max_{\pi \in \{O,C\}} \mathrm{E}[\ln R_{t+1}]. \tag{10}$$

In order to facilitate the analysis of the solution, we first define z^*:

Definition 1 (Threshold level of asset). *z^* is defined by*

$$\ln z^* \equiv \left(\ln \alpha + \mathrm{E}[\ln A_t] - \ln R^i\right)/(1-\alpha). \tag{11}$$

Proposition 1 (Capitalist representative equilibrium strategy). *The political decision of a capitalist representative at time t is given by*

$$\pi_t = O \quad \textit{if } z_t > z^*,$$

$$\pi_t = C \quad \textit{if, otherwise, } z_t \le z^*.$$

Proof. *For $\pi_t = O$, we have $\mathrm{E}[\ln R_{t+1}] = \ln R^i$. For $\pi_t = C$, $\mathrm{E}[\ln R_{t+1}] = \ln \alpha + \mathrm{E}[\ln A_t] - (1 - \alpha)\ln z_t$. The representative will open the economy if, and only if, the utility from staying open is higher than the one of staying closed: $\ln R^i > \ln \alpha + \mathrm{E}[\ln A_t] - (1 - \alpha)\ln z_t \Leftrightarrow z_t > z^*$.* □

Proposition 1 tells us that, for z_t large, an old individual is better off in an open than in a closed economy. This happens because, for a higher z_t, the possible level of an observable interest rate in a closed economy would be lower, whereas the interest rate in an open economy is independent of z_t. Since the capitalist cares only about the remuneration over his or her savings, an open economy is a more attractive option in a situation of higher z_t. Note also that $\partial z^*/\partial R^i < 0$. If the open economy offers a higher remuneration R^i, the threshold level to staying open would be lower.

The Worker (Young) Representative

A young representative who makes the political decision needs to consider two variables: $\mathrm{E}[\ln(w_t)]$ and $\mathrm{E}[\ln(R_{t+1})]$. The first term is determined by his or her decision. The second depends on what the next representative decides. Since we have restricted our attention to equilibria in which the strategies are Markov, meaning that players do not consider that the next period plays are a *direct* function of their play, we have to analyze here only two cases:

(a) Next representative will open ($\pi_{t+1} = 0$)

$R_{t+1} = R^i$, and the representative's problem is

$$\max_{\pi \in \{O,C\}} \mathrm{E}[\ln w_t]. \tag{12}$$

(b) Next representative will close ($\pi_{t+1} = C$)

We can write $\ln(R_{t+1})$ as a function of $\ln(w_t)$:

$$\begin{aligned} &\ln(R_{t+1}) = \ln \alpha + \ln A_{t+1} - (1-\alpha)\ln z_{t+1} \Leftrightarrow \\ &\ln(R_{t+1}) = \ln \alpha + \ln A_{t+1} - (1-\alpha)\ln \beta - (1-\alpha)\ln(1+\beta) - (1-\alpha)\ln w_t. \end{aligned} \tag{13}$$

This expression into the indirect utility function (10) implies

$$U_t = (1+\beta)\mathrm{E}[\ln w_t] + \beta\mathrm{E}[\ln A_{t+1}] + \beta\alpha \ln \beta - (1+\beta\alpha)\ln(1+\beta). \tag{14}$$

We have two terms that need to be determined, $\ln(A_{t+1})$ and $\ln(w_t)$, but only the latter depends on the representative's decision. We now write his or her problem as

$$\max_{\pi \in \{O,C\}} \mathrm{E}[\ln w_t]. \tag{15}$$

This is exactly the same decision problem as in case (a).

The decision of the young, therefore, does not depend on the decision of the next generation. If there is no cooperation between consecutive generations, the best thing the young can do is maximize the expected value of wages. Hence, we can associate young individuals with workers.

Proposition 2 (Young median voter equilibrium strategy). *A political decision by a young representative at time t is given by*

$$\pi_t = O \quad \textit{if } z_t < z^*,$$

$$\pi_t = C \quad \textit{if, otherwise, } z_t \geq z^*.$$

Proof. *Again, it is enough to look at the payoffs for the two possible actions. For* $\pi_t = O$, *we have*

$$\mathrm{E}[\ln w_t] = \ln(1-\alpha) + (\alpha \ln \alpha + \ln \mathrm{E}[A_t] - \alpha \ln R^i)/(1-\alpha);$$

and for $\pi_t = C$, *we have*

$$\mathrm{E}[\ln w_t] = \ln(1-\alpha) + \mathrm{E}[\ln(A_t)] + \alpha \ln(z_t).$$

□

Remark. Notice that z^* here is the same threshold value as the one obtained before. The decisions of a young and an old representative are complementary; i.e., opposite for any value of z_t. This happens because $d(w_t)/d(R_t) < 0$.

Proposition 2 tells us that, for z_t small enough, a young individual is better in an open than in a closed economy. This happens because a lower z_t means that the possible interest rate level observed in the economy is higher. If the economy opens, therefore, to the international market, the resulting capital inflows lead to higher wages. Since, as we have shown, the young care about wages only, the representative will choose to open the economy. Note also that $\partial z^*/\partial R^i < 0$. If case R^i is lower, the chance is greater that capital will flow in, and the threshold level, therefore, will be higher.

Table 3 summarizes the results of Propositions 1 and 2.

5. Capital Controls as Hedge

What is the effect of the risk associated with the productivity shocks on the political decisions?

Table 3. Representative's Decision

Representative	*Asset level:* $z_t < z^*$	*Asset level:* $z_t > z^*$
Young / workers	Open	Close
Old / capitalists	Close	Open

To answer the question, let us define z^n, the "neutral" level of assets, as the amount of capital that makes the expected closed-economy interest rate equal to the international interest rate. Equivalently, if $z_t = z^n$ and $A_t = \mathrm{E}[A_t]$, the agent is indifferent to opening or closing the economy. Formally:

$$R^i = \alpha \mathrm{E}[A_t] / (z^n)^{1-\alpha}. \tag{16}$$

Alternatively, we can appeal to Definition 2.

DEFINITION 2 ("Neutral" level of asset). *z^n is defined by*

$$\ln z^n = (\ln \alpha + \ln(E[A_t]) - \ln R^i)/(1-\alpha). \tag{17}$$

This definition is useful for the following abstraction. Suppose risk-neutral agents make the political but not the economic decision. That is, the payoffs for a worker representative and capitalist representative are, respectively, the expected values of wage and the expected value of the interest rate. In this case, the neutral level of asset z^n would be the relevant threshold level.

PROPOSITION 3 (A risk-neutral abstraction).

(*i*) *If $z_t > z^n$, then $\mathrm{E}[R_{t+1}]$ is higher for an open economy than for a closed economy, if $z_t \le z^n$, then $\mathrm{E}[R_{t+1}]$ is higher for a closed economy than for an open economy.*
(*ii*) *If $z_t < z^n$, then $\mathrm{E}[w_t]$ is higher for an open economy than for a closed economy, if $z_t \ge z^n$, then $\mathrm{E}[w_t]$ is higher for a closed economy than for an open economy.*

PROOF. *Analogous to Propositions 1 and 2.* □

Returning to our model, with logarithmic preferences, we can state the following.

PROPOSITION 4 (Risk bias). *For $z_t \in (z^*, z^n]$, the capitalist (worker) representative opens (closes) the economy.*

PROOF. *Using Jensen's inequality, we have*

$$(1-\alpha)[\ln(z^n) - \ln(z^*)] = \ln(\mathrm{E}[A_t]) - \mathrm{E}[\ln(A_t)] \ge 0.$$

Noticing that $z^n > z^*$, we can then use Propositions 1 and 2. □

Proposition 4 is nothing more than standard choice under risk theory. Due to the risk associated with the productivity shocks, the old are inclined to open and the young close the economy at $z_t = z^n$. One can think of the gap between z^* and z^n as a risk bias (see Figure 4), meaning the shift in the threshold level of asset that is due to the risk.

To grasp some intuition for this result, we proceed by obtaining the values for R_t and w_t for all possible A_t, when the economy is closed and $z_t = z^n$:

$$\begin{aligned} \ln R_{t+1} &= \ln \alpha + \ln A_t - (1-\alpha)\ln z^* = \ln A_t - \ln(\mathrm{E}[A_t]) + \ln R^i, \\ \ln w_t &= \ln(1-\alpha) + \ln A_t + \alpha \ln z^*, \\ \ln w_t &= \ln(1-\alpha) + \ln A_t + \alpha(\ln \alpha + \ln \mathrm{E}[A_t] - \alpha \ln R^i)/(1-\alpha). \end{aligned} \tag{18}$$

The same quantities, if the economy is open, are

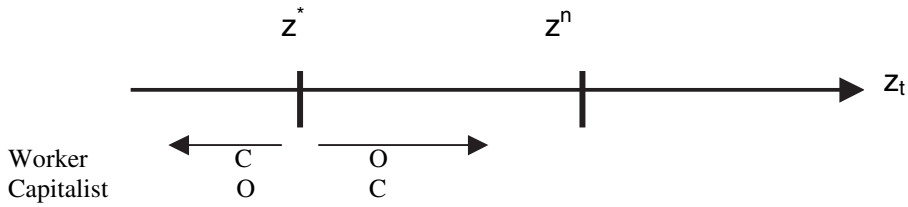

Figure 4. Risk Bias

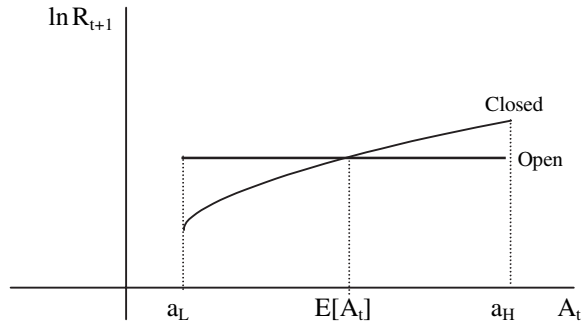

Figure 5. Capitalist's Payoffs

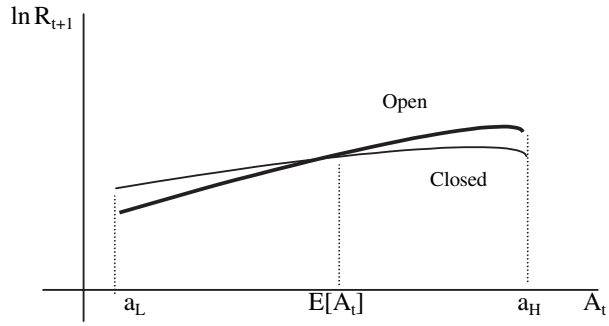

Figure 6. Worker's Payoffs

$$\ln R_t = \ln R^i,$$
$$\ln w_t = \ln(1-\alpha) + \ln A_t + \alpha \ln k_r, \tag{19}$$
$$\ln w_t = \ln(1-\alpha) + \ln A_t + \alpha(\ln \alpha + \ln A_t - \alpha \ln R^i)/(1-\alpha).$$

These expressions are plotted in Figures 5 and 6. Figure 5 indicates the possible payoffs for a capitalist representative who, if the economy is open, will get R^i regardless of A_t since capital is mobile. If the economy is closed, he or she will bear some risk because the payoff will fluctuate with the productivity shocks. A capitalist, hence, will choose to open the economy to completely insulate him or herself.

More interestingly, Figure 6 shows the payoffs for a worker representative whose payoff, if the economy is closed, fluctuates with $\ln A_t$. If the economy is open, his or

her payoff will vary according to $\ln(A_t)/(1-\alpha)$, which corresponds to larger amplitudes. This occurs because capital is mobile but labor is not. In addition to the shock, there is a flow of capital that increases wage variability. By closing the economy, a young representative forces the initial asset level to stay within the economy, partially hedging against the risk from the productivity shock.

6. Dynamics

In this section, we solve for the economy's phase diagram; i.e., the mapping of $z_t \to z_{t+1}$. For that, we first determine the dynamics for an economy that is always closed or always open. We then introduce the political decisions stated in Propositions 1 and 2 and analyze the possible resulting phenomena.

In general, the law of motion for z_t derives from the market-clearing condition and is given by

$$\ln z_{t+1} = \ln[\beta(1-\alpha)/(1+\beta)] + \ln A_t + \alpha \ln k_t. \tag{20}$$

If the economy is always closed, $k_t^a = z_t$, which implies

$$\ln z_{t+1}^a = \ln[\beta(1-\alpha)/(1+\beta)] + \ln A_t + \alpha \ln z_t^a. \tag{21}$$

If, instead, the economy is always open, then

$$\ln z_{t+1}^i = \ln[\beta(1-\alpha)/(1+\beta)] + (\alpha \ln \alpha + \ln A_t - \alpha \ln R^i)/(1-\alpha). \tag{22}$$

These two mappings define, for each z_t^a and z_t^i, the values for z_{t+1}^a and z_{t+1}^i that will result from a productivity shock A_t (see Figure 7).

Notice that, when $z_t^a = z_t^i = z^*$, the two mappings are related by

$$\ln z_{t+1}^i - \ln z_{t+1}^a = \alpha(\ln A_t - \mathrm{E}[\ln A_t])/(1-\alpha). \tag{23}$$

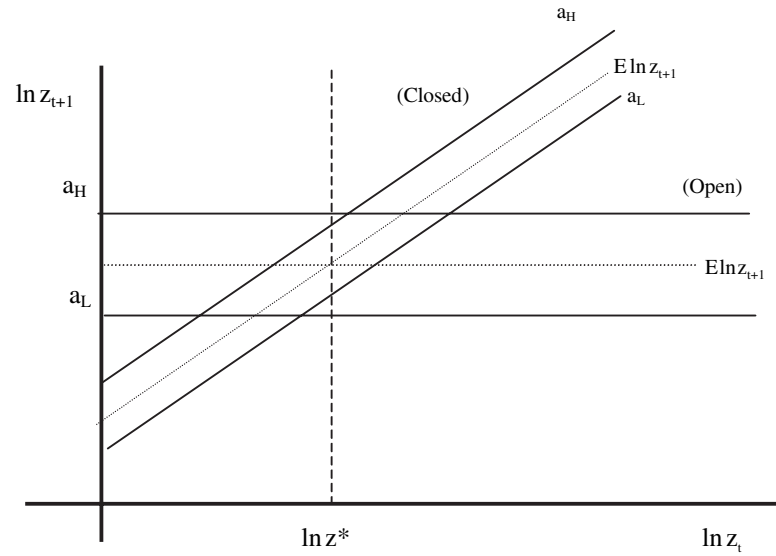

Figure 7. Phase Diagram

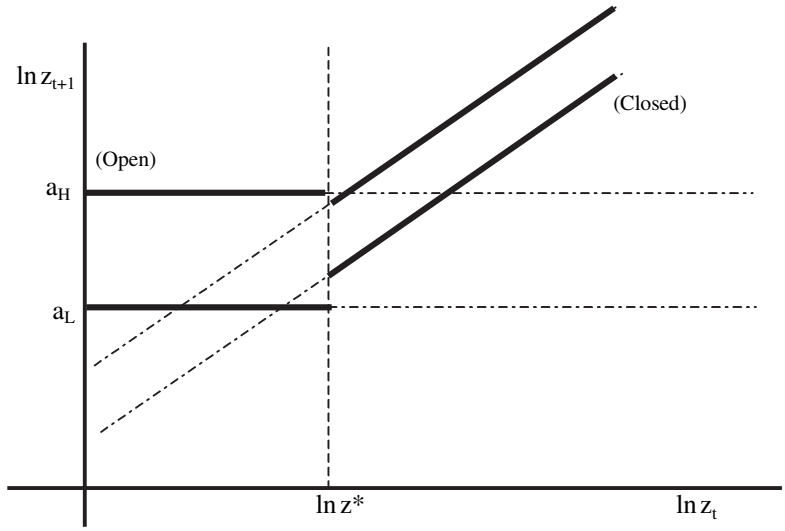

Figure 8. Phase Diagram for Worker

Therefore, at z^*, $\ln z^i_{t+1} = \ln z^a_{t+1}$ if $\ln A_t = \mathrm{E}[\ln A_t]$; $\ln z^i_{t+1} \geq \ln z^a_{t+1}$ if $A_t = a_H$; and $\ln z^i_{t+1} \leq \ln z^a_{t+1}$ if $A_t = a_L$.

Phase Diagram for Worker Representative

Using the last expression and Proposition 2, we can conclude that the phase diagram, when the representative is a worker (Figure 8), is

$$\ln z_{t+1} \begin{cases} = \ln[\beta(1-\alpha)/(1+\beta)] + (\alpha \ln \alpha + \ln A_t - \alpha \ln R^i)/(1-\alpha), & \text{if } z_t < z^*, \quad (24) \\ = \ln[\beta(1-\alpha)/(1+\beta)] + \alpha \ln z_t + \ln A_t, & \text{if } z_t \geq z^*. \quad (25) \end{cases}$$

Three possible dynamic phenomena emerge from this phase diagram.

(a) *Open economy attractor* (Figure 9). From any initial z_0, the economy will converge to an invariant set in which it is always open. This happens when an open economy maps into an open economy. More formally this means that, for any A_t, $z_t < z^*$ implies $z_{t+1} < z^*$. It is necessary and sufficient that, if the economy is open and $z_t = z^*$ and $A_t = a_H$, then $z_{t+1} < z^*$, and

$$\ln[\beta(1-\alpha)/(1+\beta)] + (\alpha \ln \alpha + \ln \alpha_H - \alpha \ln R^i)/(1-\alpha) < \ln z^*. \quad (26)$$

(b) *Closed economy attractor* (Figure 10). From any initial z_0, the economy will converge to an invariant set in which it is always closed. This happens when a closed economy maps into a closed economy. More formally this means that, for any A_t, $z_t > z^*$ implies $z_{t+1} > z^*$. It is necessary and sufficient that, if the economy is closed and $z_t = z^*$ and $A_t = a_L$, then $z_{t+1} > z^*$, and

$$\ln[\beta(1-\alpha)/(1+\beta)] + \ln a_L + \alpha \ln R^i > \ln z^*. \quad (27)$$

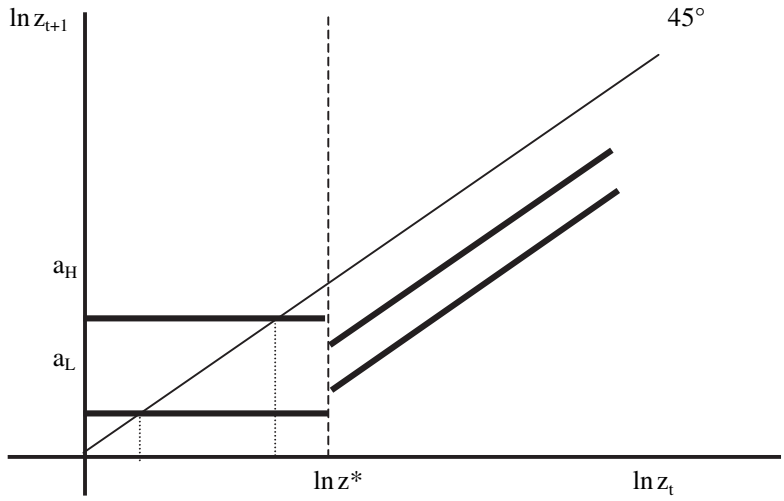

Figure 9. Open Economy Attractor

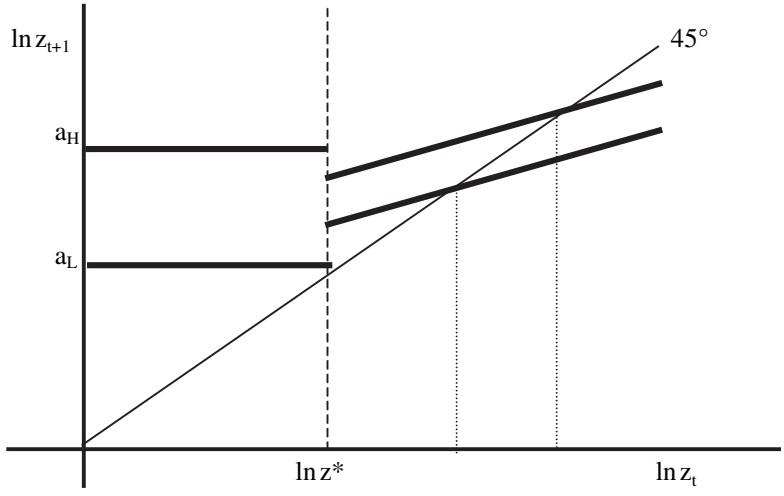

Figure 10. Closed Economy Attractor

(c) *Cycling attractor* (Figure 11). From any initial z_0, the economy will converge to an invariant set in which it cycles between closed and open. This happens when neither of the preceding cases is obtained.

To better characterize the sets for which these phenomena arise, we compared the magnitude of R^i with the rest of the parameters. For that, we defined the autarkic interest rate, R^a, as the steady-state interest rate for a closed economy with (deterministic) productivity A. It turns out that this interest rate does not depend on A.

The steady-state level of assets, z, is determined by $(1 + \beta)z = \beta(1 - \alpha)Az^{\alpha}$. This implies the following:

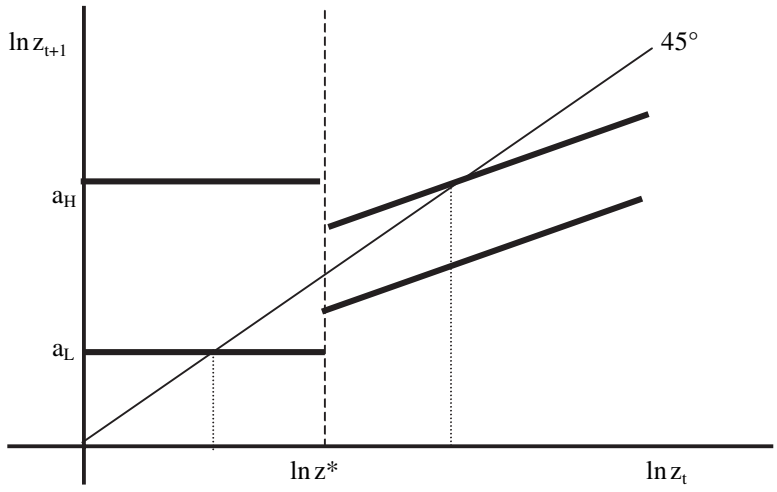

Figure 11. Cycling Attractor

DEFINITION 3 (Autarkic interest rate). *R^a is defined by*

$$\ln R^a = \ln\alpha + \ln(1+\beta) - \ln(1-\alpha) - \ln\beta. \tag{28}$$

PROPOSITION 5 (Equilibrium characterization of the young median voter economy). *The following dynamic phenomena arise in the young median voter economy:*

(*a*) *Open economy attractor if*

$$\ln(R^i/R^a) < -(\ln a_H - \mathrm{E}[\ln A_t])/(1-\alpha). \tag{29}$$

(*b*) *Closed economy attractor if*

$$\ln(R^i/R^a) > \mathrm{E}[\ln A_t] - \ln a_L. \tag{30}$$

(*c*) *Cycling attractor if*, *otherwise*,

$$-(\ln a_H - \mathrm{E}\ln[A_t])/(1-\alpha) < \ln(R^i/R^a) < \mathrm{E}[\ln A_t] - \ln a_L. \tag{31}$$

PROOF. *Straightforward from discussion in the text and Definition 3.* □

Phase Diagram for Capitalist Representative

Using Proposition 1, we conclude that the phase diagram when the representative is a capitalist is

$$\ln z_{t+1}\begin{cases} = \ln[\beta(1-\alpha)/(1+\beta)] + (\alpha\ln\alpha + \ln A_t - \alpha\ln R^i)/(1-\alpha), & \text{if } z_t > z^*, \quad (32) \\ = \ln[\beta(1-\alpha)/(1+\beta)] + \alpha\ln z_t + \ln A_t, & \text{if } z_t \le z^*. \quad (33) \end{cases}$$

As before, there are three possible dynamic phenomena:

(a) *Open economy attractor.* This will occur when an open economy maps into an open economy. More formally this means that, for any A_t, $z_t > z^*$ implies $z_{t+1} > z^*$. It is necessary and sufficient that, if the economy is open and $z_t = z^*$ and $A_t = a_L$, then $z_{t+1} > z^*$.

(b) *Closed economy attractor.* This will occur when a closed economy maps into a closed economy. More formally this means that, for any A_t, $z_t < z^*$ implies $z_{t+1} < z^*$. It is necessary and sufficient that, if the economy is closed and $z_t = z^*$ and $A_t = a_H$, then $z_{t+1} < z^*$.
(c) *Cycling attractor.* If none of the previous cases occur.

Analogously, we have the following proposition.

PROPOSITION 6 (Equilibrium characterization of the old median voter economy). *The following dynamic phenomena arise in the old median voter economy:*

(*a*) *Open economy attractor if*

$$\ln(R^i/R^a) > (\mathrm{E}[\ln A_t] - \ln a_L)/(1-\alpha). \tag{34}$$

(*b*) *Closed economy attractor if*

$$\ln(R^i/R^a) < -(\ln a_H - \mathrm{E}[\ln A_t]). \tag{35}$$

(*c*) *Cycling attractor if*, *otherwise*,

$$-(\ln a_H - E\ln[A_t]) < \ln(R^i/R^a) < (\mathrm{E}[\ln A_t] - \ln a_L)/(1-\alpha). \tag{36}$$

PROOF. *Straightforward from discussion in the text and Definition 3.* □

Propositions 5 and 6 allow us to characterize three broad types of liberalization dynamics: economies that open and remain open; economies that close and remain closed; and economies that cycle between opening and closing. To determine to which of these cases a particular country belongs, one must assess (i) its (technological) volatility, and (ii) its interest rate. If the country's volatility is high, the distance between the mean value of the productivity and the extreme values of the productivity increase, increasing the right-hand side of inequalities (29)–(30) and (34)–(35). Other things being held constant, more volatile countries are thus more likely to cycle. Likewise, if a country's interest rate is closer to the international interest rate, the left-hand sides of inequalities (29)–(30) and (34)–(35) are smaller and, again, the country is more likely to cycle.

It is important to notice that Propositions 5 and 6 relate dynamic behavior to *effective* rather than observed (or contractual) interest rates. As we mentioned before, by technological shocks here, one should understand any perturbation to the economic system such as political instability, default risk, or crisis that affects capital and labor remuneration. Analogously, by interest rates, one should understand the risk-adjusted interest rate, whereby risk refers to any phenomenon that affects capital remuneration. Because these effective interest rates are neither the market interest rates nor those directly observed in data, Propositions 5 and 6 cannot be directly tested. We view this to be a drawback of these propositions, but one expected from any model of capital flows.

However, we can evaluate Propositions 5 and 6 in terms of their indirect implications for the relationship between a country's development level and the capital control dynamics. We estimated a simple version of this relationship in section 2 and the results are summarized in Tables 1 and 2.

In order to assess how a country's interest rates and volatility relate to its development level, consider the following observations: (1) other things constant, countries with lower development levels are more volatile and therefore more prone to cycle; (2) because the international interest rate is a weighted average of all the (open)

countries' autarkic interest rates, it is more likely closer to the countries in the intermediate development level. Taken together, these two observations suggest that intermediate development level countries are more likely to cycle.[13] In this sense, Propositions 5 and 6 are consistent with the stylized facts we presented.

An alternative way to appraise Propositions 5 and 6 is to assess their implication in the context of Solow's "catching-up" theory where capital should flow from developed to developing countries because of the (effective) higher interest-rate differential. Hence, development is negatively related to interest rates. According to Proposition 6, low-income countries will remain closed if a capitalist representative chooses the policy.[14] Again, according to Proposition 6, rich countries will remain closed if they have a capitalist representative.[15]

7. Extensions and Conclusions

In this paper, we have addressed the political conflict that evolves from international capital controls in an environment in which economic agents vote on whether to close or open the economy to capital flows. We characterized the equilibria of the infinite-horizon model with overlapping players in a non-cooperative game between players who wish to maximize their own utility in an economy with productivity shocks. The inclusion of productivity shocks allowed us to characterize three types of attractor sets: economies that eventually remained open, those that eventually remained closed, and those that cycled between open and closed. Moreover, countries with intermediate development levels were more likely to be among the cycling economies. This pattern is consistent with data on liberalization policies over time and across various countries. In a regression analysis, using IMF capital controls data, we found that the number of times a country changed its capital control policy fits an inverse quadratic relationship against the level of development. That is, both richer and poorer countries tend to switch capital controls much less often than middle-income countries.

A number of extensions could improve our understanding of the proposed approach and its usefulness in analyzing a country's propensity to liberalize. In our simple model, productivity shocks reflect any perturbation in capital (and labor) returns owing, for example, to herd behavior and animal spirits, fiscal crisis, or bond-spread widening. We believe that a model that explicitly considers the differences among these types of crisis could generate sharper (or even different) predictions.

Along the same lines, the short empirical analysis tested only the model's implication for the relationship between development level and frequency of policy changes. But it was silent on the level of international and domestic interest rates, and level of assets at the moment of policy reversions. We believe this to be an important and relevant extension that should be explored, but it presents many difficult challenges. For example, because observed LDC's interest rate levels typically include a premium for default, it is difficult to map them in actual (risk-adjusted) capital returns, which is the relevant concept in our analysis. The observed *increase* in domestic interest rates, with the purpose of reducing capital *outflows* in a currency crisis, is better emulated by a *negative* productivity shock that *lowers* domestic (effective) interest rates. More data gathering and analysis of the peculiarities of case specifics prerequisite an adequate empirical study of the determinants of capital control policy changes.

Yet another direction is to focus on political economy modeling. Rather than consider only two opposing interest groups, workers and capitalists, one could study in detail the dominant political forces behind policy changes and how best to model them. Changes in the dominant groups also imply changes in policies. These changes open a

potentially interesting channel of policy determination; although the main implications of the model persist (*ceteris paribus*), middle-income countries tend to change their policies more often.

Again, although we would like to perform further tests on the political implications of the model, there is no comprehensive political database that accounts for interest groups behind the governments in developing countries. In industrialized countries, the political orientation of the party or coalition in power could be used as a proxy. In developing countries, this is a more difficult task requiring a deep knowledge of the political circumstances of each country; that is beyond the scope of this paper.

Appendix

Variable Definitions and Sources

- *Capital control index*: dummy variable taking the value of 1 when all capital controls are in place in a country in a given year; 0.75 if any three are in place; 0.5 if any two are in place; 0.25 if only one was used; and zero otherwise. The types of capital controls considered were: (1) multiple exchange rates for financial transactions; (2) restriction on payments for capital transactions; (3) restriction on payments for current transactions; and (4) restrictions to repatriation of export proceeds. *Source*: IMF Annual Report on Exchange Rate Arrangements and Restrictions, various issues.
- *CI*: The capital-control-policy change index was constructed by counting the number of times a country changed its capital control policy as defined by the International Monetary Fund's survey of Exchange Arrangements and Exchange Restrictions over the period 1966–94 (i.e., the number of times the capital control index was changed). *Source*: Constructed by authors using IMF Annual Report on Exchange Rate Arrangements and Restrictions, various issues.
- *Log*(*Initial GDP*): Log of the average real GDP per capita between 1966 and 1970 (1985 international prices). *Log*(*Average GDP*): Log of the average real GDP per capita between 1966 and 1995 (1985 international prices). *Source*: Penn World Tables and World Bank Development Indicators 2000.
- *Political Instability*: Index of political instability based on the number of political assassinations, revolutions, and coup d'etats. *Source*: Barro and Lee (1993).
- *Inflation*: Average change in the consumer price index between 1966 and 1994. *Source*: World Bank Development Indicators 2000.

Development and Cycles: an Example

We consider a particular case of Proposition 6, which we call Proposition 6′, that relates development level and control dynamics in a direct way. An analogous example can be constructed for Proposition 5.

Consider, in addition to the hypothesis of Proposition 6, that all countries have the same capital share parameter α. Consider also that the productivity shock of a country j is distributed according to

$$\ln(A) = \mu + \sigma_j \quad \text{with probability } (1 - p/2),$$

$$\ln(A) = \mu \quad \text{with probability } p,$$

$$\ln(A) = \mu - \sigma_j \quad \text{with probability } (1 - p/2).$$

Define K_j as the capital level of a country when it is in an autarkic regime and exposed to a deterministic technological productivity $\ln(A) = \mu$. Finally, define K^*, the "international capital level," as the capital level of the country with deterministic productivity $\ln(A) = \mu$, but whose interest rate coincides with the international interest rate R^i. Then Proposition 6 can be rewritten as follows.

PROPOSITION 6′. *The following phenomena arise in the old median voter economy:*

(*a*) *Open economy attractor if*

$$\ln(K_j) - \ln(K^*) < -\sigma_i / (1-\alpha)^2.$$

(*b*) *Closed economy attractor if*

$$\ln(K_j) - \ln(K^*) > \sigma_i / (1-\alpha).$$

(*c*) *Cycling attractor if, otherwise*

$$-\sigma_i / (1-\alpha)^2 < \ln(K_j) - \ln(K^*) < \sigma_i / (1-\alpha).$$

PROOF. *Remember that* $R = \alpha A / K^{1-\alpha}$. □

Stochastic International Interest Rate

In the event that the international interest rate is stochastic, the main results will have no qualitative changes. In particular, Propositions 1 and 2 will still hold, but with the transformed threshold level of assets given by

$$\ln z^* \equiv \left(\ln \alpha + \mathrm{E}[\ln A_t] - \mathrm{E}[\ln R^i]\right) / (1-\alpha).$$

The equations that define the phase diagrams for worker and capitalist median voters that are explicit in section 6 will also hold without any changes. The regions that correspond to an open economy in Figures 9, 10, and 11 would still be straight lines, but the boundaries would be determined by the extremes of the joint distribution of the country's productivity shock and the international interest rate.

Propositions 5 and 6 would still have the same qualitative flavor. They have to be cast as inequalities that relate the autarkic country's rate with the mean of the logarithm of the international rate. The boundaries that define the type of capital control dynamics, open economy attractor, closed economy attractor, and cycling attractor would depend on the distribution of both the country productivity shock and the international interest rate. The range for the cycling attractor can be greater or smaller than before, depending on the correlation of the two distributions. If the correlation is zero, the range would be greater.

References

Alesina, Alberto and Allan Drazen, "Why are Stabilizations Delayed?" *American Economic Review* 81 (1991):1170–88.

Alesina, Alberto, Vittorio Grilli, and Gian Maria Milesi-Ferretti, "The Political Economy of Capital Controls," in Leonardo Leiderman and Assaf Razin (eds.), *Capital Mobility: the Impact on Consumption, Investment and Growth*, Cambridge: Cambridge University Press (1994):289–321.

Bartolini, Leonardo and Allan Drazen, "Capital-account Liberalization as a Signal," *American Economic Review* 87 (1997):138–54.
Barro, Robert J. and Jong-Wha Lee, "Data Set for a Panel of 138 Countries," www.nber.org/pub/barro.lee (1993).
Diamond, Peter, "National Debt in a Neoclassical Growth Model," *American Economic Review* 55 (1965):1026–50.
Dooley, Michael P., "A Survey of Academic Literature on Controls over International Capital Transactions," NBER working paper 5352 (1995).
Eichengreen, Barry et al., "Capital Account Liberalization: Theoretical and Practical Aspects," IMF Occasional Paper (1998).
Ferndandez, Raquel and Dani Rodrik, "Resistance to Reform: Status Quo Bias in Presence of Individual-specific Uncertainty," *American Economic Review* 81 (1991):1146–55.
Fudenberg, Drew and Jean Tirole, *Game Theory*, Cambridge, MA: MIT Press (1991).
Grossman, Gene M. and Elhanan Helpman, "Protection for Sale," *American Economic Review* 84 (1994):833–50.
Grilli, Vittorio and Gian Maria Milesi-Ferretti, "Economic Effects and Structural Determinants of Capital Controls," *IMF Staff Papers* 42 (1995):517–51.
Helpman, Elhanan, "Politics and Trade Policy," NBER working paper 5309 (1995).
International Monetary Fund, *Annual Report on Exchange Arrangements and Exchange Restrictions*, issues from 1966 to 1994.
Krugman, Paul R., "Saving Asia: It's Time to Get Radical," *Fortune* (7 September 1998):74–80.
Mayer, Wolfgang, "Endogenous Tariff Formation," *American Economic Review* 74/5 (1984): 970–85.
Obstfeld, Maurice, "The Global Capital Market: Benefactor or Menace?" *Journal of Economic Perspectives* 12(4) (1998):9–30.
Obstfeld, Maurice and Alan M. Taylor, "The Great Depression as a Watershed: International Capital Mobility over the Long Run," NBER working paper 5960 (1999).
Reinhart, Carmen and R. Todd Smith, "Temporary Controls on Capital Inflows," *Journal of International Economics* 57 (2002):327–51.
Rodrik, Dani and Tanguy van Ypersele, "Capital Mobility, Distributive Conflict and International Tax Coordination," NBER working paper 7150 (1999).
Summers, Robert and Alan Heston, "The Penn World Table (Mark 5): an Expanded Set of International Comparisons, 1950–1988," *Quarterly Journal of Economics* 106 (1991):327–68.
Woodford, Michael, "Expectations, Finance Constraints, and Aggregate Instability," in Meir Kohn and S. C. Tsiang (eds.), *Finance Constraints, Expectations and Macroeconomics*, Oxford: Oxford University Press (1988).
World Bank, *Development Indicators* (2000).

Notes

1. See Obstfeld and Taylor (1999) and Eichengreen et al. (1998).
2. The International Monetary Fund's survey of Exchange Arrangements and Exchange Restrictions keeps track of the restriction on payments for current transactions; restriction on payments for capital transactions; enforcement of multiple exchange rates; and restrictions to repatriation of export proceeds. The policy change index was constructed by counting the number of times a country changed any of these controls between 1966 and 1994. Section 2 describes this index in detail.
3. Dooley (1995) and Eichengreen (1998) review the theoretical and empirical literature on capital controls.
4. See Woodford (1988).
5. We are grateful to Leonardo Bartolini who kindly provided the data on capital controls. The countries included in the sample are: Algeria, Argentina, Australia, Austria, Belgium, Bolivia, Brazil, Burundi, Canada, Chile, Colombia, Congo, Costa Rica, Côte d'Ivoire, Denmark, Dominican Republic, Ecuador, El Salvador, Ethiopia, Finland, France, Gabon, Germany, Ghana, Greece,

Guatemala, Guinea, Honduras, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Jamaica, Japan, Kenya, Korea, Malawi, Malaysia, Mexico, Morocco, Nepal, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Paraguay, Peru, Philippines, Portugal, Rwanda, Sierra Leone, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Trinidad and Tobago, Turkey, United Kingdom, Uruguay, United States, Venezuela, Zimbabwe.

6. Grilli and Milesi-Ferretti (1995) cite as alternative measures of the degree of intensity of capital controls such as onshore–offshore interest differentials, size of black market premium, deviations from covered interest parity. These measures are more suited to analyses that require higher frequency data.

7. An additional measure that considers only changes in the tendency of the capital control index—from increasing to decreasing or vice versa—was constructed. This measure described in the working paper version of this paper yields similar estimation results.

8. These assumptions, of full depreciation and logarithmic utility functions, help facilitate the algebra but are not fundamental for the main results of the paper.

9. In the Appendix we discuss a case in which the international interest rate is stochastic. The main qualitative results are unaltered.

10. See Fudenberg and Tirole (1991).

11. Helpman (1995) surveys the political economy of trade policy.

12. See Grossman and Helpman (1994).

13. A concrete example is given in the Appendix.

14. Note that these outcomes are more likely under an "interest-group driven" electoral system (in which a capitalist dictates policy) or some type of non-democratic government, in the sense that one would expect the median voter in poorer countries to belong to the younger-worker group. Interestingly, most African countries, which have remained closed during the sample period, have been governed by autocratic rulers. A detailed analysis of this correlation is beyond the scope of this paper.

15. Again, this outcome implies a world in which government policies tend to reflect the capitalist point of view.