

# Capital Mobility and Reform

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## Abstract

Financial globalization is commonly viewed as a powerful force in constraining or disciplining domestic policies. This paper presents a model that captures various ways in which international capital mobility affects domestic policy incentives. Capital mobility supports reform in two ways: 1) capital inflows enhance the benefits of good policies; 2) liberalizing capital outflows may lock in political support for reforms. On the downside, capital mobility makes possible self-fulfilling capital flight that destroys the domestic investor basis and the political support for reform. More generally, individual investment decisions do not internalize their impact on policy incentives, opening some scope for second-best public intervention.

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# 1 Introduction

A recurring theme in the debate on financial globalization is that international capital mobility is a powerful force in constraining or shaping domestic policies. In his bestseller *The Lexus and the Olive Tree* Thomad Friedman gives a vivid description of how international investors (the "Electronic Herd") increase the wealth of nations by putting their governments under the yoke of a "Golden Straitjacket". Many economists view discipline as one important benefit—if not *the* main benefit<sup>1</sup>—of capital account openness. By contrast, some have argued that the constraints exercised by capital mobility are biased toward policies that please international investors in the short run but are not necessarily conducive to growth and development in the long run<sup>2</sup>.

The main purpose of this paper is to provide a theoretical framework to better understand the incentive effects of capital account mobility on domestic policies. We think that a theoretical framework may be useful for at least two reasons.

First, the incentive effects of capital mobility are multifaceted—in particular, they are not limited to the discipline it exercises on domestic policies. For example, a strong and stable domestic investor basis is important because it creates a domestic constituency for investor-friendly reforms. Is capital mobility conducive to a strong domestic investor basis? We think it is useful to develop a framework that puts together the main channels of interplay between capital mobility and domestic policies in a consistent way.

Second, even if one restricts the focus on the seemingly straightforward disciplinary effect of capital mobility some questions are worth exploring. Most discussions of the discipline effect pay insufficient attention, we think, to the question of what makes capital mobility credible. If the problem is one of commitment to good policies, one should acknowledge that an open capital account is one of the policies that the country has a problem committing to. Why would it be easier for a country to commit to an open capital account

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<sup>1</sup>For example, Obstfeld (1998) states that the "*main* potential positive role of international capital markets is to discipline policymakers who might be tempted to exploit a captive domestic capital market" (our emphasis). In an otherwise rather skeptical review of the benefits of capital mobility Stiglitz (2000) states that "the argument with which I am most sympathetic is that opening the capital account imposes 'discipline'. Countries are 'forced' to have good economic policies, lest capital flow out of country."

<sup>2</sup>For example Rodrik (1998).

than to other policies? One contribution of this paper will be to endogenize capital account policies in the same way as other policies.

We present a very stylized model to shed light on these questions. A government sets the capital account regime (closed or open). The question is how the capital account regime affects the incentives to implement "good" policies. We model good policy as a reform that increases domestic productivity because this is a way that capital mobility could have a large welfare impact on the countries that open their capital account. As we have shown in Gourinchas and Jeanne (2005), the welfare benefits of capital mobility for developing countries are relatively small in a calibrated neoclassical growth model.<sup>3</sup> For capital mobility to yield large welfare gains it should in some way increase the productivity of the countries that open their capital account.

Capital mobility can enhance the incentives to reform in two ways: 1) capital inflows increase the benefits of reform by expanding the domestic capital base; 2) the threat of capital flight may dissuade the domestic government from deviating from good policies. We show that the second result is more subtle than usually acknowledged once the capital account policy is endogenized in the same way as the other policies. In particular, it requires some ability to commit on the side of the government.

However, the benefits of capital mobility come with some costs, most notably that of self-fulfilling capital flights that destroy the incentives to reform and may leave the country worse off ex post than if it had kept the capital account closed. This cost is the mirror image of the benefit and the two are difficult to separate. Thus capital mobility is a double-edged sword; it is only a second-best solution to the lack of domestic ability to commit, and it is in general dominated by other policies (institutional, political or governance reforms) that would allow countries to commit to good policies more directly.

The costs associated with capital mobility are the reflection of a basic but powerful externality. Individual investors do not internalize the impact of their investment decisions on the domestic policy incentives (a problem analogous to the common agency problem emphasized by Tirole, 2002). This externality is for example at the root of the coordination failure behind self-fulfilling capital flights. By taking his capital out of the country an individual

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<sup>3</sup>We find that the welfare gain from switching from perfect financial autarky to perfect financial integration amounts to about 1 percent of consumption for the average developing country. This is sizeable but quite small when compared to the welfare benefit of productivity increases of the order of magnitude observed in some countries.

investor marginally reduces the domestic incentives to implement good policy, inducing other investors to do the same. This externality means that our framework is generically not one in which laissez-faire is efficient, opening some scope for second-best public intervention that may in some cases take the form of optimal capital controls.

**Literature.** This paper is related to various literatures: 1) the literature on the benefits and costs of international capital mobility, especially the branch that deals with the discipline induced by the threat of a capital flight; 2) the literature on reform, especially commitment problems in their implementation.

**1) literature on the benefits and costs of international capital mobility.**

In our model the gains from international financial integration are limited by a financial friction resulting from the borrowing country's inability to commit to good policies, like in Gertler and Rogoff (1990). Other papers in which the gains from integration are limited by financial friction include Boyd and Smith (1997), Barro et al (1997) and Matsuyama (2004). Matsuyama (2004) shows that in a world where countries' ability to borrow abroad is constrained by their domestic collateral, financial globalization might make some countries richer only at the expense of making the rest of the world poorer, and could slow down the growth process of middle-income countries.

Bourguignon and Verdier (2000) show that international financial liberalization, while stimulating physical capital accumulation, reduces the capitalist elite willingness to subsidize domestic human capital accumulation and thus delays the process of democratization.

The point that capital mobility may help to discipline domestic policies may seem straightforward, and only a slight generalization of well-known results about tax competition. The idea that international financial integration can help to solve the time consistency problem in the taxation of capital has been formally modeled (see e.g. Kehoe, 1989, and Quadrini, 2001). In a related vein, Tornell and Velasco (1992) present a model in which the discipline induced by capital mobility raises growth and welfare by ameliorating the tragedy of the commons on a common pool of resources. The argument has also been applied to regions within a decentralized state: Qian and Roland (1998) show how competition may discipline regional or local policymakers by punishing wasteful or corrupt governments with capital flight.

We think that our model innovates relative to the existing literature by

clarifying the fact that the argument does not require the assumption—implicitly made in the previous literature—that the government can commit to an open capital account even though it cannot commit to future taxation. As we show, a country can commit to a reform at a long horizon even if it can commit to an open capital account only for a relatively short time, through a “political lock-in” effect.

The empirical literature on the discipline effect is still in its infancy, and has focused exclusively on fiscal and monetary policies. Kim (2000) reports evidence that capital account liberalization is associated with a lower fiscal deficit. Tytell and Wei (2004) find modest evidence that financial globalization may have induced countries to pursue low-inflation monetary policies, but no evidence that it has encouraged low budget deficits.

## 2) literature on reform

Rajan and Zingales (2003) argue that capital mobility helps financial development through the discipline effect.<sup>4</sup> [to be completed]

The paper is structured as follows. Section 1 presents the basic assumptions of our model. Section 2 shows that an efficient reform may not be time-consistent, the importance of a domestic investor base in mitigating this problem, and how capital mobility may reinforce or destroy the domestic investor base. Section 3 focuses on the discipline induced by capital mobility. Finally section 4 concludes with a discussion of possible paths for future research.

## 2 Assumptions

We consider a developing country. There are two periods  $t = 0, 1$ . Investment takes place in period 0 and production and consumption take place in period 1. The production function is Cobb-Douglas,

$$y = Ak^\alpha l^{1-\alpha}.$$

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<sup>4</sup>Rajan and Zingales (2003): "it is the fortuitous combination of a need on the incumbents' part for financing as well as the discipline on government intervention stemming from borders open to capital flows that channels political efforts toward improving financial infrastructure" (p.197).

The country has an exogenous endowment of labor, normalized to 1. Labor is immobile internationally.

Final productivity could be high or low,

$$A = \underline{A} \text{ or } \bar{A},$$

depending on whether the country has implemented a reform or not. The reform could be thought of as an investment in the domestic "social infrastructure"—in particular the institutions guaranteeing the enforcement of contracts—that is necessary for the development of a modern productive sector. The utility cost of the reform for the domestic representative agent is denoted by  $\gamma$ .

The country starts with an endowment of productive capital denoted by  $\omega$ . We assume that each resident has the same endowment (i.e., there is a representative resident).<sup>5</sup>

There is also a pool of international investors who can invest their capital in the country, or in the rest of the world at an exogenous gross interest rate  $R^*$ . Investment in the country takes the form of equity: each investor receives a share of the profit on a pro rata basis.

The efficient level of capital equates the domestic marginal return to investment with the world return,

$$\alpha A k^{\alpha-1} = R^*,$$

implying an efficient level of capital that is higher conditional on the reform than if the reform is not implemented,

$$\bar{k} \equiv \left( \frac{\alpha \bar{A}}{R^*} \right)^{\frac{1}{1-\alpha}} > \underline{k} \equiv \left( \frac{\alpha \underline{A}}{R^*} \right)^{\frac{1}{1-\alpha}}.$$

We assume that the country is capital-scarce conditional on a reform,

$$\omega \leq \bar{k},$$

but could be capital-scarce or capital-abundant conditional on no reform (i.e.,  $\omega$  could be smaller or larger than  $\underline{k}$ ).

The utility of agents is equal to their expected final consumption, net of the cost of reform for residents. Assuming that capital is perfectly mobile

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<sup>5</sup>It will be interesting to generalize the model by introducing some heterogeneity in the level of wealth. This will allow us to differentiate the incentives of labor and capital to open the capital account.

internationally and can be invested at rate  $R^*$ , the representative resident's utility is,

$$U = w + R^*\omega - e\gamma,$$

where  $w$  is the real wage, and  $e$  is the dummy variable for the reform effort (equal to 1 if the reform is implemented, to 0 otherwise). The real wage is equal to the marginal productivity of labor,

$$w = (1 - \alpha)Ak^\alpha = (1 - \alpha)A \left( \frac{\alpha A}{R^*} \right)^{\alpha/(1-\alpha)}.$$

Again the real wage is higher conditional on reform than conditional on no reform. We denote the two conditional wage levels by,

$$\bar{w} > \underline{w}.$$

We assume that the reform is efficient, i.e., its benefit in terms of a higher wage is larger than its utility cost,

$$\bar{w} - \underline{w} \geq \gamma, \tag{1}$$

The country decides whether or not to open its capital account at the beginning of times. For simplicity we reduce the capital account policy to a binary choice between opening (perfect capital mobility) or closing (financial autarky). The capital account regime is captured by a dummy variable  $\delta$  (equal to 1 if the country opens, to zero otherwise). Intermediate levels of restriction on capital flows will be discussed later.

If the capital account is closed, there are no capital flows and the domestic productive capital is equal to domestic wealth ( $k = \omega$ ). If the capital account is open, residents and international investors can invest domestically or abroad. We respectively denote by  $k^d$  and  $k^f$  the domestic wealth invested at home and abroad ( $k^d + k^f = \omega$ ). The difference  $k - k^d$  is financed by international investors.

We consider the following sequence of actions.

**Period 0.a** The government decides whether the capital account is open or closed ( $\delta = 1$  or  $0$ ).

**Period 0.b** Residents and international investors decide where to invest.

**Period 0.c** The government decides to reform or not ( $e = 1$  or  $0$ ).

**Period 1** Production and consumption take place.

We look at perfect Bayesian equilibria in which the government sets policy (toward the capital account and reform) so as to maximize the representative resident's welfare, and resident and international investors allocate their wealth in a decentralized way so as to maximize their profits. We restrict the attention to symmetric equilibria in which all residents take the same actions.

Note that the policy and investment decisions are taken *sequentially* inside period 0. In particular, the domestic country cannot commit to the reform when investors allocate their wealth. This assumption captures the fact that in the real world, investors typically commit capital to a country without completely knowing its future domestic policies. This assumption is obviously key to our analysis, since it generates the agency problem that we want to study in connection with capital mobility. If the country could commit to implement the reform before investors commit their capital to the country (in period 0.a), then the government's problem would become trivial. It would open the capital account and implement the reform, thus putting domestic welfare at the first-best level,

$$U^{fb} = \bar{w} + R^*\omega - \gamma,$$

which is higher than welfare conditional on no reform,  $\underline{w} + R^*\omega$ , because of assumption (1). Conditional on  $e$  it is always optimal to open the capital account since this removes a constraint on the resident's optimization problem. Hence, the commitment first best is to implement the reform *and* open the capital account.

### **3 On the importance of a domestic investor base**

The main purpose of this section is to derive the optimal capital account policy  $\delta$  in the absence of commitment. The question is how the capital account regime affects the domestic incentives to reform, and so the level

of investment. We proceed backwards, characterizing first the equilibrium conditional on  $\delta$ , and then the optimal  $\delta$ .

The equilibrium is simple to derive under autarky. The resident invests  $\omega$  domestically and receives  $A\omega^\alpha$  in wages and capital income. The reform is implemented if its utility cost is lower than its benefit in terms of additional output,

$$\gamma \leq (\bar{A} - \underline{A})\omega^\alpha,$$

that is if domestic wealth is larger than a threshold,

$$\omega \geq \hat{\omega} \equiv \left( \frac{\gamma}{\bar{A} - \underline{A}} \right)^{1/\alpha}.$$

The benefit of reforming is increasing with the domestic capital base. As a result, a country may be too poor to find it profitable to implement the reform under financial autarky.

We now derive the equilibrium under capital mobility. Under what conditions will the reform be implemented in equilibrium? The decision to implement the reform is taken by the resident representative *after*  $\bar{k}$  has been installed in the country, based on the expectation that the reform will be implemented. Let us denote by  $k^d$  the capital that is domestically owned ( $k^d \leq \omega$ , with a strict inequality if the residents invest abroad). The resident's welfare is given by,

$$U = (1 - \alpha)A(e)\bar{k}^\alpha + \frac{k^d}{\bar{k}}\alpha A(e)\bar{k}^\alpha + R^*(\omega - k^d) - e\gamma.$$

The first term is the wage. The second and third terms are the returns to domestic capital invested at home and abroad respectively.

The incentive condition is,

$$(\bar{A} - \underline{A}) \left( 1 - \alpha + \alpha \frac{k^d}{\bar{k}} \right) \bar{k}^\alpha \geq \gamma.$$

This condition is more likely to be satisfied if the share of domestic productive capital owned by residents,  $k^d/\bar{k}$ , is higher, other things equal. One way of minimizing the time consistency problem is to maximize the share of capital that is domestically-owned by setting  $k^d = \omega$ . This points to the importance of a domestic investor base. A country has more incentives to implement a reform if a larger share of the benefits goes to domestic investors rather than foreign ones.

In our model the "optimal home bias" can be achieved at no cost by putting an infinitesimal tax on capital outflows by residents. Such a tax implies that capital does not flow both ways in equilibrium: if residents invest abroad then foreign investors do not invest in the country, and if foreign investors invest in the country then residents do not invest abroad. It is a restriction on capital flows but it is very minor relative to the capital controls that will be discussed later in the paper. The tax rate can be infinitesimal, implying virtually no distortion cost<sup>6</sup>.

Thus we assume that  $k^d = \omega$  and the incentive condition becomes,

$$(\bar{A} - \underline{A}) \left( 1 - \alpha + \alpha \frac{\omega}{k} \right) \bar{k}^\alpha \geq \gamma,$$

which (after some computations) can be rewritten,

$$(\bar{w} - \underline{w}) - \kappa + \alpha \frac{\bar{A} - \underline{A}}{k^{1-\alpha}} \omega \geq \gamma,$$

where  $\kappa \equiv (1 - \alpha) \underline{A} [\bar{k}^\alpha - \underline{k}^\alpha]$ .

For a country with no wealth, the benefit of the reform is lower once productive capital is bolted down inside the country  $((\bar{w} - \underline{w}) - \kappa)$  instead of  $(\bar{w} - \underline{w})$  because investment no longer depends on the decision of reforming or not. The benefit of reforming increases with the domestic wealth invested in the domestic productive sector.

So under capital mobility a reform could be efficient but not time-consistent. The intuition is the same as in debt overhang models. Foreign liabilities discourage reform by introducing a wedge between the total benefit of reform and the benefit that accrue to the representative resident.

In order to make the problem interesting we assume that the incentive condition is violated for a country with zero wealth,

$$\bar{w} - \underline{w} < \gamma + \kappa. \tag{2}$$

This implies that a country with zero wealth cannot credibly promise to implement the reform under capital mobility. By continuity the argument

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<sup>6</sup>The optimal home bias would not be costless to achieve if there were a motive for international portfolio diversification, for example in terms of optimal risk-sharing. In that case there would be a trade-off between the benefits of diversification in terms of risk-sharing and the benefits of home bias in terms of incentives. This is not the case here because investors are risk-neutral.

applies to a country with a low level of domestic wealth. We have the following proposition (the proof is given in the Appendix).

**Proposition 1** *Under capital mobility there is one equilibrium in which the country implements the reform if and only if the level of domestic wealth,  $\omega$ , is larger than a critical level  $\omega^* \in ]0, \bar{k}[$ . If  $\omega < \omega^*$  the country does not implement the reform and receives a lower level of capital inflows (or exports capital if  $\omega > \underline{k}$ ).*

*The critical wealth level for reforming is lower under capital mobility than under autarky ( $\omega^* < \widehat{\omega}$ ). Therefore, countries with wealth in the range  $[\omega^*, \widehat{\omega}]$  do not reform under a closed capital account but might reform with an open capital account.*

The second part of the Proposition gives a reason why capital mobility is good for reform. A country that reforms under autarky also reforms under capital mobility, but the reverse is not necessarily true. In capital-scarce countries the leverage of reform is enhanced by capital inflows that increase the stock of productive capital. Capital inflows dilute the domestic investor base, but this effect is dominated by that of the larger capital stock.

Proposition 1 characterizes one equilibrium but it is not the only one under capital mobility. Assume that domestic and foreign investors think that the reform will *not* be implemented so that investment is equal to  $\underline{k}$ . If  $(\bar{A} - \underline{A})\underline{k}^\alpha < \gamma$  the reform is indeed not implemented in equilibrium, which validates market expectations. The condition  $(\bar{A} - \underline{A})\underline{k}^\alpha < \gamma$  is equivalent to  $\underline{k} < \widehat{\omega}$  (i.e., a country can be capital-abundant under financial autarky).

**Proposition 2** *If  $\underline{k} < \widehat{\omega}$ , there exists an equilibrium in which investors invest  $\underline{k}$  in the country and the reform is not implemented. This equilibrium exists, under capital mobility, irrespective of the country's wealth  $\omega$ .*

It follows that countries with  $\omega \geq \omega^*$  can be in two equilibria under capital mobility: one equilibrium with a high level of investment followed by a reform, and one equilibrium with a low level of investment followed by no reform. The first equilibrium is associated with capital inflows and the

second one with capital outflows if  $\omega > \underline{k}$ . A low level of investment can be self-fulfilling because it weakens the domestic incentives to reform. The equilibrium with high investment Pareto-dominates the equilibrium with low investment—so we can call them the "good" and "bad" equilibrium.

A country does not know which equilibria it will be in when it opens its capital account. Conceivably a country could prefer financial autarky to capital mobility if the risk of falling in the bad equilibrium is high and the bad equilibrium is worse than autarky. This raises the question of how the bad equilibrium compare with financial autarky in terms of welfare.

The bad equilibrium is better than autarky for countries with  $\omega < \omega^*$ , since these countries do not reform anyway and at least receive the gains from a better allocation of capital under capital mobility. By contrast, the bad equilibrium could be worse than autarky for the countries with  $\omega \geq \omega^*$ . This is the case for the countries that are not very scarce in capital (for which the domestic capital shortage  $\bar{k} - \omega$  is small). For these countries the welfare gain from receiving  $\bar{k} - \omega$  in capital inflows is dominated by the risk of a self-fulfilling capital flight that destroys the domestic capital base. Thus, opening the capital account is optimal only for the countries that are *sufficiently* scarce in capital.

The optimal capital account policy is characterized in the following proposition.

**Proposition 3** *If the probability of a self-fulfilling capital flight is strictly positive, there is a wealth threshold  $\omega_* \in ]\omega^*, \bar{k}[$  such that:*

- countries with  $\omega \in [0, \omega_*]$  open their capital account ( $\delta = 1$ ),
- countries with  $\omega \in [\omega_*, \omega^*]$  keep their capital account closed ( $\delta = 0$ ).

*The threshold  $\omega_*$  is a decreasing function of the probability of a self-fulfilling capital flight.*

By contrast with Proposition 1, Propositions 2 and 3 point to a potential downside of capital mobility: the risk of capital outflows that destroy the domestic investor base<sup>7</sup>. The problem can be analyzed as a coordination failure. The self-fulfilling capital flights result, in our model, from the following basic

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<sup>7</sup>This formulation implicitly assumes that  $\omega > \underline{k}$ , so that the bad equilibrium is associated with capital outflows. If  $\omega < \underline{k}$  the bad equilibrium is associated with less capital inflows than the good equilibrium.

but powerful externality: by taking his capital out of the country an individual investor reduces the domestic incentives to reform, and so the return for the other investors who have stayed in the country. It is this strategic complementarity that leads to the existence of several Pareto-ranked equilibria.

One brutal but effective (in our model) way of making residents internalize the social benefits of a domestic investor base is to forbid them to take their capital abroad, i.e., liberalize capital inflows but not outflows. All countries with wealth larger than  $\widehat{\omega}$  are willing to partially liberalize their capital account in this way since this ensures that the bad equilibrium no longer exists. Even if no foreign capital flows in, their domestic productive capital will be larger than  $\widehat{\omega}$  so the reform will be implemented. A fortiori the reform will be implemented if some foreign capital flows in, so there is one unique equilibrium with reform and a high level of investment. Liberalizing capital inflows but not outflows puts the welfare of these countries at the commitment first-best level.

By contrast the countries with wealth smaller than  $\widehat{\omega}$  do not remove the bad equilibrium by outlawing capital outflows, so they are better off liberalizing their capital account completely so as to get the full efficiency gains from capital mobility. Thus we have the following proposition.

**Proposition 4** *Assume that countries can open themselves to capital inflows without liberalizing outflows. Then*

- countries with  $\omega \in [0, \widehat{\omega}]$  liberalize both inflows and outflows,
- countries with  $\omega \in ]\widehat{\omega}, \bar{k}]$  liberalize inflows but not outflows.

We conclude this section with some remarks on the implications of our model for the direction of capital flows between poor and rich countries. Let us consider a world composed of a large number of countries such as the one we have described, with different wealth levels, some larger than  $\bar{k}$ . Under financial autarky the countries would fall in two groups: poor countries with low productivity levels ( $\omega < \widehat{\omega}$  and  $A = \underline{A}$ ) and rich countries with high productivity levels ( $\omega \geq \widehat{\omega}$  and  $A = \overline{A}$ ). This may be reminiscent of the world we are living in, but note that in our model the causality goes from wealth to productivity rather than from productivity to wealth. Productivity differences, furthermore, are entirely determined by wealth differences (a "Sachsian world", so to speak).

An outside observer looking at this world would conclude that poor countries are not necessarily more capital-scarce than rich countries. In fact poor countries with wealth in the interval  $[\underline{k}, \widehat{\omega}]$  are capital-abundant given their low level of productivity. On this basis, the outside observer might conclude that international financial integration will trigger an international reallocation of capital within each group, but not necessarily from rich to poor countries.

These predictions, however, ignore the endogeneity of productivity to capital mobility. The patterns of capital flows in our model might be very different from the one predicted by the naive observer. Some poor countries that seemed capital-abundant under autarky may actually receive capital inflows as their productivity increases with the mobility of capital, while conversely some seemingly rich and capital-scarce countries might become less productive and export capital. In fact, the equilibrium is not uniquely determined in our model, making the international allocation of capital difficult to predict. Our standard insights and intuitions, which tend to be based on the assumption that productivity is endogenous, may be seriously misleading in the context of our framework.

[Numerical illustration.]

## 4 The golden straitjacket

Countries with wealth below  $\omega^*$  cannot credibly commit to implement the reform. We now show how the reform can be made credible for some of these countries by the discipline of international capital mobility. The argument involves the mobility of capital "between" period 0 and period 1—after capital has been installed but before it pays off. Thus we must specify the actions that the agents can take between period 0 and 1.

We enrich the time structure of the model by introducing  $T - 1$  new periods between 0 and 1,

$$t = \frac{s}{T}, \quad s = 1, \dots, T - 1.$$

Although some of our results could be derived by introducing only one new period  $t = 1/2$ , we keep the number of periods arbitrary because one important result (the existence of self-fulfilling capital flights) requires more than one intermediate period. In addition, the time between subperiods,  $1/T$ ,

will have an economic interpretation. Finally this will allow us to derive an elegant, continuous time version of the model in the limit where  $T$  goes to infinity.

We must make assumptions about the "physical" mobility of capital between period 0 and period 1 (by opposition to its "legal" mobility, which is determined by the capital account regime). In the two-period model capital is perfectly mobile in period 0 and completely fixed in period 1. We assume that a fraction  $\lambda$  of the initial capital stock can be removed from the country between period 0 and period 1. Parameter  $\lambda$  is a measure of the physical mobility of capital<sup>8</sup>. In addition the stock of capital cannot be increased between 0 and 1: the capital that is productive in 1 must be installed in period 0<sup>9</sup>.

The completion of the reform requires an action to be taken in every period  $1 < t \leq 1$ ,

$$e_t = 1,$$

where  $e_t$  is a dummy variable for the reform effort at time  $t$ . Productivity is high if the effort has been produced in all  $T$  periods  $t = \frac{1}{T}, \frac{2}{T}, \dots, 1$ , it is low otherwise (that is if there is a subperiod  $t \leq 1$  in which  $e_t = 0$ )<sup>10</sup>. Pursuing the reform costs  $\gamma/T$  per period to the representative resident.

The policy toward the capital account can also be changed between 0 and 1. It is represented by a dummy variable  $\delta_t$ , equal to 1 if investors can freely take their capital out of the country in subperiod  $t$ , and to 0 if they can't. So there are two policy instruments in each subperiod  $t = \frac{1}{T}, \dots, 1$ :  $e_t$  for the reform effort, and  $\delta_t$  for the capital account regime.

First, assume that the country can commit to neither policy instrument. Then it is easy to see that the capital account policy does not solve the time consistency problem in the reform. A country that suffers from a time consistency problem (with  $\omega < \omega^*$ ) is expected to trap the capital installed in the country in period 0 by closing the capital account in period  $\frac{1}{T}$ , and subsequently produce no reform effort. Essentially, closing the capital account

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<sup>8</sup>In order to capture the idea that capital "attaches itself" to the country (becomes less liquid) between 0 and 1, we could assume that  $\lambda$  is time-varying and decreases over time. This slightly complicates the analysis without affecting the essence of our results.

<sup>9</sup>We must penalize late investment in some way, otherwise investors would wait for the completion of the reform before committing to their investment decisions.

<sup>10</sup>One could study the robustness of our results to more substitutability between reform efforts at different periods.

makes the model equivalent to the one in the previous section—it makes capital immobile between period 0 and 1.

**For the capital account policy to matter we must assume that the country has *some* ability to commit.** Hereafter we assume that the country can commit to its capital account policy one subperiod ahead.

**Assumption A1.** The country can commit to an open capital account  $\frac{1}{T}$  period ahead, i.e., the representative resident sets  $\delta_{t+\frac{1}{T}}$  at time  $t$ .

This gives us the interpretation of parameter  $T$ . The horizon at which the country can commit to an open capital account is a fraction  $1/T$  of the horizon at which private investors commit capital to the country. As we shall see, if the country can commit at a very short horizon ( $T$  is very large), the equilibrium is fundamentally different from the case where the country cannot commit at all ( $T$  infinite). For the problem to be interesting  $T$  has to be larger than 1: if the country could commit itself at the same horizon as investors, there would be no commitment problem.

Assumption A1 is key to our analysis so it is important to interpret it carefully. First it could be interpreted as a feature of the technology of capital controls. Imposing capital controls may require some actions that are observed by the public before the controls become effective. This gives investors a window of opportunity to take their capital out before the controls become effective.

Another, maybe more interesting, interpretation is in terms of domestic political delegation. Assume that policy is delegated to a policymaker who is committed to certain policies. Then changing policies require a change in the policymaker. In this interpretation the period corresponds to the horizon at which a typical policymaker can be changed, which depends on the electoral system, or more broadly, the level of political stability in the country.

In order to be completely consistent with the second interpretation assumption A1 should be made slightly stronger. If the country can commit to its capital account policy  $1/T$  period ahead, this should also be possible for the reform effort. There is no reason, as a matter of logic, to assume that the country can commit *more* to its capital account policy than to reform. This leads us to state a stronger version of Assumption A1.

**Assumption A2.** The country can commit to an open capital account and to pursuing the reform  $\frac{1}{T}$  period ahead, i.e., the representative resident sets  $\delta_{t+\frac{1}{T}}$  and  $e_{t+\frac{1}{T}}$  at time  $t$ .

We tend to prefer A2 to A1 because it does not rely on an ad-hoc asymmetry giving capital account policy an edge in terms of commitment. Also, assumption A2 lends itself to nice political economy interpretations. But—interestingly—which assumption we pick does not matter very much: the two assumptions have exactly the same implications for the equilibrium.

The sequence of actions is now the following.

- In period 0 residents and foreign investors invest  $k_0$  in the country. Simultaneously the domestic government commits to its policies for the first subperiod,  $e_{\frac{1}{T}}$  and  $\delta_{\frac{1}{T}}$ .

- In each subperiod  $t = \frac{1}{T}, \dots, 1 - \frac{1}{T}$ , investors reallocate their capital and simultaneously the domestic government commits to its policies in the following subperiod,  $e_{t+\frac{1}{T}}$  and  $\delta_{t+\frac{1}{T}}$ . Investors can reallocate their capital at  $t$  if the capital account is open ( $\delta_t = 1$ ), under the constraint  $(1 - \lambda)k_0 \leq k_t \leq k_0$ .

- In period 1 production and consumption take place. The level of productive capital is equal to whatever has been left in the country in the following period,  $k_1 = k_{1-\frac{1}{T}}$ .

It is not difficult to see that if the physical mobility of capital  $\lambda$  is large enough, there is an equilibrium with reform and a high level of investment irrespective of the country's wealth. Intuitively, the country's policy is disciplined by the threat of a capital flight, like in the "golden straitjacket" strategy mentioned in the introduction.

To make this point more formally, let us assume that capital is physically sufficiently mobile that capital can jump down from  $\bar{k}$  to  $\underline{k}$  in a capital flight,

$$(1 - \lambda)\bar{k} \leq \underline{k}.$$

Given that  $\bar{k}$  has been installed in period 0 and maintained in the country until period  $t$ , stopping the reform from  $t + \frac{1}{T}$  onwards triggers a capital flight that lowers  $k$  from  $\bar{k}$  to  $\underline{k}$ . The country does not deviate from the reform if the benefit of a deviation is lower than its cost in all periods, that if for all

$$t = 0, \frac{1}{T}, \dots, 1 - \frac{1}{T}$$

$$\left(1 - \frac{T}{T-1}t\right) \gamma \leq \bar{w} - \underline{w}. \quad (3)$$

The left-hand-side is the residual cost of the reform that is saved by stopping the effort in period  $t + \frac{1}{T}$ <sup>11</sup>. The right-hand-side is the cost of the capital flight in terms of a lower wage (note that the capital income of the representative resident does not appear in this equation, since the gross return on capital is equal to  $R^*$  whether or not there is a capital flight).

We only need to check the condition for  $t = 0$  since the benefit of a deviation is decreasing in  $t$  while its cost is independent of  $t$ . (A deviation, if it occurs, does so as early as possible, when the residual cost of the reform is maximum.) For  $t = 0$ , the incentives condition (3) is the same as the efficiency condition (1), which is true by assumption. Capital mobility makes the country internalize the full social benefit of reforming. It can no longer "trap" foreign investors, who are free to take their capital out of the country as soon as the country stops reforming. It becomes as if investors could choose the level of capital *after* the reform has been implemented, which solves the commitment problem.

It is interesting to see why the country keeps the capital account open in equilibrium. Investors are aware that if the country closed its capital account in period  $t$  then it would be able to stop the reform in  $t + \frac{1}{T}$  without bearing the cost of a capital flight in that period. Anticipating this, investors would take their capital out in period  $t$ . Thus, a capital flight can be triggered by a failure either to reform or to maintain an open capital account.

Conversely if capital is sticky ( $\lambda$  is small) the country loses only a small quantity of capital by not reforming, and the discipline induced by capital mobility is weak. In the limit case where  $\lambda$  is equal to zero, the model is exactly the same as in the previous section, implying that a country with wealth below  $\omega^*$  cannot credibly commit to reform in equilibrium.

The case in which  $\lambda$  takes intermediate values is characterized in the following proposition (see the proof in the Appendix).

**Proposition 5** *If its wealth belongs to a range  $[\tilde{\omega}(\lambda), \omega^*[$ , there is an equilibrium in which the country maintains its capital account open in all periods*

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<sup>11</sup>It is equal to the number of periods after  $t$  times the cost of the effort per period,  $\gamma/(T-1)$ . The periods after  $t$  are  $t + \frac{1}{T}, t + \frac{2}{T}, \dots, 1 - \frac{1}{T}$ ; their number is  $T(1-t) - 1$ .

and completes the reform in order to avoid a capital flight (the "golden strait-jacket" strategy). The wealth range  $[\tilde{\omega}(\lambda), \omega^*]$  is nonempty if the physical mobility of capital  $\lambda$  is large enough, and its width is increasing with  $\lambda$ .

Thus the golden straitjacket strategy expands the set of countries that may benefit from opening their capital account. An interesting interpretation of this result is in terms of "political lock-in". Assume that in each subperiod  $t = \frac{1}{T}, \dots, 1 - \frac{1}{T}$  the electorate selects a policymaker in a pool containing two types: a "hard" type that is committed to pursue the reform and keep the capital account open, and a "soft" (or populist) type which is not committed to anything. By electing a hard type in the first subperiod  $t = \frac{1}{T}$  the population effectively commits to reelecting that type until the reform is completed, because once the capital account is open, electing a soft type triggers a capital flight. Thus capital mobility makes the reform sustainable by "locking in" the hard type in power.<sup>12</sup>

However, the "golden straitjacket" strategy is also vulnerable to self-fulfilling crises in which capital flies out and the reform is interrupted. This vulnerability always exists, irrespective of the country's wealth, and in this sense it is a very generic feature of the golden straitjacket strategy. The capital that remains in the country after a capital flight is trapped there: it cannot go up or down until period 1. Conditional on this level of capital the country will not implement a reform effort that was not optimal conditional on an even higher level of capital  $\bar{k}$  (this is why the country had to put on the golden straitjacket in the first place). These self-fulfilling crises can occur when the residual cost of the reform remains sufficiently high, that is in early periods  $t$ .

**Proposition 6** *The "golden straitjacket" strategy is vulnerable to self-fulfilling capital flights followed by reform abandonment.*

A country may be worse off after a self-fulfilling capital flight than if it had not attempted to implement the reform at all. This point is easy to see

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<sup>12</sup>In such a situation, populist parties will have incentives to present candidates of the hard type in elections (if they care about being in office). Thus capital mobility might have an effect on the ideology professed by its political parties. To the extent that ideology is costly to change this effect might last longer than capital mobility itself.

if  $\lambda \geq 1 - \underline{k}/\bar{k}$ , because in this case the country is left with  $\underline{k}$  after a capital flight (the same amount of capital as if it had not attempted the golden straitjacket strategy) but it has paid the cost of reforming before the capital flight.

The self-fulfilling capital flights may be triggered by a sunspot variable that coordinate investors around the bad equilibrium. Let us assume that the sunspot variable gives the "signal" of a capital flight with a constant probability  $\pi$  per period. The risk of a self-fulfilling capital flight lowers the benefit of the "golden straitjacket" strategy and so shrinks the wealth range in which countries choose this strategy. Obviously if a self-fulfilling capital flight is almost certain no country will choose it.

There is no easy way out of this problem. For example, one would like to make capital mobility conditional on the reform: investors can take their capital out in period  $t$  only if it is observed that the reform will be stopped in  $t + 1/T$ . But if it were possible to write such a "contract", then the reform could be made credible without capital mobility. Self-fulfilling crises are a reflection of the underlying commitment or contract incompleteness problem.

## 5 Concluding Comments

International economists need a relative complete typology of the benefits and costs of capital mobility in order to better structure the debate on the pros and cons of financial globalization. This paper attempts to make progress in this direction by looking at the question from a particular angle—the relationship between international capital mobility and domestic policy incentives. We find that a relatively simple framework leads to nontrivial insights, as well as some normative policy analysis.

The analysis was based on a very stylized partial equilibrium model of a small open (or not) economy. It would be interesting to extend the analysis to a dynamic general equilibrium framework to see how the pattern of international capital mobility evolves over time as the outcome of endogenous national policy choices. One important state variable will be the wealth of nations, which, as we have seen in this paper, is a key determinant of the optimal capital account policies. An explicit multi-country model would allow one to study one dimension of the problem that we have largely ignored here:

the network externalities that arise between the capital account policies of different countries (the benefit of liberalizing one's inflows obviously depends on whether others have liberalized their outflows).

The paper suggests several questions that would deserve scrutiny in future empirical work: 1) the link between a strong domestic investor base and political support for reform; 2) the link between capital mobility/controls and the maintenance of a strong domestic investor base; 3) how the domestic investor base and political support for reform changed in recent capital account crises. In addition, our model suggests that capital account liberalization increases domestic support for reform conditional on no crisis, but also increases the probability of a crisis that reduces support for reform (with an ambiguous net effect on the incentives to reform). This prediction is potentially testable.

## APPENDIX

### Proof of Proposition 1

We have shown in the text that  $\omega \geq \omega^*$  is a necessary condition for an equilibrium with reform to exist under capital mobility. We now show that if  $\omega < \omega^*$  the equilibrium involves low investment ( $k = \underline{k}$ ) and no reform. The incentives to reform are weaker under low investment if,

$$\left(1 - \alpha + \alpha \frac{\omega}{\underline{k}}\right) \underline{k}^\alpha < \left(1 - \alpha + \alpha \frac{\omega}{\bar{k}}\right) \bar{k}^\alpha.$$

To show that this is true, let us consider the case  $\omega = \underline{k}$ , where the incentives to reform conditional on  $k = \underline{k}$  are the strongest. Then this equation can be written,

$$z^\alpha - \alpha z < 1 - \alpha,$$

where  $z = \underline{k}/\bar{k}$ . This inequality is true because the function  $z \mapsto z^\alpha - \alpha z$  increases from 0 to  $1 - \alpha$  when  $z$  increase from 0 to 1.

To show that  $\omega^* < \hat{\omega}$  we note that  $z^* = \omega^*/\bar{k}$  and  $\hat{z} = \hat{\omega}/\bar{k}$  are solutions to,

$$\begin{aligned} (1 - \alpha + \alpha z^*) \bar{k}^\alpha &= \gamma, \\ \hat{z}^\alpha \bar{k}^\alpha &= \gamma. \end{aligned}$$

Then one can show that

$$\forall z \in [0, 1], \quad z^\alpha \leq 1 - \alpha + \alpha z.$$

This implies  $\hat{z} > z^*$  and so  $\hat{\omega} > \omega^*$ .

### Proof of Proposition 5.

Let us assume that  $\bar{k}$  has been invested in period 0, and that the country has pursued the reform and kept its capital account open up to time  $t$ . If the country deviates in period  $t$  by not committing any longer to the reform ( $e_{t+\frac{1}{T}} = 0$ ), the level of domestic capital falls to  $\underline{k}$  if it can, otherwise to the lowest possible level,

$$\tilde{k}(\lambda) = \max((1 - \lambda)\bar{k}, \underline{k}).$$

The country does not deviate from the reform if this decreases the representative resident's welfare,

$$(1-\alpha)\underline{A}\tilde{k}(\lambda)^\alpha + \frac{\omega}{\underline{k}}\alpha\underline{A}\tilde{k}(\lambda)^\alpha + R^* \left( \omega - \frac{\omega}{\underline{k}}\tilde{k}(\lambda) \right) - \frac{t}{T}\gamma \leq (1-\alpha)\bar{A}\bar{k}^\alpha + \frac{\omega}{\bar{k}}\alpha\bar{A}\bar{k}^\alpha - \gamma. \quad (4)$$

The left-hand-side is the welfare of the domestic representative resident if the government drops the reform, so that productivity and capital respectively fall to  $\underline{A}$  and  $\tilde{k}(\lambda)$ , and the cost of reform is incurred up to time  $t$  only. Note that the share of domestic ownership remains equal to  $\omega/\bar{k}$  after a capital flight since residents and nonresidents take out the same fraction of their capital. The right-hand-side is the country's welfare if the reform is pursued until completion.

The incentive condition is satisfied for all periods  $t = 0, \frac{1}{T}, \dots, 1 - \frac{1}{T}$  if and only if it is satisfied for  $t = 0$ . Using the expressions for  $\underline{k}$  and  $\bar{k}$  the incentive condition for  $t = 0$  may be rewritten,

$$\gamma \leq (1-\alpha)\bar{A}\bar{k}^\alpha - (1-\alpha)\underline{A}\tilde{k}(\lambda)^\alpha + R^* \frac{\tilde{k}(\lambda)}{\bar{k}} \left( 1 - \left( \frac{\underline{k}}{\tilde{k}(\lambda)} \right)^{1-\alpha} \right) \omega. \quad (5)$$

In Figure 1 the right-hand-side of this condition is represented as a function of  $\tilde{k}$  for different values of  $\omega \leq \omega^*$ . If  $\tilde{k} = \underline{k}$  it is equal to  $\bar{w} - \underline{w}$ , which is strictly larger than  $\gamma$  by assumption (1). If  $\tilde{k} = \bar{k}$  it is equal to  $\gamma$  if  $\omega = \omega^*$  and it is lower than  $\gamma$  if  $\omega < \omega^*$ . The right-hand-side of (5) is a convex function of  $\tilde{k}$ .

It follows that for a given  $\omega$  the incentive condition is satisfied only if  $\tilde{k}(\lambda)$  is small enough, that is if  $\lambda$  is large enough. Because the curve shifts downward when  $\omega$  goes down, the minimum level of  $\lambda$  consistent with incentives is decreasing with  $\omega$ . This implies that  $\tilde{\omega}(\lambda)$ , the minimum level of wealth consistent with the incentives for a given  $\lambda$ , is decreasing with  $\lambda$ .

If  $\omega \geq \tilde{\omega}(\lambda)$  then at any given time  $t$  the government announces the pursuit of the reform ( $e_{t+\frac{1}{T}} = 1$ ) provided that the capital account is open in that period.

We now consider the capital account policy. If the government deviates in period  $t$  by not committing any longer to an open capital account ( $\delta_{t+\frac{1}{T}} = 0$ ) then investors understand that in  $t + \frac{1}{T}$  the country will be able to stop reforming without suffering the consequence of a capital flight. But if  $\omega < \omega^*$  this is what the country will do, at least in the early periods when the residual

cost of the reform is still large enough. So in equilibrium the government must not only pursue the reform but also keep the capital account open in order to avoid a capital flight. This is true only in the early periods. After some time the country can close the capital account without suffering a capital flight because the residual cost of the reform is sufficiently small that it will be completed anyway; then  $\delta_t$  is indeterminate.

### Proof of Proposition 6

Let us assume that  $\bar{k}$  has been installed in period 0. The country is vulnerable to a self-fulfilling capital flight in time  $t$  if the reform is not worth pursuing once capital has irreversibly fallen to  $\tilde{k}(\lambda)$ , that is if,

$$(\bar{A} - \underline{A}) \left( 1 - \alpha + \alpha \frac{\omega}{\bar{k}} \right) \tilde{k}(\lambda)^\alpha < \left( 1 - \frac{t}{T} \right) \gamma.$$

This condition is necessarily satisfied for  $t = 0$  since it is satisfied for  $\tilde{k} = \bar{k}$  (provided that  $\omega < \omega^*$ ) and  $\tilde{k} \leq \bar{k}$ . By continuity it is satisfied for low  $t$ . The time window during which the country is vulnerable to a self-fulfilling capital flight is decreasing with  $\omega$  and increasing with  $\lambda$ .

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