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Can a Liberalization of Capital Outflows Increase Net Capital Inflows?

Raúl Labán M. and Felipe Larraín B.

ABSTRACT

Facing massive capital inflows that put downward pressure on the real exchange rate, some policy makers and analysts have recommended a liberalization of capital outflows. Empirically, however, the removal of capital outflow controls has apparently stimulated a net inflow of capital in several experiences, such as Britain since 1979, Italy, New Zealand and Spain in the mid to late 1980s, and Colombia, Egypt and Mexico in the 1990s. Numerous measures to liberalize capital outflows in Chile during the 1990s have not had a noticeable effect in offsetting a surge of net capital inflows.

How can we explain the apparent paradox that reducing controls on capital outflows can actually increase net capital inflows? Our theoretical model provides one such explanation. A liberalization of capital outflows, understood here as a reduction in the minimum capital repatriation period for foreign investment, reduces the degree of "irreversibility" of the decision to invest in a given country. This, in turn, lowers the option value of waiting until uncertainty about a possible change in the rules of the game that affect investment in domestic assets is resolved, because in this event foreigners investing at home will be stuck with the low-return asset for a shorter period of time. Thus, a reduction in the minimum repatriation period is likely to increase --not decrease-- net capital inflows.

This result has an important policy implication. Liberalizing capital outflows may have significant benefits on its own. But it may not be the appropriate policy to defend the real exchange rate in the presence of massive capital inflows, because it is likely to strengthen those very capital inflows.

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I. INTRODUCTION

Latin America has experienced a massive inflow of private capital since the end of the 1980s. This is in sharp contrast to the situation observed in the region during most of the 1980s, when almost no private capital flowed into the region. Capital returned to Latin America in many different forms. Foreign direct investment, short and long term syndicated loans, public and private bond emissions in foreign financial markets, equity sales in foreign stock exchanges, and even repatriation of capital held by locals abroad all increased significantly during this period.

The sharp increase of capital inflows into the region since the late 1980s has resulted from the combination of a number of external and internal factors. Among the former are low international interest rates, poor economic performance in the industrial countries, and higher availability of international capital. On the internal front there are a number of political and economic developments which have been translated into a reduction of the risk premium that domestic and foreign investors require to hold Latin American securities (see, for example, Williamson (1991), Calvo et al (1993), and Culpeper and Griffith-Jones (1992)).

This renewed access to international capital markets provides a number of potential benefits to the region -- e.g., increased availability of resources to finance capital formation in the region, and the possibility to sustain a more stable consumption path-- but also poses a number of policy dilemmas. Among the latter stands the difficulty of maintaining a reasonable degree of autonomy in monetary policy, without introducing excessive volatility to the nominal exchange rate and -- in presence of short term price and wage rigidity -- to the real rate.

A growing empirical evidence suggest that an excessive instability of the real exchange rate has a depressive impact on exports (Caballero and Corbo, 1989) and on private real investment (Larraín and Vergara, 1993). On theoretical grounds, Krugman (1987), has shown the negative (and permanent) effect that a transitory appreciation of the real exchange rate can have on the tradable sector as a response to short run stabilization policy and other

transitory shocks. Tornell (1990) argues that excessive instability in the real exchange rate and/or the real interest rate caused by short run speculative capital flows can have a negative impact on productive investment and, thus, on economic growth.

This paper focuses on the reaction of economic authorities in recipient countries to increased capital inflows. In particular, it addresses the issue of whether a liberalization of capital outflows is an effective device to offset (at least partially) the inflow of capital. Section 2 discusses the policy reactions to capital inflows that are currently observed and recommended. The next section develops a theoretical model to assess the main question posed above. A short conclusion follows.

II. POLICY REACTIONS TO INCREASED CAPITAL INFLOWS

Calvo et al. (1993) have presented evidence showing that the massive inflow of capital into Latin America has led to a significant appreciation of real exchange rates, thereby deteriorating the competitiveness of the tradable sector in a number of countries in the region. This has happened precisely as many of these countries were implementing economic reforms to foster export-led growth. Aimed at preventing a further real appreciation of the exchange rate, these countries have reacted by accumulating important amounts of international reserves. The monetary effect of this reserve accumulation has been (at least partially) sterilized, thus preventing a more rapid reduction of domestic interest rates and causing significant operational losses to central banks.

Other policy options have been recommended as well by economists to prevent a sharp real appreciation of the exchange rate. Among them, two figure prominently: increasing controls on capital inflows and liberalizing capital outflows. We turn to them now.

II.A. Stepping up controls on inflows

Some analysts have argued for the introduction of additional restrictions on short term speculative capital inflows. Others have criticized this position, basing their argument on the

presumption that free capital mobility is optimal and that the capacity of regulators to impose capital inflow controls is low in an economy which is increasingly integrated to the rest of the world in goods, services, and finance.

Free capital mobility is clearly desirable in a world without distortions, with perfectly functioning markets and fully flexible prices and wages. The violation of these assumptions, however, gives a second-best justification for the use of capital controls. In fact, several economists have argued in favor of some sort of capital controls (e.g., Tobin (1978), Krugman (1987), Giavazzi and Giovannini (1989)).

In a well-known 1978 article, Tobin argued that it was necessary "to put some sand in the wheels" of the extremely efficient international capital markets because financial flows -- especially short term-- provoke wide exchange rate fluctuations which adversely affect the real sector. Thus, Tobin favored taxing short term capital flows. Krugman (1987) has argued in favor of protecting the tradable sector from transitory shocks which can lead to a transitory over-appreciation of the domestic currency, for example, with the application of controls on short-term capital inflows. Behind this recommendation lies the belief that a transitory appreciation of the real exchange rate can have a permanent depressing impact on exports and on efficient import substitution (e.g., due to the presence of hysteresis, which may arise as a result of dynamic comparative advantages). Summers (1988) suggests that taxes of various kinds are justified in the presence of speculation. Tornell (1990) has shown that Tobin taxes on short term international capital movements can improve welfare in the presence of irreversible investment.[1] Calvo et al (1993), discussing different policy reactions to capital inflows, concludes that the least damaging option may be some form of capital control.

[1] Tornell's model, however, assumes that the only source of instability is external.

II.B. Liberalizing capital outflows

As noted, a number of specialists have opposed the use of controls on capital inflows. Some of them have argued in favor of an asymmetric liberalization of the capital account, moving faster in the relaxation or removal of controls on capital outflows than on inflows. Others have suggested that the authorities should rely only on a more aggressive and widespread elimination of controls on capital outflows. Liberalizing outflow controls --the argument follows-- improves efficiency in local capital markets, allows residents to spread risks through international diversification of their portfolios, and helps to reduce downward pressure on the real exchange rate. This line of argument, however, rests on two crucial assumptions: first, that controls are effective; and second, that liberalizing outflows effectively promotes a net capital outflow.

It is indeed more difficult for capital controls to be effective in a context of increasing globalization of capital markets and of current account convertibility, as Mathieson and Rojas-Suárez (1993) have argued. The experience of industrialized countries, and especially that of Spain during 1987-89, suggests so.[2] But there is a long way from this to the assertion that capital controls are totally ineffective, as Williamson (1991) has stressed. Furthermore, as it has become more difficult to implement controls on capital inflows, it has also become tougher to control outflows. Thus, the export of capital can be **de facto** liberalized even before restrictions are lifted. Therefore, a removal of controls on capital outflows is no guarantee that there is going to be an increase (decrease) in net outflows (inflows).

Also, as Viñals (1990) has argued for Spain in 1987-89, when a substantial rate of return differential favors local currency assets, controls on inflows may be binding while controls on outflows may not be, even if capital outflows are more heavily restricted than inflows at the time. Thus, the relaxation or removal of controls on capital outflows may do little to increase the incentive to export capital, as may well have been the case in several Latin American countries during the early 1990s.

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[2] See, for example, The Economist (1992), and Viñals (1990).

II.C. Some international experiences

Faced with large inflows of capital, several countries --both in the industrial and developing world-- have moved to ease controls on capital outflows in recent years. The liberalization of outflows has occurred in several ways. First, local agents have been allowed to invest a larger share of their assets abroad and to diversify the menu of options available. This change has tended to be particularly important for institutional investors, which normally face close scrutiny from a regulatory agency (less so for individuals, who can bypass restrictions more easily). Second, restrictions on the repatriation of profits and capital for foreign investors have been eased. And finally, exporters have been allowed free disposal over a larger fraction of their export earnings, thus phasing out the strict surrender requirements that central banks have generally been used to.

Schadler et al (1993) have provided a detailed account of capital outflow liberalization in Chile, Colombia, Egypt, Spain and Thailand in the aftermath of large inflow episodes; they speculate that this kind of liberalization might attract inflows instead of stimulating outflows --but do not investigate the issue in detail. Williamson (1991) went further, and pointed out that the removal of capital outflow controls could clearly stimulate a net inflow of capital. He claims this to have actually happened, for example, in Britain in 1979, New Zealand in 1984, and Yugoslavia in 1990. This apparent paradox may be the result of a decline in the degree of "irreversibility" of the decision to invest in a given country and/or an increase in a country's credibility not to engage in distortionary taxation, with a more open capital account.[3]

The liberalization of capital outflows has been diverse across countries, but consistently applied after inflow episodes. Colombia, for example, following a surge in capital inflows in 1991, moved in early 1992 in three fronts: a) extended the liberalization of export surrender requirements to all exporters; b) allowed local agents to hold offshore stocks and

[3] Nevertheless, as Sargent (1983) and Hanson (1992) suggest, investors should internalize that a country has substantial incentives to deviate from a regime of flexible exchange rates and capital mobility, to extract an inflation tax from its residents. The capacity of overcoming this time-inconsistency problem is one of the most important benefits that countries such as Chile and Mexico could expect, say, from NAFTA membership.

other assets up to $500,000 (with higher amounts requiring government authorization); and c) eased restrictions on the provision of foreign loans. Nonetheless, the country experienced a further increase of net inflows in the following years.

The rise of capital inflows to Spain happened in 1987, and the Spanish authorities started liberalizing investment abroad on that same year. Between December 1989 and the end of 1990, most restrictions on direct and portfolio investment by Spanish residents abroad were eliminated. All remaining constraints on the purchases of foreign financial assets were eliminated in April 1991. But net capital inflows surged from $9 - 10 billion in 1987-88 to over $14.5 billion in 1989-90, and then swelled to $30 billion in 1991.

Other experiences with liberalization of outflows have included that of Mexico, which in late 1991 eliminated surrender requirements for exporters and other exchange controls, thus allowing exchange rate unification. Egypt allowed free transfer of foreign exchange abroad for both physical and capital transactions in early 1991. Thailand, on the other hand, liberalized foreign direct investment in 1991: local residents were allowed to freely send abroad up to $5 million, and foreign investors in Thailand no longer required a Bank of Thailand authorization to repatriate capital. Of these three countries, only Thailand did not experience a massive increase of net capital inflows after the outflow liberalization measure was undertaken.

Bartolini and Drazen (1995) review the experiences of Italy, New Zealand and Spain since the mid-1980s, and that of Uruguay in the mid to late 1970s. In all these cases, they find evidence of strong capital inflows following a liberalization of controls on capital outflows.

Another widespread liberalization of capital outflows has occurred in Chile since 1991, after capital inflows surged in 1989-90. But net capital inflows have increased from $1.1 billion in 1991 to $3 billion in 1992, $2.8 billion in 1993, and a massive $4.5 billion (9% of GDP) in 1994. This massive inflow of resources was attracted by the consolidation of economic and political reforms in Chile, and by a wide gap between local and foreign interest

rates.[4]

Chilean economic authorities reacted first through sterilization, which increased the operating loss of the Central Bank. In June 1991, capital inflow controls were established with the introduction of a 20% reserve requirement on foreign credits, later increased to 30% in August 1992. In addition to these, the authorities have also tried several measures to liberalize capital outflows, among them: a) the easing of capital repatriation restrictions for foreign investments made through debt-equity swaps, which was allowed ahead of schedule, and the reduction of the minimum permanence period for capital under regular foreign investments from 3 years to 1 year in March 1993; b) the liberalization of investment restrictions abroad for private administrators of pension funds (AFPs) and other institutional investors, who became gradually allowed to invest abroad an increasing fraction of the value of their fund and to diversify their choice of financial instruments; (c) the gradual elimination of surrender requirements for exporters.[5]

So far, these measures have not had a noticeable effect in offsetting net capital inflows.

III. IS A LIBERALIZATION OF CAPITAL OUTFLOWS AN EFFECTIVE DEVICE TO OFFSET CAPITAL INFLOWS? A THEORETICAL APPROXIMATION

The evidence presented thus far is suggestive, but does not prove that relaxing capital outflow controls will bring into the country a net inflow of capital. To study this issue further at a theoretical level, in this section we present a model which shows that, under certain conditions, a relaxation of controls on outflows can lead --perhaps paradoxically-- to an increase in net inflows. If this is the case, an important policy conclusion becomes inescapable: such a policy may have benefits of its own, but is not appropriate by itself to defend the real exchange rate in the presence of massive capital inflows.

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[4] For a detailed analysis of the Chilean experience with capital movements since the mid-1980s, see Labán and Larraín (1993, 1994).

Bartolini and Drazen (1995) have provided another theoretical approximation to this issue. In their two-period model the government may remove controls on capital outflows to signal its commitment to maintain investment-friendly policies over time. Investors with imperfect information about the government's future intentions may infer the course of future policy measures from the observation of current policies. If this signal is successful, then liberalization of capital outflows may induce capital inflows.

Before proceeding the, however, it is important to stress that our analysis is not invariant to the type of restriction that is lifted. The relaxation of certain specific capital outflow controls may lead to an increase in net capital outflows, such as Chile's decision to allow an increasing portion of pension funds to be invested abroad. Liberalization of capital repatriation controls for foreign investment, however, is more likely to create a net inflow of capital. Let us now turn to the model.

III.A. A two-period model

Assume that initially capital inflows are fully liberalized but neither capital nor interest earnings on foreign investment can be repatriated before two years inside the country. In period 1 the returns on a foreign riskless asset and on a domestic risky asset are r^* and r_h, respectively. Suppose, too, that the government will impose a tax on domestic capital in period 2 with probability $(1-q)<1$, reducing the return on this asset to $r_1 = r_h - t$, where t > 0 is the tax on domestic capital.[6] If the tax is not imposed, local assets will perceive a return equal to that of period 1. Thus, there is less than full credibility on the sustainability of a stable tax regime for domestic investment.[7]

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[5] Further details about Chile's recent capital account policies may be found in French-Davis et al. (1995).

[6] Any other source of non diversifiable risk (e.g., expropriation risk) will lead to equivalent results.

[7] This is a partial equilibrium model in which the tax rate and the rate of return on capital are independent of the stock of domestic capital accumulated. We also assume that the probability of policy reversion is exogenous. But

We assume that there is a continuum of risk neutral foreign investors maximizing the expected present discounted value (EPDV) of their initial wealth, which is assumed to be one unit of the foreign asset at the beginning of period 1. We assume that returns satisfy the following restriction: $0 \leq r_l < r^* < r_h$. Initially, if foreign investors decide to invest in domestic assets in period 1, they will have to remain holding the assets in period 2. Thus, although the domestic asset may be "liquid", the presence of capital outflow controls makes the decision of investing in domestic assets irreversible.

Irreversible investment models and their implications in closed economies have been presented, for example, by Bernanke (1983), Dixit (1990), and Pindyck (1991). Dornbusch (1990) and Tornell (1990) have extended this type of model for economies which are financially integrated to the rest of the world. Our model is part of this tradition, and the initial setup of 2 periods, 2 assets and 2 states of the nature follows Dornbusch (1990). All these authors, however, assume that the nature of irreversibility is technical, due to the purchase of a specific piece of capital (machine, equipment, or structure). In our model, the irreversibility of the domestic asset arises from an institutional restriction: the presence of capital outflow controls.

Let V_1 be the EPDV of investing one unit of wealth in domestic capital at the beginning of period 1, and V_{0n} the EPDV associated with the decision of waiting given that holding the foreign liquid asset allows deferring commitment until the uncertainty concerning the tax regime is resolved. Defining $\beta > 0$ as the discount factor, assuming returns to be small and ignoring residual value, the values of these two assets (common to all foreign investors) under capital outflow controls are given by:

(1) $V_1(q) = r_h + \beta\left[qr_h + (1-q)r_l\right]$,

and

(2) $V_{on}(q) = r^* + \beta\left[qr_h + (1-q)r^*\right]$,

---

it may well be the case that this probability decreases with the stock of domestic capital (see Rodrick (1989); Eaton and Gersovitz (1989); and Labán and Wolf (1993)).

where, if the restrictions on returns are satisfied, it is an equilibrium strategy to enter (not enter) in period 2 if the program is maintained (collapses). At the beginning of period 1, each investor's optimization program is given by:

(3) $V_n^*(q) = \max\left[V_1(q), V_{0n}(q)\right]$

This equation implicitly defines the threshold level of q that will render investment in domestic assets the preferred option before uncertainty about the tax regime is resolved $\left[V_n^*(q_n^0) = V_1(q_n^0) = V_{0n}(q_n^0)\right]$[8].

We are implicitly making the assumption that by not investing in the domestic asset in period 1, investors do not lose the possibility of doing so in period 2. If there is a chance that investment opportunities at home would not be available (under the same conditions), the option value conferred to the foreign asset will be lower (but still positive), since it will take into account this possible event. Also, small investors making portfolio decisions in an uncoordinated way are unlikely to internalize the impact of their decision in the stock of available investment opportunities.

In this model, the equilibrium arbitrage condition for period 1 is given by:

(4) $r_h = r^* + \beta(1 - q_n^0)(r^* - r_1) > r^*$,

which has a positive "front-end" risk premium $\alpha = \beta(1 - q_n^0)(r^* - r_1)$, even in the presence of risk neutral investors. Thus foreign investors require a "premium" equal to α over the international interest rate to be indifferent between holding foreign or domestic assets. This risk premium is consistent with Bernanke's (1983) bad news principle: an increase in the expected spread between r^* and r_1 (i.e., an increase in the expected value of bad news) will increase the front-end premium that foreign investors require to invest at home during the

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[8] For $q_n^0 > 0$, we need that $V_1(q = 0) < V_{on}(q = 0)$, implying that $r_h - r^* < \beta(r^* - r_1)$, which we will assume to hold. The restrictions on asset returns ensure that $q_n^0 < 1$. Thus for $0 \le q \le q_n^0$, it will be optimal not to invest in domestic assets at period 1, and for $q_n^0 < q \le 1$, it will be optimal to invest at home in the first period.

"noisy" period. On the other hand, an increase in the expected spread between r_h and r^* will have no effect in the investment criterion, since foreign investors, by not investing at home in period 1, do not lose the option to do so at the beginning of period 2 if distortionary taxes on capital are not imposed.

We claim that the presence of uncertainty about the future tax treatment on domestic capital, coupled with the assumption that investment opportunities do not disappear if not undertaken immediately, and that investment at home is irreversible, confers a non-negative (call) option value to foreign liquid assets even in the presence of risk neutrality, for all q. The combination of these three factors is the key to the results of our model.

This option value[9] can be computed by comparing $V_n^*(q)$ with the maximum value of wealth attainable under equivalent conditions but without the possibility of deferring precommitment, $V_c^*(q)$. In this case, investors remaining liquid in period 1 must decide how to allocate their portfolios in period 2 before the uncertainty regarding the future tax structure is resolved. Thus, the value of the not-entering-in-period 1 strategy and the optimization program are given by,

(5) $V_{0c}(q) = r^* + \beta \max\left[qr_h + (1-q)r_1, r^*\right]$,

and

(6) $V_c^*(q) = \max\left[V_1(q), V_{0c}(q)\right]$.

Solving for $V_c^*(q) = V_1(q) = V_{0c}(q)$, gives the threshold value for q without the deferment option $\left(q_c^0\right)$. In order to determine the sign of $\left[q_n^0 - q_c^0\right]$, we compare $V_{on}(q)$ with $V_{oc}(q)$, for all q, which is equivalent to comparing $\Omega = \left[qr_h + (1-q)r^*\right]$ with argmax $\left[qr_h + (1-q)r_1, r^*\right]$, for any given likelihood of policy reversion. It is straightforward to show that $\Omega > r^*$ and $\Omega > qr_h + (1-q)r_1$, since, given the assumed restrictions on assets returns, it

[9] For a more detailed derivation of this option value, see Dornbusch (1990), Van Wijnbergen (1985), and Labán (1991).

is an equilibrium strategy to invest in domestic (foreign) assets if distortionary taxes on domestic capital is not imposed (imposed) in period 2.

Thus, $V_{on}(q) \geq V_{oc}(q)$ for all q (i.e., foreign liquid assets are more valuable when they allow deferment of precommitment), implying that $q_n^0 > q_c^0$: if waiting were possible at q_c^0, it would be equilibrium strategy to do so. Without the deferment option, foreign investors will require a smaller front-end premium in order to invest in domestic assets.

The option value conferred to the liquid asset under capital outflow controls, $OV(q) = V_n^*(q) - V_c^*(q) \geq 0$, is illustrated in Figure 1, where ABC and ADC represent $V_n^*(q)$ and $V_c^*(q)$, respectively. We thus have that

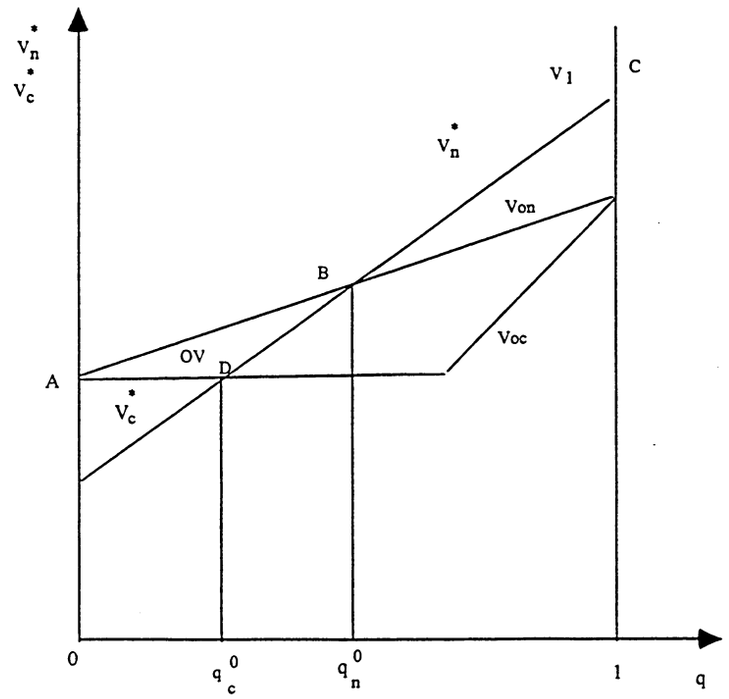
$$(7) \qquad OV(q) = \begin{cases} V_{0n}(q) - V_{0c}(q) & if \;\; 0 \leq q < q_c^0 \\ V_{0n}(q) - V_1(q) & if \;\; q_c^0 \leq q < q_n^0 \\ 0 & if \;\; q_n^0 \leq q < 1 \end{cases}$$

Hence $OV(q)$, corresponding to the area ABD, is non-negative for all q. In the range $[0, q_c^0)$ remaining liquid in period 1, is the preferred option with and without the deferment possibility. In the range $[q_c^0, q_n^0)$, investment in domestic assets in the noisy period is not an equilibrium strategy is deferment is possible, but it is the desired strategy without this possibility. Finally, in the range $[q_n^0, 1)$ the option is worthless since foreign investors will optimally invest in domestic capital in period 1, regardless of the deferment possibility.

Let us assume now that capital outflow controls are relaxed, and capital is allowed to be repatriated in just one year time from the moment it enters. In this case the EPDV associated with the decision of investing one unit of wealth in domestic assets at the beginning of period 1 $\left(V_1(q)'\right)$ is given by,

$$(8) \; V_1(q)' = r_h + \beta\left[qr_h + (1-q)r^*\right].$$

FIGURE 1
THE OPTION VALUE OF WAITING WITH CONTROLS ON CAPITAL OUTFLOWS



It is easy to see that $V_1(q)' > V_{on}(q)$, for all q, so that it will always pay investors to enter at the beginning of period 1 even without any risk premium, and to repatriate their capitals if a distortionary tax on domestic capital were to be implemented. In this case the option value conferred to the foreign liquid assets will be worthless for any q, since the opening of capital outflows eliminates the irreversibility of investing in domestic assets.

III.B. A multi-period framework

In the two-period model just analyzed, one could only study the impact on net capital inflows of eliminating the minimum period required for repatriation. In this section, we extend our model to a multi-period framework in order to evaluate how robust are our previous results to a reduction --and not necessarily an elimination-- of the minimum-period restriction. For this purpose, we introduce an ε-horizon model.

Let us assume, as before, that at the beginning of period 1 investors are faced with the decision of investing one unit of wealth in domestic capital or in foreign liquid assets. If they

decide to invest at home, they will have to remain holding the local asset for at least N periods (N > 2). Once again, investing in the foreign liquid asset allows investors to defer commitment until uncertainty concerning the tax regime at home is resolved (at the beginning of period 2). The remaining assumptions and definitions of variables are equivalent to those in the previous section.

Thus, the EPDV of investing one unit of wealth in the domestic and foreign assets at the beginning of period 1 are, respectively,

$$(9) \qquad V_1(q^N) = r_h + \sum_{i=1}^{N} \beta^i (q r_h + (1-q) r_l) + \sum_{j=N+1}^{\infty} \beta^i (q r_h + (1-q) r^*)$$

and

$$(10) \qquad V_{on}(q^N) = r^* + \sum_{i=1}^{\infty} \beta^i (q r_h + (1-q) r^*) = V_{on}(q) \quad \forall \; N$$

As we can see from equation (10), the EPDV of the foreign asset at the beginning of period 1 is independent of the length of the minimum repatriation period at home (i.e., N).

In this model, each investor's optimization program and the equilibrium arbitrage condition at the beginning of period 1 are given, respectively, by:

$$(11) \qquad V_n^*(q^N) = \max \left[V_1(q^N), \; V_{on}(q^N) \right]$$

and

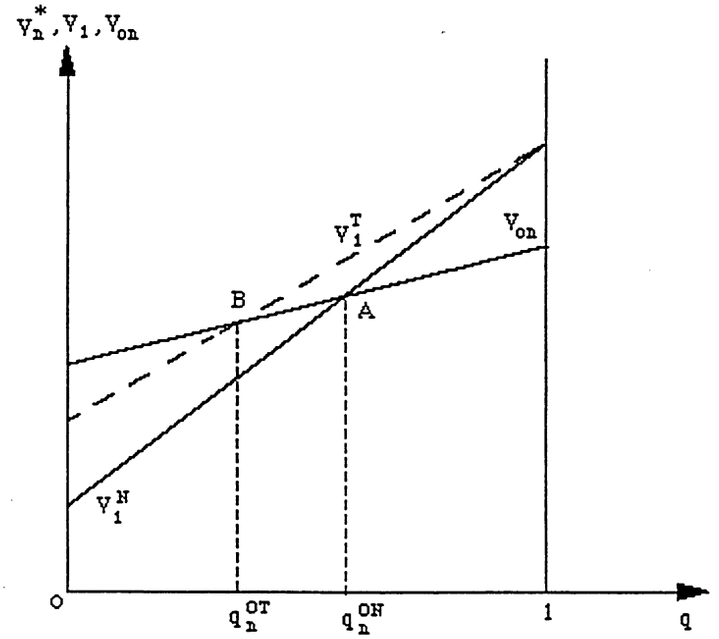
$$(12) \qquad r_h = r^* + \sum_{i=1}^{N} \beta^i (1 - q_n^{0N})(r^* - r_l) \; > \; r^*$$

thus, even risk neutral investors will require a positive "front-end" risk premium (over the international risk-free interest rate) to invest in the domestic asset in the "noisy" period. As clear from equation (12), this risk premium coefficient increases with the minimum number of years investors are forced to hold the domestic asset before repatriation is permitted for any given q, and with the expected value of "bad news".

On the other hand, equation (11) implicitly defines the threshold level of $q(q_n^{0N})$ that will render investment in domestic assets the preferred option before uncertainty about the tax

regime is resolved, in the presence of a minimum wait of N periods before repatriation. The solution to this optimization program is illustrated by point A in Figure 2, where we have that $V_n^* = (q_n^{0N}) = V_1(q_n^{0N}) = V_{0n}(q_n^{0N})$.

FIGURE 2
DETERMINATION OF THE EQUILIBRIUM ARBITRAGE CONDITION



Let us now assume that the minimum repatriation period at home is reduced to T years, where $0 < T < N$. In this case, the EPDV of investing one unit of wealth at the beginning of period 1 in the domestic asset is given by equation (9), substituting N by T; as we have mentioned, the EPDV of the foreign asset at the beginning of period 1 is independent of the length of the minimum repatriation period, and is given by equation (10). Thus, the optimization program for each investor, and the equilibrium arbitrage condition at the beginning of period 1 are given, respectively, by equations (11) and (12), evaluated at T.

As we can see from these equations and from Figure 2, the EPDV of investing one dollar in the domestic asset increases with a decline in the minimum repatriation period, for all q. Since $V_{on}(q,N) = V_{on}(q,T)$ and $V_1(q,N) < V_1(q,T)$ for all q, we will have from equation (11) that $q_n^{0T} < q_n^{0N}$. Therefore, as the length of the minimum repatriation period declines, the threshold value of q that renders investment at home the equilibrium strategy in the "noisy"

period also declines; i.e., for all $q \in (q_n^{0T}, q_n^{0N})$ entering (not entering) at the beginning of period 1 will be an equilibrium strategy if the minimum repatriation period is T (N). On the other hand, for all $q < q_n^{0T} (q \geq q_n^{0N})$ remaining liquid (investing in the domestic asset) in period 1 will be the preferred option for a minimum repatriation period of both N and T years.

Thus, for all $q \in (q_n^{0T}, q_n^{0N})$, a reduction of the minimum repatriation period (i.e., a relaxation of controls on capital outflows) will increase the share of total wealth invested in the domestic asset from 0 to 1.[10]

Equation (12) shows that, for any given probability of policy reversion, the "front-end" risk-premium required by investors to exercise the "wait-and-see" option (and thus to invest in the "irreversible" domestic asset in the "noisy" period) declines with a reduction in the length of the minimum repatriation period.

Following the same line of argument of the previous section, it is straightforward to show that despite the fact that N < ∞ (the horizon of the model), the combination of uncertainty about the future tax treatment at home, the assumption that investment opportunities do not disappear if not undertaken immediately, and the irreversibility of local investment, confers a non-negative (call) option value to foreign liquid assets even in the presence of risk neutrality, for all q.

This option value can be computed by comparing $V_n^*(q^N)$ with the maximum value of wealth attainable under equivalent conditions but without the possibility of deferring precommitment, $V_c^*(q^N)$. The value of not entering in period 1 and the optimization program are given, for a minimum repatriation period of N years, by:

$$(13)\ V_{oc}(q^N) = r^* + \max\left[\sum_{i=1}^{N} \beta^i (q r_h + (1-q) r_l) + \sum_{j=N+1}^{\infty} \beta^j (q r_h + (1-q) r^*); \sum_{i=1}^{\infty} \beta^i r^*\right]$$

[10] This discrete jump from one corner solution to the other is due to our assumption that all investors are equal. Instead, we could have assumed the existence of a continuum of investors in the unit interval, ordered from the minimum to the maximum required front-end premium to invest at home at the beginning of period 1. In this case, we would have a smooth increase in capital inflows as the minimum required period for repatriation declines.

and

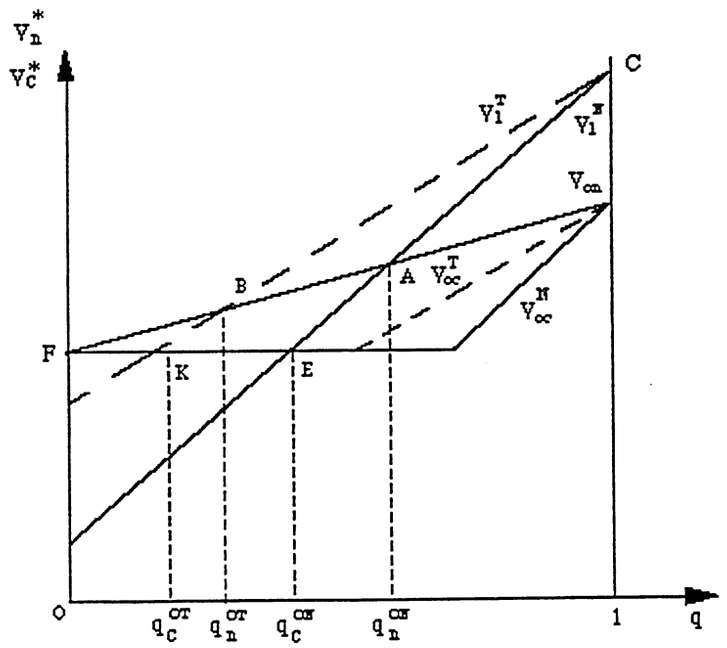
(14) $V_c^*(q^N) = \max\left[V_1(q^N),\ V_{oc}(q^N)\right]$

The option value conferred to the liquid asset under a minimum repatriation period of N years, $OV(q^N) = V_n^*(q^N) - V_c^*(q^N) \geq 0$ for all q, is illustrated in Figure 3, where FAC and FEC represent $V_n^*(q^N)$ and $V_c^*(q^N)$, respectively. As we can see, $OV(q^N)$, corresponding to the area FEA, is non-negative for all q.

Let us now reduce the minimum repatriation period to T > 0 years. As clear from equations (9) and (13), the EPDV of both first-period strategies -- investing at home, and remaining liquid without the possibility of deferring precommitment -- will increase as we reduce the minimum repatriation period. In this case, the option value conferred to the liquid asset $OV(q^T)$ will still be non-negative for all q, and will be represented by the area FKB in Figure 3.

Figure 3 shows that as we reduce the minimum repatriation period, the range for the probability of policy reversal in which the option value conferred to the foreign asset is worthless increases. We can also see from this Figure that for a range of very low probability of policy continuation $[0, q_c^{0T})$, the option value is positive and does not decline with the flexibilization of controls on capital outflows. Then we have the range $[q_c^{0T}, q_n^{0T})$, where the option value is still positive but smaller as we go from N to T. For the range $[q_n^{0T}, q_n^{0N})$ this option value is positive if the minimum repatriation period is N years but is zero for T years; and for the range $[q_n^{0N}, 1]$, this option value will be zero, both for a minimum repatriation period of N and T years.

FIGURE 3
THE EFFECT OF LIBERALIZING CAPITAL OUTFLOWS



Thus, reducing the minimum repatriation period at have lowers, on average, the value of the "wait-and-see" option of the foreign liquid asset during the "noisy" period.

IV. SUMMARY AND CONCLUSIONS

The return of private capital to Latin America in the 1990s has been due to a combination of external factors (low international interest rates, poor economic performance in the industrial countries) and domestic elements (economic restructuring and --in some cases-- the consolidation of democracy). Significant net capital inflows provide important benefits, such as the opportunity of financing higher levels of capital formation, which are necessary for sustained and higher growth rates. Yet, at the same time, they pose important policy dilemmas. Among the latter stand the difficulty of maintaining autonomy in monetary policy without introducing excessive volatility to the nominal and the real exchange rate. Massive capital inflows are also bound to appreciate the real exchange rate, which may

jeopardize an export-led development strategy.

Aimed at preventing a further real appreciation of the exchange rate, countries have reacted by accumulating important amounts of international reserves and sterilizing their monetary impact. Sterilization, however, has prevented a more rapid reduction of domestic interest rates and has caused significant operational losses to central banks. Thus, countries have turned to other policies, such as increased controls on capital inflows, and liberalization of capital outflows.

A lot has been written on the issue of capital inflow controls and --especially-- on Tobin taxes, both at a theoretical and empirical level. Comparatively very little has been said about the liberalization of capital outflows as an alternative device. This paper has attempted to fill part of this gap. In particular, it has studied whether a liberalization of capital outflows is an effective device to offset (at least partially) an inflow of capital.

At an empirical level, the removal of capital outflow controls has apparently stimulated a net inflow of capital in several experiences, such as Britain in 1979, New Zealand in 1984, Spain after 1987, and Colombia, Egypt and Mexico in the 1990s. Numerous measures to liberalize capital outflows in Chile during the 1990s have not had a noticeable effect on stemming net capital inflows.

How can we explain the apparent paradox that reducing controls on capital outflows can actually increase net capital inflows? Our theoretical model provides one such explanation. A liberalization of capital outflows, understood here as a reduction in the minimum capital repatriation period for foreign investment, reduces the degree of "irreversibility" of the decision to invest in a given country. This, in turn: (i) lowers the front-end risk premium required by investors to invest at home during the "noisy" period, for any probability of policy reversal; (ii) reduces the minimum probability of policy continuity that renders investment in the domestic asset the preferred strategy during the noisy period – and, thus, investors will be willing to enter in period 1; and (iii) if the minimum repatriation period is reduced but not eliminated ($T > 0$), there will still be a non-negative option value conferred

to the foreign liquid asset for all q, but it will be less valuable on average.

The rationality behind these results is the following: when the capital outflow restriction is relaxed, investors would be stuck with the "wrong" asset for a shorter period of time if it turned out they were to make the "wrong" decision in the noisy period. Thus, they will be willing to take a higher risk and invest at home even with a higher probability of a change in the rules of the game; for the same probability of policy continuation, they will be willing to invest at home even with a lower risk-premium; and they will assign a lower value to the "wait-and-see" option of remaining liquid in the noisy period. Thus, a reduction in the period of time that foreign investment is required to stay in the country is likely to increase -- not decrease-- net capital inflows.

This result has an important policy implication. Liberalizing capital outflows may have many significant benefits for a country. But it may not be the appropriate policy to defend, by itself, the real exchange rate in the presence of massive capital inflows because it is likely to strengthen those very capital inflows.

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