

# THE WELFARE COST OF CAPITAL IMMOBILITY AND CAPITAL CONTROLS

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# THE WELFARE COST OF CAPITAL IMMOBILITY AND CAPITAL CONTROLS

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**Abstract:**

*This paper examines the macroeconomic welfare effects of interest risk premia and controls that limit international capital mobility. Using extended loanable funds analysis, it first demonstrates how perfect capital mobility maximises national income, contrary to a prevalent view that it is inimical to economic welfare. As a corollary, the analysis then shows that capital controls, irrespective of their form, generally reduce national income and economic welfare by widening real cross-border interest differentials. Capital controls in the form of quantitative controls, such as the Chilean unremunerated reserve requirement system, and explicit taxes on foreign investment flows impose similar welfare losses. However, quantitative controls are relatively more costly than options to tax capital flows, due to revenue effects.*

JEL: F36, F40

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## 1. INTRODUCTION

Since the demise of the Bretton Woods system of exchange rate management and consequent dismantling of a broad range of exchange controls, there has been an enormous growth in the volume of international capital flows. Advanced economies progressively abolished exchange controls from the early 1970's onwards, whereas capital account liberalisation in emerging economies accelerated most rapidly from the early 1990's, according to an index of capital controls devised by the International Monetary Fund (IMF, 1997, p.242).

Meanwhile, liberalised capital accounts have increased emerging economies' vulnerability to sudden international capital flow reversals of the magnitude witnessed in East Asia and other emerging economies in the late 1990's. In view of the economic and financial distress that short term capital flow reversals may cause, many economists, such as Bhagwati (1998), Cooper (1998), Eichengreen (1999), Krugman (1998), Rodrik (1998) and Wade (1998), favor the retention of capital controls for emerging economies.

Discussion of capital mobility in the literature<sup>1</sup> has focussed heavily on assessing conditions for it, and on its implications for the effectiveness of short run macroeconomic policy management.<sup>2</sup> Capital mobility has been measured against the standard interest parity conditions, as well as the extent of correlation between domestic saving and investment (proposed by Feldstein and Horioka (1980)). While considerable attention has been given to examining how capital mobility affects the potency of monetary and fiscal policy as stabilisation tools, relatively little attention has been paid to examining how capital mobility

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<sup>1</sup> See surveys by Dumas (1995), Lewis (1995), Marston (1995) and Isard (1995).

<sup>2</sup> See Mundell (1962) and Fleming (1962) and later surveys of their model by Bruce and Purvis (1985) and Frenkel and Razin (1995), amongst others.

directly affects national income as a measure of macroeconomic welfare.

This paper first demonstrates how international borrowing improves national income and macroeconomic welfare. As a corollary, it then identifies the welfare losses, or implicit costs, that arise when international capital mobility is less than perfect, due to official capital controls of various kinds. In preview, these losses occur because capital immobility raises the external cost of capital, making national income sub-optimal. However, the size of the welfare loss depends on the kind of capital controls in place.

## 2. AN EXTENDED LOANABLE FUNDS FRAMEWORK

International capital flows are not purely financial phenomena since international borrowing and lending is ultimately tied to economic factors that determine saving and investment behaviour. Intertemporal open economy models recognise this, yet their focus is external account determination with reference to the behaviour of saving, investment and intertemporal consumption under conditions of perfect capital mobility.<sup>3</sup>

In what follows, capital mobility is related to saving, investment and the international flow of funds, consistent with the intertemporal approach. However, unlike intertemporal models, the analysis is limited to within-period effects to identify the welfare costs of capital controls.

### 2.1 Capital Autarky versus Perfect Capital Mobility

First, we assume autarky and that domestic saving,  $S$ , the residual from national income after private and public consumption plans have been satisfied, is fixed and interest inelastic.

Total investment spending over a given period is funded out of available saving, with the real interest rate performing the balancing role. Demand for loanable funds is a function of the real interest rate:

$$I = I(i) \tag{1}$$

where  $i$  is the real interest rate and  $I'(i) < 0$ . In equilibrium under autarky, the domestic interest rate  $i_A$  is such that the market for loanable funds clears and

$$I(i_A) = S_A \tag{2}$$

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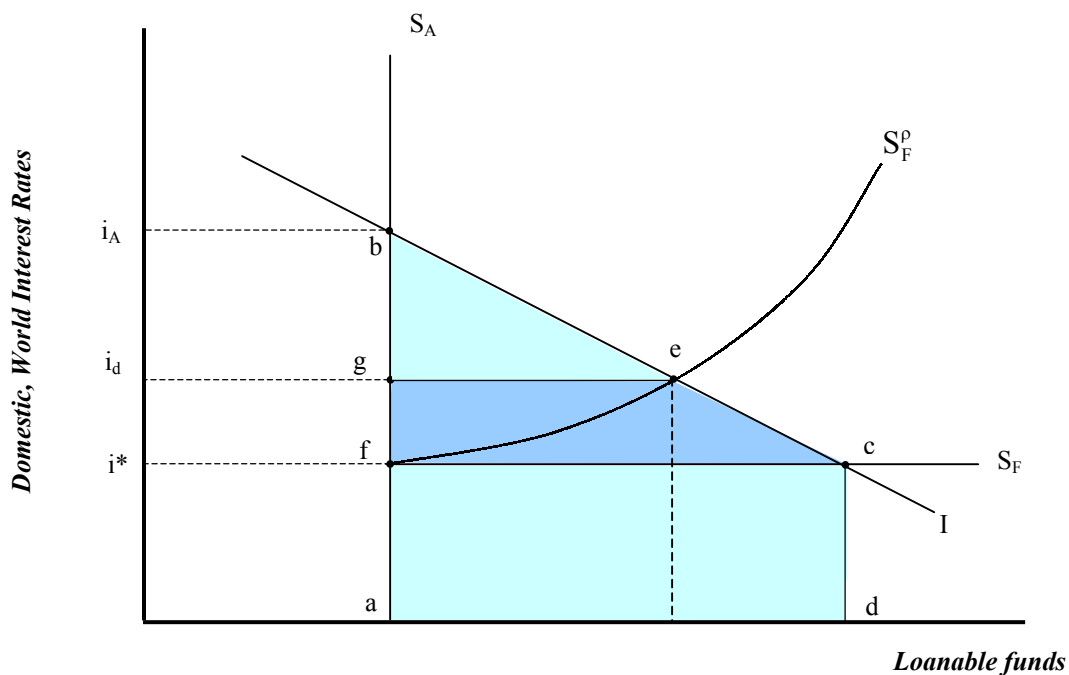
<sup>3</sup> See for instance Frenkel and Razin (1987) and Obstfeld and Rogoff (1996).

Consequently, the domestic saving schedule is drawn vertically, whereas the net domestic demand for investment purposes is a derived demand, depicted as a downward sloping schedule in interest rate-loanable funds space in Figure 1.

With perfect capital mobility, a small economy's domestic borrowing requirement over and above available domestic saving is fully met by foreign lenders (investors) at the exogenous real world interest rate,  $i^*$ . Therefore, let  $S_F$  be the foreign lending schedule, where  $S_F = S_F(i)$ . Moreover,  $S'_F(i) = \infty$ , as the foreign lending schedule is infinitely elastic. Since domestic firms will only be willing to borrow from abroad if  $i_A > i^*$ , assume this condition also holds. The market for loanable funds must clear, so with perfect capital mobility

$$I(i^*) = S_A + S_F \quad (3)$$

where from the home economy perspective,  $S_F$  is foreign capital inflow in the form of borrowing.<sup>4</sup>



**Figure 1 – International Capital Mobility and Macroeconomic Welfare**

<sup>4</sup> This paper restricts attention to borrowing, although foreign capital inflow can of course also include foreign ownership of equities issued by resident enterprises.

Domestic investment therefore exceeds domestic saving at  $i^*$  to the extent of foreign borrowing. This *ex ante* foreign borrowing requirement is shown by distance  $fc$  in the figure. Hence, if external debt is initially nil, it reaches level  $fc$  by period end. As the real world interest rate is lower than the real autarky interest rate, and since  $I'(i) < 0$ , we must have  $I(i^*) > I(i_A)$ , so that investment under autarky is always lower than when international borrowing is permitted.

Here, and in what follows, we abstract from the effect that changing exchange rate expectations have on interest differentials by assuming that foreign lending is denominated in the currency of the lenders, thereby nullifying exchange rate risk from foreigners' perspective. This is consistent with the practice of advanced economy lending to emerging economies, the bulk of whose loans are denominated in foreign currency terms. Alternatively, it is possible to assume that exchange rate expectations are static throughout. International capital mobility is therefore perfect in this context if foreign lenders satisfy the excess domestic demand for funds and real interest parity prevails.

## 2.2 Income Gains from Foreign Borrowing

Figure 1 also reveals how foreign borrowing raises national income, consistent with McDougall's (1960) neoclassical foreign investment model. The marginal product of capital determines the slope of the investment demand schedule, so that given  $i^*$ , extra units of foreign financed capital, times their marginal product, add to GDP to the extent of the area  $abcd$ . However, of that the rectangular area,  $afcd$  is paid to foreign lenders, leaving a net national income gain equivalent to the triangular area  $abc$ . International capital mobility

therefore enables lower domestic interest rates and higher national income, provided the productivity of the extra foreign-financed capital exceeds its cost.

More formally, the welfare gain under perfect capital mobility is:

$$W_P = \int_{i^*}^{i_A} [I(i) - S_A] di = \int_{i^*}^{i_A} I(i) di - S_A \cdot [i_A - i^*] \quad (4)$$

Note that, since  $I(i) > S_A$  for all interest rates between  $i_A$  and  $i^*$ , we must have  $W_P > 0$ , so that the welfare gain from international borrowing is always positive. Interest paid to foreign investors is equal to  $i^*[I^* - S_A]$ .

### 2.3 The Costs of Capital Immobility

If foreign lenders perceive high foreign debt as a sign of heightened country risk and diminished creditworthiness, they demand an interest premium,  $\rho$ , to compensate. This explains the convex foreign lending schedule rising from the world interest rate,  $i^*$  in Figure 1. The more averse foreign investors are to rising foreign debt, the steeper the slope of the  $S_F$  schedule and the higher the risk premium and interest differential will be. At some point, foreigners could judge the level of lending risk prohibitive, such that the foreign lending schedule becomes vertical.

Hence, the foreign lending schedule is no longer perfectly elastic. Reflecting the assumption that the risk premium is an increasing function of the stock of borrowing outstanding, it obeys,  $S_F = S_F(i)$  with  $S'_F(i) > 0$ .<sup>5</sup> The risk premium, always positive, is the difference

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<sup>5</sup> Of course, if the initial level of debt exceeded zero, the foreign lending schedule would rise from a point above  $i^*$ .



between the interest rate foreign lenders demand under imperfect capital mobility and the interest rate  $i^*$  under perfect capital mobility. Hence,

$$i_d = i^* + \rho \quad (5)$$

where  $i_d$  is the equilibrium domestic interest rate.

Now the market for loanable funds must still clear, so in equilibrium,

$$I(i_d) = S(i_d) \quad (6)$$

or, using the above expression for  $i_d$ ,

$$I(i^* + \rho) = S(i^* + \rho) \quad (7)$$

Since  $\rho > 0$ , and since the demand for loanable funds is decreasing in the interest rate,

$$I(i^* + \rho) < I(i^*) \quad (8)$$

Hence, under imperfect capital mobility, investment is lower than with perfect capital mobility.

Foreign debt related risk therefore causes macroeconomic welfare losses since potential national income gains from foreign borrowing are not realised. With reference to Figure 1, the welfare loss is area  $fgec$ . Note however that foreign borrowing still confers a net welfare gain of  $gbe$ , provided the equilibrium interest rate allowing for risk is less than the autarky rate. Although international capital immobility limits an economy's growth, it also follows that the higher the interest risk premium, the slower foreign debt accumulates, suggesting that rising interest risk premia stabilise foreign debt levels.

More formally, the welfare gain from foreign borrowing under imperfect capital mobility,

$W_1$ , is

$$W_I = \int_{i^* + \rho}^{i_A} [I(i) - S_A] di \quad (9)$$

The costs, or welfare losses, of imperfect capital mobility can now be quantified simply as,

$$L = \int_{i^*}^{i^* + \rho} [I(i) - S_F(i)] di \quad (10)$$

This loss is always positive, since  $I(i) > S_F(i)$  for all interest rates in between  $i^*$  and  $i^* + \rho$ .

### **3. CAPITAL CONTROLS**

In the above benchmark cases, foreign investors lent funds through their purchases of debt instruments, without official restrictions of any kind imposed by the borrower economies. We now examine the macroeconomic welfare costs of imposing such restrictions. In practice, such controls range from those aimed at limiting the quantum of capital inflows to those in the form of taxes on capital inflows. What becomes evident is that irrespective of the type of capital control, the minimum lending rate demanded by foreign lenders, or alternatively the minimum yield expected on bonds issued by the borrowing economy, will always be higher than the prevailing world interest rate, with adverse implications for national income.

#### **3.1 Quantitative Restrictions**

First we consider the welfare costs of via measures that restrict the quantum of capital inflows. The most common means by which the domestic monetary authorities may limit capital inflows is through mandatory unremunerated reserve requirements (URR). In the past, URR's have been most notably implemented by Chile, but also by monetary authorities in Argentina, Brazil, Columbia, Costa Rica, Czech Republic and Mexico. A URR requires that a set percentage of funds borrowed from abroad be deposited with the central bank for a minimum period. As no interest is paid on the deposit, this effectively makes the reserve requirement an implicit tax on capital inflows.<sup>6</sup>

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<sup>6</sup> Under the Chilean system, foreign investors also had the option of paying the central bank an amount equal to the forgone interest without actually depositing funds, making the tax on capital flows explicit. See Neely (1999), De Gregorio et al (1999) and Ulan (2000) for related discussion.

Reserve requirements therefore act to raise the minimum interest rate at which foreign investors would lend to finance additional domestic investment. International lenders are faced with the choice of (i) lending  $F^*$  units for  $n$  periods to the economy with the URR at a rate of  $i_{q_0}$  or (ii) buying bonds offering a yield of  $i^*$ . With option (i), if  $V$  is the future value of  $F^*$  at period  $n$ , then  $V$  and  $F^*$  must be related according to the relationship,

$$F^* = \frac{V}{(1+i_{q_0})^n} \quad (11)$$

Total capital inflow to the economy imposing the reserve requirement will be  $F^*(1+s)$ , where  $s$  represents the fraction of the inflow required to be deposited with the central bank for  $m$  periods, assuming  $m \leq n$ .<sup>7</sup> At the end of period  $m$ , the unremunerated reserve deposit  $sF^*$  is refunded by the central bank and is lent at the rate  $i^*$ . At period  $n$ , both option (i) and (ii) investments mature.

To determine the relationship between  $i_{q_0}$  and the exogenous world interest rate  $i^*$ , the present values of the two investments are equated, yielding:

$$(1+s)F^* = \frac{sF^*}{(1+i^*)^m} + \frac{V}{(1+i_{q_0})^n} \quad (12)$$

By substituting in the relationship between  $V$  and  $F^*$ , then rearranging, the following relationship between  $i_{q_0}$  and  $i^*$  is obtained.

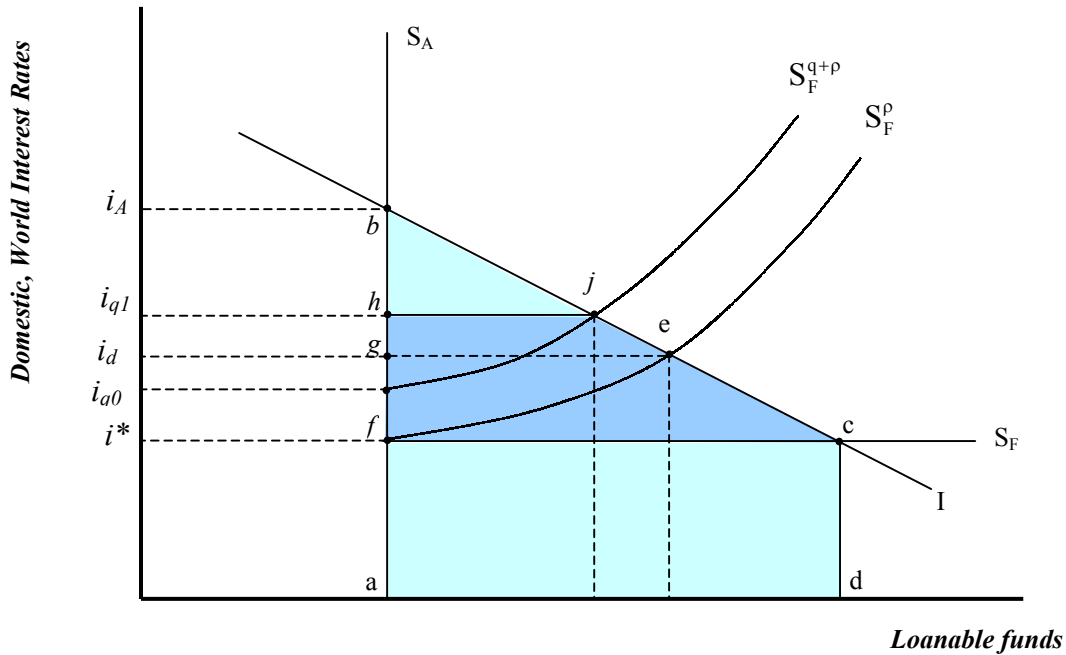
$$i_{q_0} = (1+i^*) \left[ 1 + \frac{s \left\{ (1+i^*)^m - 1 \right\}}{(1+i^*)^m} \right]^{\frac{1}{n}} - 1 > i^* \quad (13)$$

The above expression suggests that the initial minimum lending rate  $i_{q_0}$  must rise as  $s$  and  $m$  rise or as  $n$  falls. However, for the purposes of estimating welfare effects, we assume that

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<sup>7</sup> As a special case, under the Colombian regime, the reserve requirement depended inversely on the maturity of the foreign loan.

$m=n=1$ . Again, if investors continue to be averse to rising external indebtedness, the equilibrium interest rate will be  $i_{q1}$ , inclusive of a risk premium, and the macroeconomic welfare effects will be as shown in Figure 2 below. The welfare loss from capital immobility is area  $fhjc$ , whereas the net gain compared with the autarky state is area  $hbj$ .



**Figure 2 – Macroeconomic Welfare Effects of Unremunerated Reserve Requirements**

Mathematically, domestic residents receive a welfare gain over the autarky state of,

$$W_q = \int_{i_{q1}}^{i_A} [I(i) - S_A] di = \int_{i_{q1}}^{i_A} I(i) di - S_A [i_A - i_{q1}] \quad (14)$$

Since  $i_{q1} > i^*$ , this welfare gain is lower than that under perfect capital mobility and lower than under imperfect capital mobility in the absence of a reserve requirement. The overall net welfare loss is given by:

$$W_p - W_q = \int_{i^*}^{i_{q1}} [I(i) - S_A] di > 0 \quad (15)$$

and the loss specifically due to the URR regime is:

$$W_I - W_q = \int_{i^*}^{i_{q1}} [I(i) - S_A] di \quad (16)$$

### 3.2 Taxes on Foreign Lending

Alternatively, capital controls may be in the form of explicit proportional taxes on principal loaned or interest earned by foreign lenders (sometimes called withholding taxes). Assume foreigners have  $F^*$  to invest and can choose between (i) holding foreign currency denominated debt instruments issued by the borrower economy that mature at the end of period  $n$ , paying a pre-tax rate of return of  $i_{t0}$  or (ii) holding bonds at the alternative world interest rate of  $i^*$ .

If the proportional rate of tax on foreign lending is  $t$ , then arbitrage should ensure that,

$$F^* (1+i^*)^n = F^* (1+i_{t0})^n (1-t) \quad (17)$$

which yields the following expression<sup>8</sup> for  $i_{t0}$ .

$$i_{t0} = \frac{i^*}{(1-t)^{\frac{1}{n}}} + \frac{1-(1-t)^{\frac{1}{n}}}{(1-t)^{\frac{1}{n}}} > i^* \quad (18)$$

This expression shows that with a discriminatory tax on foreign lending, the minimum return  $i_{t0}$  demanded by foreign investors to fund domestic investment has to be higher than  $i^*$ , the higher is  $t$ , or the lower is  $n$ . Again, for the purpose of gauging the within period macroeconomic welfare effects, however, we simply assume  $n = 1$ , in which case the above expression reduces to

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<sup>8</sup> More complicated formulations are possible, such as including regular repayments on the loan, but these do not provide a closed form solution to the interest rate relationship.

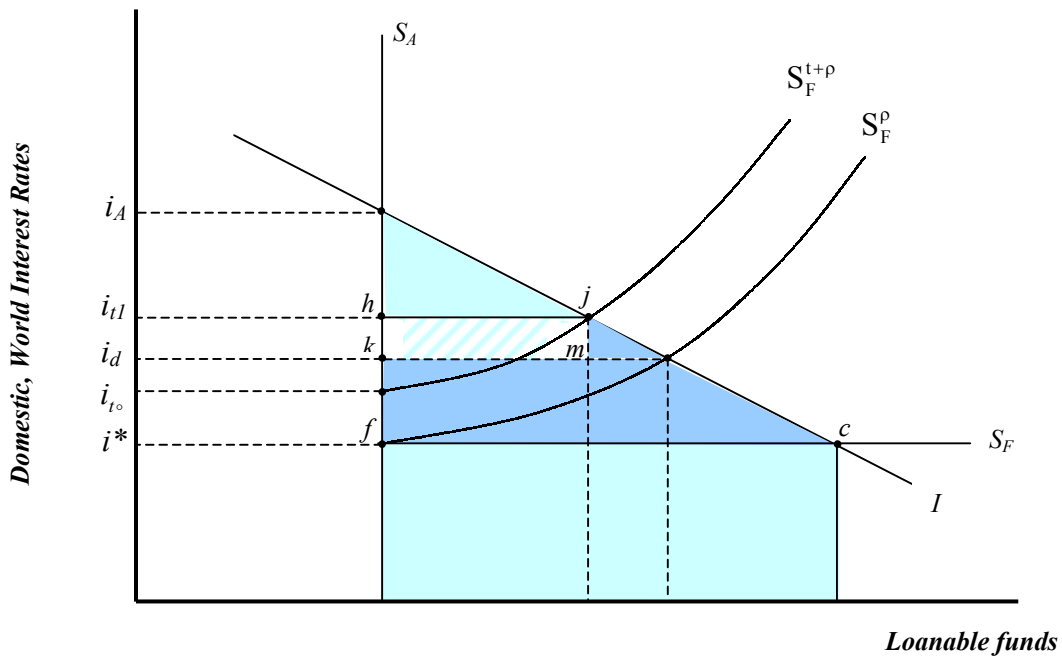
$$i_{t0} = \frac{i^* + t}{1 - t} \tag{19}$$

or,

$$i_{t0} \approx i^* + t \tag{20}$$

provided the discriminatory tax rate is not excessively high.

Moreover, if foreign investors remain averse to the economy's rising external indebtedness as discussed earlier, the equilibrium domestic interest rate will be  $i_{t1}$  as shown in Figure 3. The loss specifically due to the tax on capital outflows is the foregone national income  $h j c f$  less the taxation revenue gain for the economy, approximated by  $h j m k$ .



**Figure 3 – Welfare Effects of Taxes on Capital Inflows**

More formally, the economy experiences a net economic welfare gain compared to autarky equal to,

$$W_t = \int_{i_{t1}}^{i_A} [I(i) - S_A] di \tag{21}$$

Because  $i_{t1} > i_d > i^*$ , this welfare gain is lower than that accruing with imperfect capital mobility and no discriminatory taxes, and less again than perfect capital mobility would bestow.

The macroeconomic welfare loss specifically due to the tax on capital inflow is,

$$W_I - W_t = \int_{i_d}^{i_{t1}} [I(i) - S_A] di + (i_{t1} - i_d) [I(i) - S^A] \quad (22)$$

Other things equal, this loss is less than would arise under a URR capital control regime.



#### 4. CONCLUSION

High capital mobility improves macroeconomic welfare in advanced and emerging economies because it narrows real interest differentials and raises domestic investment. In this way, international financial flows play an important role in the process of economic growth by enabling domestic capital accumulation to be higher than otherwise. An important, though hitherto neglected corollary is that capital immobility stemming from capital controls directly causes macroeconomic welfare losses.

Using an extended loanable funds framework, this paper has shown that exchange controls of different kinds reduce macroeconomic welfare by raising the external cost of capital. Capital controls in the form of taxes on inflows are preferable to quantitative controls known as unremunerated reserve requirements, since taxes impose smaller welfare losses due to revenue effects. This result mimics the well-known result from international trade theory that it is better to impose tariffs, rather than quotas, on imported goods and services.

At the same time, this paper has abstracted from problems that may arise in practice with the intermediation of funds through financial institutions, as well as information asymmetries between domestic borrowers and international lenders and moral hazard problems arising from official guarantees to lenders, explicit and implicit. It has also implicitly been assumed that capital controls are not evaded, though empirical evidence provided by Dooley (1996) and Edwards (1998) suggests that in practice evasion has been widespread.

Capital controls are advocated as a means of minimising international capital flow reversals that occur due to information and moral hazard problems. However, the above analysis

suggests these problems are best addressed at their primary source, the domestic economy's financial system, not by means of capital controls as a second best policy option.

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