International Tax and Public Finance, 4, 263–276 (1997)

Capital Controls as Taxation Policy

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Abstract

This paper studies the public finance implications of controls on international financial capital flows, proposing a model of controls as distortionary taxation. The model formalizes a capital controls rule that conforms real-world stylized facts and is sustainable in the long-run. Capital controls are shown to distort agents' optimal intratemporal portfolio decisions and intertemporal consumption decisions, affecting the dynamics of financial and real variables. We use the model to analyze the feasible set of tax instruments—in terms of level and mix—available to the government and the complex relationships between expenditures and taxes mediated by the foreign sector.

JEL code: E61, E62, F32, F41, H60.

1. Introduction

This paper studies the public finance implications of controls on international financial capital flows. It proposes a model of controls as distortionary taxation, explores the macroeconomic consequences of this form of taxation and discusses the choices faced by governments implementing such policy. The background for this investigation is that controls are prevalent in most economies and have been shown to yield substantial revenue for the government. IMF data indicate that at the end of 1994 only 52 countries out of 183 surveyed had no capital controls [see IMF (1995, pp. 562–567)]. Giovanni and de Melo (1993) report estimates of the revenue induced by controls and show that it may reach sizable proportions of total tax revenue or GDP. For example, they report that in Mexico in the period 1984–1987 it constituted almost 40% of tax revenues and 6% of GDP.

The model formalizes a capital controls rule that satisfies two criteria—it conforms real-world stylized facts and it is sustainable in the long-run. We use the following modelling route: we examine the data and find two prevalent forms of controls; we construct a model that encompasses both forms and allows us to examine capital controls policy within a unified framework; the model is set up so that it caters for essential characteristics of economies that use controls in practice; we then formalize the dynamics of the model and derive the policy rule that satisfies the stability requirements of the dynamic set-up.

We use the model to analyze the dynamics induced by the distortionary effects of capital controls on agents' intratemporal and intertemporal choices, the feasible set of tax instruments—in terms of level and mix—available to the government and the complex relationships between expenditures and taxes mediated by the foreign sector.

The paper proceeds as follows: section 2 sets up the model and discusses the policy rule. Section 3 studies the afore cited public finance implications. Section 4 concludes.

2. The Model

We use a model of capital controls proposed by Yashiv (1997). In this section we briefly present the main elements of that model.[1] In the cited paper the focus is on macroeconomic issues, and in particular on the consequences of traditional policy experiments (monetary and fiscal) for key macroeconomic variables. In this paper the focus is on public finance issues and its main new contributions are presented in the next section.[2] The modelling strategy has two underlying principles: (a) to endow the economy with real-world features including the forms of capital controls actually used; (b) to employ an optimizing agent framework that is consistent with open-economy dynamics.

2.1. Basic Intuition

We first examine the real-world experience with capital controls policy schemes. Looking at data published by the IMF [see IMF (1995)] we find that there are two prevalent forms of controls (or some combination of the two):

a. Private sector holdings of foreign assets or debt are prohibited. When this type of controls is imposed the government frequently resorts to the issuance of foreign-currency linked (or otherwise indexed) domestic debt to prevent massive capital flight but typically pays less than the nominal foreign rate of interest. This may take the form of indexing the debt only partially to the foreign currency rate of depreciation.

b. The government does allow capital flows and domestic ownership of foreign assets (or holding of debt) but it taxes interest receipts or uses a dual exchange rate system. The latter employs different exchange rates for current account and capital account transactions. Adams and Greenwood (1985) have shown that these two alternatives—an interest tax on foreign bonds or a dual exchange rate system—are equivalent.

The model formalizes the two types of control within a unified framework. It caters for the following major elements that make it relevant for economies that use controls in practice: the economy produces and consumes both traded and non-traded goods; current account flows include interest payments on foreign debt; the government consumes both goods and uses distortionary taxation and debt to finance its expenditures; and private agents choices of consumption and financial asset holdings are determined optimally. In the following short subsections we formalize these elements. We then obtain a characterization of the economy's dynamics in terms of the endogenous variables. We derive the policy rule that conforms the stability requirements of this system.

Throughout the discussion we shall use the following notation for any variable s:

$$\dot{s} = \partial s/\partial t;\ \ \hat{s} = \dot{s}/s;\ \ s_x = \partial s/\partial x;\ \ s_{xy} = \partial s_x/\partial y.$$

2.2. Goods Markets

The economy is a small open economy with two goods: traded (Y^T) and non-traded or home goods (Y^H). Assuming a small country, the foreign currency price of traded goods,

P^{T*}, is constant and set equal to one; foreign interest (i^*) is constant as well. All nominal quantities are deflated by a price index $P = P^{H^\alpha} E^{1-\alpha}$ where E is the nominal exchange rate. The rate of inflation in this price is denoted π. The relative price of the two goods ('the real exchange rate', $q = E/P^H$) determines private production and consumption decisions and hence current account flows.

Price flexibility of the home good ensures continuous equilibrium in its market:

$$Y^H(q) = C^H + G^H, \quad \partial Y^H/\partial q < 0 \tag{1}$$

We assume that given full wage flexibility, output depends only upon relative prices. G^H is a policy parameter, while C^H is determined by utility maximization, to be examined below. The supply and consumption of the traded good is determined likewise and thus the current account flow is:

$$\dot{R} = Y^T(q) - C^T - G^T + i^*R, \qquad \partial Y^T/\partial q > 0. \tag{2}$$

Note that foreign assets earn the foreign interest i^*. Whenever the economy is a net borrower, as is typically the case in many of the relevant economies, R is negative (foreign debt) and i^*R are foreign interest payments.

2.3. The Government

The government budget constraint is at the heart of the analysis. The government consumes both types of goods (G^T, G^H) financing this consumption by debt issuance and two distortionary taxes—the inflation tax and capital controls. The government manages the nominal exchange rate, i.e. it sets $\hat{E}$. This encompasses regimes such as a fixed peg or a crawling peg. Alesina, Grilli and Milesi-Ferretti (1994) show that this is indeed the prevalent case for economies using capital controls.

In the case of the first type of controls, there are two domestic financial assets issued by the government: money (M) and foreign currency linked bonds (F in foreign terms), both held by domestic citizens. In terms of the price index they shall be denoted $m = \frac{M}{P}$ and $f = FE/P$ respectively. Foreign assets (R) are entirely held by the government. In the case of the second type of controls, the two financial assets held by domestic residents are money and foreign bonds (R^p) while the government holdings of foreign assets are denoted R^g.

Under the first type of capital controls the following budget (flow) constraint, which is key to the analysis, obtains:

$$G^H q^{\alpha-1} + G^T q^\alpha + i^* f - i^* R q^\alpha = \mu m + \tau f + \hat{F} f - \dot{R} q^\alpha. \tag{3}$$

where $\mu = \dot{M}/M$; $m = M/P$; $\hat{F} = \dot{F}/F$; $f = FE/P$; τ is the financial tax (capital controls) to be explained below. The equation is set in real terms.

The LHS of the equation shows that government expenditures consist of expenditures on home goods ($G^H q^{\alpha-1}$), traded goods ($G^T q^\alpha$), interest payments on domestic debt ($i^* f$) and interest payments on foreign debt ($-i^* R q^\alpha$). The RHS shows that these expenditures are financed by taxes and debt issuance. The taxes consist of two distortionary taxes: the inflation tax (μm) and capital controls (τf). The financial tax (τ) is the policy parameter which formally expresses capital controls. It reflects the gap between foreign interest receipts in the absence of controls and the actual interest receipts on foreign linked bonds. We explore its determination in detail below.[3] Consumers' utility maximization explored below will demonstrate why these two taxes are distortionary. Note that adding a lump-sum tax or an income tax would not change the analysis. Debt issuance consists of domestic foreign-linked debt ($\hat{F} f$) and foreign-debt ($-\dot{R}q^{\alpha}$).

Under the second form of capital controls discussed above, whereby the private sector is allowed to hold foreign assets R^p, the government continues to hold foreign assets (denoted R^g) so now:

$$R = R^p + R^g. \tag{4}$$

The government taxes interest receipts ($i^* R^p$) on private sector foreign bonds or alternatively uses a dual exchange rate system.[4] Thus the government budget constraint is:

$$G^H q^{\alpha-1} + G^T q^{\alpha} - i^* R^g q^{\alpha} = \mu m + \tau i^* R^p q^{\alpha} - \dot{R}^g q^{\alpha}. \tag{5}$$

Note that here again τ is the parameter expressing capital controls, standing for taxation of foreign interest receipts or for a dual exchange rate system.

We consider G^H, G^T and $\hat{E}$ exogenous policy variables. Given that m, f, q, R and τ are endogenously determined and i^* is given, μ and $\hat{F}$ are assumed to be adjusted so as to satisfy (3).[5] Essentially this means that once the government "targets" the nominal interest rate ($i^* + \hat{E} - \tau$) it has to adjust the quantities of financial assets in accordance with the target.

2.4. Private Agents' Optimization

Under the first type of capital controls, private agents' financial wealth consists entirely of government issued assets:

$$w = m + f \tag{6}$$

Under the second type of controls the private sector portfolio is made up of real money balances and foreign bonds:

$$w = m + R^p q^{\alpha} \tag{7}$$

To obtain the private sector's budget constraint, differentiate (6) or (7) with respect to time and use equations 1–3 and the definition of q to obtain:

$$\dot{w} = q^{\alpha-1}(Y^H - C^H) + q^{\alpha}(Y^T - C^T) + [i^* - \tau + \alpha\hat{q}]w - [i^* - \tau + \hat{E}]m. \tag{8}$$

Assets are accumulated (in real terms) by savings net of taxes and by interest receipts on foreign linked bonds. The unlinked part (m) depreciates in real terms at the rate of nominal depreciation. If, however, there is real depreciation ($\hat{q} > 0$) then assets accumulate in real terms.

We conduct the analysis that follows in identical form for the two types of capital controls, noting that w and R are defined differently in the two cases.

Private agents' utility is given by the following function which allows for endogenous time preference. It is based on Epstein & Hynes (1983) and its two-sector open economy application by Penati (1987):

$$U = -\int_0^\infty \exp\left\{-\int_0^s [u(C^T, C^H) + v(m)]d\sigma\}\right\} ds. \tag{9}$$

This form of modelling agents' time preference has two advantages: first, it makes the rate of time preference positively dependent upon the utility derived from future consumption and money balances. Thus the specification of utility in (9) establishes an intertemporal dependence in consumption decisions, which is empirically more appealing.[6] Second, were we to use a constant rate of time preference, then under the open-economy set-up a determinate and reasonable steady state would not obtain [see Svensson and Razin (1983)]. The use of this type of utility function in the current context provides a channel through which changes in financial wealth generate changes in consumption patterns by affecting the intertemporal marginal rate of substitution. In particular this generates intertemporal effects to capital controls.

Private agents seek to maximize (9) with respect to C^T, C^H and m subject to the budget constraints (6) and (8). The first order conditions for maximum are:

$$\begin{aligned}
&(a)\quad \tfrac{U_T}{U_H} = q.\\
&(b)\quad (v_m/U_T)q^\alpha = i^* - \tau + \hat{E}.\\
&(c)\quad \dot{U}_T/U_T = \rho[z(w)] - (i^* - \tau)
\end{aligned} \tag{10}$$

Equation (a) is the usual intratemporal equality between the subjective rate of substitution and the market price of the two goods. Equation (b) determines portfolio allocation between money and bonds by equating the marginal utility of money balances with the value of foregone consumption. Equation (c)[7] is an intertemporal condition defining the dynamic behavior of consumption as a function of the gap between the subjective and the market discount rates.

2.5. The Dynamic System

We combine the model's equations to generate a linear differential equation system describing the economy's dynamics in the neighborhood of steady state.

Using (1) and (10a) the following relations hold for optimal consumption:

$$\partial C^H/\partial q < 0,\ \ \partial C^H/\partial G^H < 0. \tag{11}$$

$$\partial C^T/\partial q < 0,\ \ \partial C^T/\partial G^H < 0. \tag{12}$$

The relations in (11) and (12) enable us to transform (10c), the intertemporal condition of consumer maximization into a differential equation for the real exchange rate:

$$\dot{q} = (U_T/U_{T_q})\{\rho[z(w)] - i^* + \tau\}. \tag{13}$$

Inserting (11) and (12) and the consumer's F.O.C. relating to money balances (10b) into the flow of constraint for private sector assets (8) yields:

$$\begin{aligned}\dot{w} \;=\; & q^{\alpha-1}[Y^H(q) - C^H(q, G^H)] + q^{\alpha}[Y^T(q) - C^T(q, G^H)] \\ & + [i^* - \tau + \alpha\hat{q}]w - [i^* - \tau + \hat{E}]m\{q, \hat{E}, G^H, \tau, i^*\}.\end{aligned} \tag{14}$$

Reproducing (2) with the relations implied by (12) we get:

$$\dot{R} = Y^T(q) - C^T(q, G^H) - G^T + i^* R. \tag{15}$$

Linearizing the system in the neighborhood of the steady state yields the following first order linear differential equation system:

$$\begin{bmatrix} \dot{q} \\ \dot{w} \\ \dot{R} \end{bmatrix} = \begin{bmatrix} 0 & \dot{q}_w & \dot{q}_R \\ \dot{w}_q & \dot{w}_w & \dot{w}_R \\ \dot{R}_q & 0 & \dot{R}_R \end{bmatrix} \begin{bmatrix} q & - & \bar{q} \\ w & - & \bar{w} \\ R & - & \bar{R} \end{bmatrix} \tag{16}$$

2.6. The Capital Controls Policy Rule

We now ask what type of policy rule will be consistent with this framework. In particular we seek to uncover the constraints on the policy rule that are implied by the dynamics of the model. The aim is to formulate a rule which is both realistic and sustainable, i.e. one which insures that the economy is placed on a convergent path to long-run equilibrium, ruling out unsustainable policy.

We derive the policy rule that will be consistent with the stability of the system (16), i.e. we focus on sustainable policy. By solving the stability requirements of the system [see Yashiv (1997)] the following characterization obtains:

$$0 \le \tau \le i^* \tag{17}$$

$$\tau = \tau(R), \;\; \frac{\partial \tau}{\partial R} < 0 \tag{18}$$

$$|\tau_R| < \frac{i^* \dot{w}_q \rho_w}{(Y_q^T - C_q^T)\{\rho_w(w - m) + \rho_w(i^* + \hat{E} - \tau)m_\tau + i^* - \tau\}} \tag{19}$$

First, τ has to be smaller than (or equal to) the interest rate it taxes; second, it has to be a positive function of the stock of foreign debt (i.e. a negative function of R); third, the marginal change in τ whenever foreign debt changes is bounded from above. These are basically intertemporal constraints; to see their intuition consider the following arguments:

(i) Were capital controls (τ) a policy parameter independent of foreign debt (or assets), the stock of private sector assets (w) and the real exchange rate (q) would "jump" to the steady state. In this case foreign debt would grow or decline indefinitely (as $\dot{R}_R > 0$).[8]

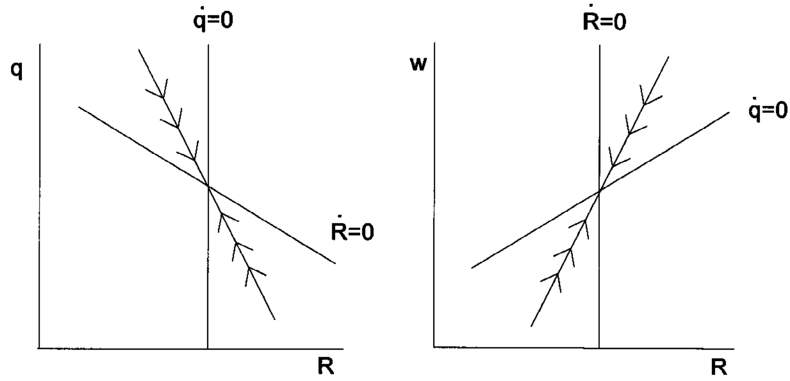

Figure 1. The dynamic system.

(ii) The bound on the marginal change in controls means that the government should raise more revenue whenever foreign debt increases, but is constrained not to do so too drastically. Raising τ too much implies that more foreign debt might be accommodated thus creating the possibility for divergence of the system.

Thus the dynamic structure of the economy imposes restrictions on capital controls policy if it is to be sustainable. The result is a saddle path [for the full derivation see the appendix in Yashiv (1997)]. Using the above policy rule (equations 17, 18, 19) and some reasonable assumptions we get:

$$\dot{q}_w,\ \dot{w}_w,\ \dot{R}_q,\ \dot{R}_R,\ \dot{w}_q,\ \dot{w}_R > 0,\ \ \dot{q}_R < 0 \tag{20}$$

These dynamics are portrayed in Figure 1.

3. The Tax Role of Capital Controls

In this section we discuss the public finance implications of the model. We analyze taxation policy along the dynamic path and in the steady state (3.1) and then study the repercussions of various policy schemes (3.2). Note two characteristics of the taxation policy embodied in this model:

(i) The model encompasses two taxes: the inflation tax and the capital controls tax. The government sets directly only the steady state rate of one of the taxes at its disposal—the inflation tax (in the steady state $\pi = \hat{E}$). The capital controls tax rate (τ) and the tax revenues (πm and τf or $\tau i^* R^p q^\alpha$) are endogenous as is the inflation tax rate (π) in the short-run.

(ii) The model has an endogenous "Tobin tax" [see Tobin (1978)] as the τ policy outlined above resembles Tobin's suggestion to create a tax wedge between the foreign and domestic interest rates.

3.1. Taxation Along the Dynamic Path and in the Steady State

3.1.1. Dynamics

The dynamics induced by the capital controls policy described above pertain to the following time dimensions:

*Intra*temporally τ influences portfolio allocation (see equation (10b): any change in controls will induce a shift between bonds and money. This shift generates a change in the real value of financial wealth (w) because the two assets earn different returns. This leads to intertemporal effects. Note that a similar role is played here by the inflation tax.

*Inter*temporally the change in τ and in w alter the relationship between the endogenous rate of time preference which depends on $w(\rho[(z(\bar{w})])$ and the rate of interest $(i^* - \tau)$. According to equation (10c) this changes consumption growth. The latter induces changes in the real exchange rate [see equation 13] and hence generates changes in current account flows. These affect the level of foreign assets or debt and in turn induce a further change in τ.

Thus capital controls have dynamic repercussions for both the financial sector (portfolio re-allocation) and the real sector (consumption and current account flows). The feature which drives these dynamics is the distortionary tax aspect of the controls: the fact that the optimal portfolio decision (10b) and the optimal intertemporal consumption decision (10c) are distorted by τ underlies these dynamics.

When the economy is out of steady state equilibrium it moves along the saddle path depicted in Figure 1 towards this equilibrium. This path can be used to describe the dynamics of taxation: if the economy is in the short run position where R is higher than the steady state then τ increases along the dynamic path (as R declines) as does π (q is increasing); the reverse is true if the economy is below its long run value of R.

3.1.2. Steady State

In order to analyze taxation policy in the steady state note that in this state there is no debt issuance. Thus government expenditures, including interest payments on accumulated debt, are financed by the two distortionary taxes. We can represent these taxes using the following relationships:

First we solve the dynamic system for the steady state. Setting $\dot{w} = \dot{q} = \dot{R} = 0$ in (16) we obtain the following three equations, the solution of which gives the steady state values of w, q and R:

$$\begin{aligned}
&(a) \quad \rho[(z(\bar{w})] = i^* - \tau(\bar{R}) \\
&(b) \quad Y^T(\bar{q}) - C^T(\bar{q}, G^H) - G^T = -i^*\bar{R} \\
&(c) \quad \bar{q}^{\alpha-1}[Y^H(\bar{q}) - C^H(\bar{q}, G^H)] + \bar{q}^{\alpha}[Y^T(\bar{q}) - C^T(\bar{q}, G^H)] + [i^* - \tau(\bar{R})]\bar{w} \\
&\qquad - [i^* + \hat{E} - \tau(\bar{R})]m\{\bar{q}, \tau(\bar{R}), \hat{E}, i^*, G^H\} = 0.
\end{aligned} \tag{21}$$

Equation (a) says that the rate of time preference used to discount utility is equal to the after-tax rate of interest. Equation (b) implies that the current account net of interest payments equals the latter flow. Equation (c) is the steady state budget constraint of the private sector. It implies that all nominal quantities, except linked debt, increase at the policy determined rate of depreciation, i.e. $\mu = \hat{E} = \pi$, so that private sector assets remain at level $\bar{w}$.

To derive the tax **rates** all that is needed is to solve (21) for $\bar{R}$ and then, knowing the policy rule $\tau(\bar{R})$, solve for the capital controls tax rate (τ). The inflation rate is simply the exogenous $\hat{E}$.

To derive the tax **revenues** one more step is required: from the F.O.C. for portfolio allocation (10b) we derive the amount of steady state money balances. Thus:

$$\bar{m} = m\{\bar{q}, \tau(\bar{R}), \pi, i^*, G^H\} \tag{22}$$

Knowing $\bar{w}$ we derive $f = w - m$ in the steady state. We can then derive the government budget constraint in the steady state:

$$\tau \bar{f} = -\pi \bar{m} + G^H \bar{q}^{\alpha-1} + G^T \bar{q}^{\alpha} + i^* \bar{f} - i^* \bar{R} q^{\alpha} \tag{23}$$

For the second type of controls the budget constraint is:

$$\tau i^* \bar{R}^p \bar{q}^{\alpha} = -\pi \bar{m} + G^H \bar{q}^{\alpha-1} + G^T \bar{q}^{\alpha} - i^* \bar{R}^g \bar{q}^{\alpha} \tag{24}$$

We can represent these equations graphically in $\tau f - \pi m$ space.[9] We draw two lines: the budget constraint (23 or 24) and a ray from the origin which slope is:

$$\frac{\tau \bar{f}}{\pi \bar{m}} = \frac{\tau(\bar{R})[\bar{w} - \bar{m}\{\bar{q}, \tau(\bar{R}), \pi, i^*, G^H\}]}{\pi \bar{m}\{\bar{q}, \tau(\bar{R}), \pi, i^*, G^H\}} \tag{25}$$

The point of the economy on the budget line will be given by its intersection with the ray from the origin.

The resulting graph is given in Figure 2.

The budget line shows the **level** of taxation while the ray from the origin indicates the particular tax policy **mix**. While the government choices of G^H, G^T and π affect both lines, the outcome is endogenous. The budget line shows that for the same real value of government outlays—consumption of goods and interest payments—there is a certain feasible range for the tax mix. The particular mix is determined by the ray from the origin which reflects the ratio between the two tax rates $(\frac{\tau}{\pi})$ and the portfolio choice of agents $(\frac{\bar{f}}{\bar{m}})$. Thus the feasible set for the two taxes is the set of intersection points of the two lines. Both move as a result of changes in the exogenous variables. Algebraically this set may be derived by solving the system (21) as a function of the exogenous variables π, i^*, G^H and G^T and then inserting the results into (23) or (24) and (25). Note that if this were to be implemented empirically all that needs to be known is the functional form of utility (u and v) and production (Y^T, Y^H).

The graph and the equations it depicts imply that changing one of the exogenous policy variables would have the following effects:

(i) A direct effect on the level of government outlays and hence on the position of the budget constraint.

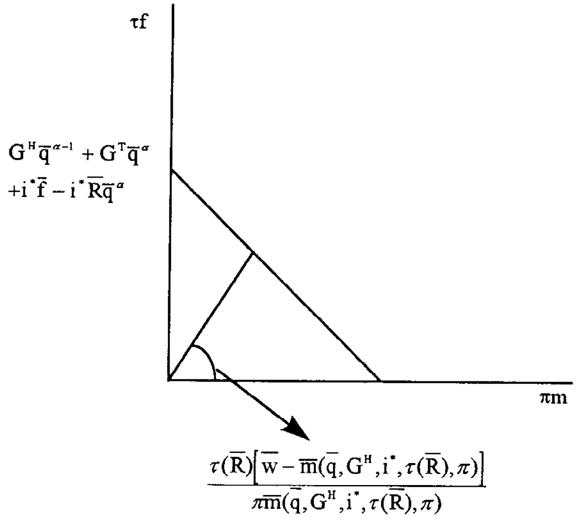

Figure 2. The steady state budget constraint.

(ii) If the exogenous change is in government consumption, then it affects the relative price of the two goods both directly and indirectly via its effects on private consumption. Hence there is a real exchange rate movement (q changes). Consequently there are effects on the current account and on foreign debt (R changes). The changes in q and R generate a further shift of the budget constraint as the real value of government outlays is affected again.

(iii) As R changes the capital controls tax changes endogenously.

(iv) The induced effects on q, R and τ affect agents' portfolio choice and hence the slope of the ray from the origin.

3.2. Policy Schemes

In this section we examine the changes in taxation that take place when the government changes one of its policy variables. Algebraically, total differentiation of (21) yields the change in the capital controls tax rate (τ) given any exogenous change. We examine changes in the three exogenous policy variables: a change in government expenditures on traded goods (i.e. changing G^T), on home goods (G^H) and a change in the other distortionary tax i.e. the rate of depreciation ($\hat{E}$) and hence steady state inflation (π). A key idea here is that the outcomes are ambiguous and it is of interest to study the economic processes that underlie this ambiguity.

3.2.1. A Change in Expenditures on Traded Goods

Changing G^T creates an effect on the relative price q and hence on current account flows. This changes the foreign debt position of the economy and therefore changes τ. Formally, differentiate (21) to get:

$$\frac{d\tau}{dG^T} = \frac{d\tau}{d\bar{R}}\frac{d\bar{R}}{dG^T} = \frac{d\tau}{d\bar{R}}\frac{1}{\dot{R}_R}\left(1 + \dot{R}_q \frac{A}{\dot{R}_R \Delta}\right) < 0 \tag{26}$$

where

$$\Delta = \frac{\dot{w}_q \dot{R}_R \dot{q}_w - \dot{R}_q \dot{w}_R \dot{q}_w + \dot{R}_q \dot{w}_w \dot{q}_R}{\dot{R}_R \dot{q}_w} > 0$$

$$A = \dot{w}_R - \frac{\tau_R}{\rho_w}\dot{w}_w > 0$$

The signs of these expressions are determined using the relationships in (20) above and noting that the policy rule defines a negative relationship between τ and R.

Equation (26) indicates that there is an **inverse** relationship between traded good expenditures and the capital controls tax rate even though the rate of the other tax—inflation—does not change. To see the intuition for this result consider the case of an increase in G^T: the increase means that the current account worsens and so less foreign debt payments can be accommodated in the steady state. Thus foreign debt must be lower in the long run and therefore capital controls will be lower too. The dynamics that generate this result are a real depreciation upon impact which improves the current account and leads to asset accumulation along the dynamic path and thus to a decrease in the amount of foreign debt.

3.2.2. A Change in Expenditures on Home Goods

Here again there are effects on the real exchange rate and on current account flows and foreign debt but they are more complex and yield an ambiguous outcomes. Formally:

$$\frac{d\tau}{dG^H} = \frac{d\tau}{d\bar{R}}\frac{d\bar{R}}{dG^H} = -\frac{d\tau}{d\bar{R}}\left[\frac{\dot{R}_q}{\dot{R}_R}\left(\Delta^{-1}\left(-\dot{w}_{G^H} + A\frac{\dot{R}^{G_H}}{\dot{R}_R}\right)\right) + \frac{\dot{R}_{G^H}}{\dot{R}_R}\right] \tag{27}$$

where

$$\dot{w}_{G^H} = q^{\alpha-1} - q^{\alpha}\frac{\partial C^T}{\partial G^H} - (i^* - \tau + \hat{E})\frac{\partial m}{\partial G^H} > 0$$

and Δ and A are defined as above.

The sign of $\frac{d\tau}{dG^H}$ depends on the sign of the term in the square brackets, which may be positive or negative [as a close examination using (20) would soon reveal]. This is so as there are two effects in operation here: (i) the change in home good expenditures changes the amount of resources available for private sector consumption at a given level of relative prices and (ii) the fiscal change affects relative prices. The change in relative prices affects production and consumption in the foreign sector generating changes in current account flows, which in turn affect foreign debt and hence capital controls.

The two possible outcomes may be explained as follows, using the example of an increase in G^H:

If the first effect is dominant, the fiscal expansion would "crowd out" private consumption, including C^T. This would lead to an improvement of the current account and thus more foreign debt is accommodated in the steady state. Hence controls increase and $\frac{d\tau}{dG^H} > 0$.

If the second effect is dominant, the fiscal expansion leads to a real appreciation, worsening the current account. Less foreign debt is accommodated and capital controls decrease. Hence $\frac{d\tau}{dG^H} < 0$ as in the case of traded goods consumption.

3.2.3. A Change in the Rate of Depreciation

While the two policy moves discussed above stressed the effect of government consumption on the foreign sector and hence on capital controls, the mechanism in operation here relates to the role of both taxes in the financial asset choices of agents. To see what processes are in operation here differentiate (21) to get:

$$\frac{d\tau}{d\hat{E}} = \frac{d\tau}{d\bar{R}}\frac{d\bar{R}}{d\hat{E}} = \frac{d\tau}{d\bar{R}}\left(-\frac{\dot{R}_q}{\dot{R}_R}\frac{d\bar{q}}{d\hat{E}}\right) = \frac{d\tau}{d\bar{R}}\frac{\dot{R}_q}{\dot{R}_R}\frac{\dot{w}_{\hat{E}}}{\Delta} \tag{28}$$

where Δ is defined as above.

The sign of $\frac{d\tau}{d\hat{E}}$ depends negatively on the sign of $\dot{w}_{\hat{E}}$ as the following holds: $\frac{d\tau}{d\bar{R}} < 0$ by the policy rule; $\frac{\dot{R}_q}{\dot{R}_R} > 0$ by definition of the current account flow and Δ is positive as noted. The crucial term is:

$$\dot{w}_{\hat{E}} = -[m + \hat{E}m_{\hat{E}}] - (i^* - \tau)m_{\hat{E}} \tag{29}$$

and can be either positive or negative. It expresses consumers' asset accumulation dynamics $(\dot{w})$ following the policy change. These dynamics are driven by the change in the asset composition of agents' portfolios: agents move between money and bonds as rates of return on them change when the rate of depreciation is modified. This portfolio re-allocation changes the flow of inflation tax payments (the first term on the RHS) and the flow of interest receipts on bonds (the second term on the RHS). Operating in opposite directions, the net outcome depends upon which effect is stronger. These asset dynamics lead to private consumption dynamics and hence to effects on the current account, foreign debt and consequently capital controls. If the inflation tax effect is dominant $\dot{w}_{\hat{E}} < 0$ and so $\frac{d\tau}{d\hat{E}} > 0$ i.e. controls change in the same direction as inflation; if the interest receipts effect is dominant the signs are reversed and there is a trade-off between the two distortionary tax rates.

4. Conclusions

The paper provided a model for the analysis of the public finance implications of capital controls policy. This model is based on two principles: (i) it incorporates the two prevalent types of controls in the real world within a unified framework; (ii) it includes key characteristics of economies that use controls in practice. The derivation of the policy rule was based on the solution of the stability requirements of the economy's dynamic system, hence generating a sustainable policy rule.

Capital controls were shown to act as a distortionary tax affecting agents' optimal intratemporal portfolio decisions and intertemporal consumption decisions. Hence both financial and real variables are affected. The relationship of this distortionary tax to the inflation tax, which is also distortionary, was studied.

The analysis showed that there are complex interactions between the policy variables under direct government control and the real and financial sectors of the economy. As the capital controls tax is endogenous, these complex relationships carry over to the links between government expenditures and the capital controls tax.

Possible extensions of the current model are the study of a stochastic rather than a deterministic system permitting the evaluation of the effects of different shocks within this set-up and, as a possible follow-up for such an approach, an empirical examination.

Acknowledgments

I am grateful to two anonymous referees and seminar participants at the IIPF 52nd annual congress for helpful comments on previous versions of the paper. Any remaining errors are all mine.

Notes

1. We refer the reader to that paper for the full derivation of the model's equations.
2. For related models see Calvo, Reinhart and Vegh (1995), Guidotti and Vegh (1992), Obstfeld (1986), Roubini and Sala-i-Martin (1995) and Sussman (1991) on the macroeconomic aspects and Aizenman (1986) and Giovannini (1988) on the public finance aspects.
3. Capital controls in this case are made of of two main elements: (i) τ as expressed above; (iia) prohibition on private sector ownership of foreign assets or (iib) a "surrender" requirement on foreign assets.
4. The equivalence of these two formulations is demonstrated in Adams and Greenwood (1985).
5. In the steady-state $\mu = \hat{E}$ and $\hat{F} = 0$.
6. Obstfeld (1990) provides a detailed survey and a clear exposition of intertemporal dependence and impatience, discussing among other things this particular formulation. The basic idea was introduced by Uzawa (1968).
7. z is a positive function of w. See Epstein and Hynes (1983) or Yashiv (1997) for the deriviation which follows Proposition 9 in Arrow & Kurz (1970, p. 50).
8. Technically this means that $\dot{w}_R = \dot{q}_R = 0$ and that the sub-system of w and q converges while R does not. For a similar discussion in a closed-economy context see McCallum (1981) and Calvo (1985).
9. For the second type of controls the relevant space is $\tau i^* R^p q^\alpha - \pi m$. In order to keep the analysis simple, in the figure below we analyze only the first type of controls, but the same reasoning and methodology applies to the second type too.

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