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CAPITAL IMPORT TAX

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ANTI-INFLATIONARY MONETARY POLICY AND THE CAPITAL IMPORT TAX

by

Nissan Liviatan

Anti-inflationary monetary policy faces special problems under flexible exchange rates and free capital movements. While this policy might be quite effective in reducing inflation it is also likely to create changes in relative prices which can be undesirable. In particular the short run capital imports which are induced by the restrictive policy may bias the deflationary effect towards the exchange rate and thus lead to its appreciation in real terms. While this phenomenon may be temporary it may cause sufficient concern in an export oriented economy.

A situation of this sort arose in the Israeli economy in the second part of 1978 when restrictive monetary policies led to a considerable (real) appreciation of the exchange rate.^{1/} This has been followed by various restrictive measures on the movements of short run capital imports in order to protect the interests of the exporting industries which are given top priority in the Israeli economy.

The problem raised by the foregoing experience is that of using special methods of intervention which are designed to neutralize the effect of monetary policy on the real exchange rate, while maintaining its effect on the general price level. In this paper I wish to discuss a specific method adopted in the Israeli economy, namely a tax on short run borrowing from abroad which I shall call a Capital Import Tax (CIT). In principle this is similar to the method of imposing a negative interest

rate on foreign deposits, which has been used in Germany and Switzerland. Note that an attempt to support the real exchange rate through purchase of foreign exchange by the government will render the anti-inflationary policy ineffective since it requires an increase in the supply of domestic money.

The idea of the CIT is to discourage the short term capital inflow induced by the restrictive monetary measures. This may enable the stabilization of the real exchange rate during the period when anti-inflationary measures are undertaken. At the same time, the CIT system induces changes in the real interest rate during the adjustment process which affect the behaviour of the commodity and asset markets. The objective of stabilizing the real exchange rate, which may be considered as desirable in itself, has then to be evaluated in the light of the induced changes in the real interest rate which, in turn affects the level of output and employment. Roughly speaking, we are concerned with a trade-off between stabilization of the real exchange rate and an increase in the real interest rate by means of the CIT.

Basically there are two types of difficulties arising from anti-inflationary monetary policy and associated real appreciation of the exchange rate. One difficulty is due to the loss of foreign markets as the result of the appreciation and the effort to regain them as the exchange rate return to its normal level, assuming that money is neutral in the long run. This frictional cost is not taken into account explicitly in our model and is represented implicitly by the temporary deviations of the real exchange rate from its long term level.

The second difficulty is due to the deflationary effect that a

real appreciation has on the level of output and employment under some degree of downward stickiness of domestic prices. This deflationary effect is aggravated by the increase in the real rate of interest in the early stages of the anti-inflationary policy. This cost can be calculated by the loss of output during the adjustment process.

The purpose of the CIT can be considered as the elimination of the first type of cost. However even the system with CIT cannot avoid the second type of cost (unemployment) because it involves an increase in the real interest rate. Generally one cannot determine under which regime will the unemployment cost the larger without some assumptions to be discussed below.

In this paper I shall examine the foregoing problems in a model where there is some downward rigidity in domestic prices and where expectations are formed rationally, using a theoretical framework developed in a recent paper by Dornbusch (1976). There is, however, a basic extension of this model which I shall have to introduce. Specifically, the Dornbusch model relates to a static economy where the quantity of money is constant in steady states. In this framework, "anti-inflationary policy" does not make much sense. I shall therefore extend the model to include inflationary trend caused by a constant rate of monetary expansion.

The plan of the paper is as follows. We start with a formulation of the model. We then show that a reduction in the rate of monetary expansion has an immediate effect of creating a real appreciation. Moreover the real exchange rate must remain below its full equilibrium value throughout the adjustment process. We then show how the imposition of a capital import tax (which is manipulated continuously) can stabilize the real

exchange rate and analyse the effect of the tax on output and on the balance of payment as compared with the tax-free system. Finally, we discuss the complications arising from the fact that in practice the CIT may not be accompanied by a corresponding subsidy on foreign lending.

The Model

The elementary model is based on the following set of relationships:

- | | | |
|-----|--|----------------------------|
| (1) | $r = r^* + e$ | arbitrage condition |
| (2) | $\dot{e} = w\gamma + (1-w)\dot{p}$ | expectations formation |
| (3) | $\phi y - \lambda r = (m-p) - \alpha(e-p)$
$= m - [\alpha e + (1-\alpha)p]$ | money market equilibrium |
| (4) | $y = \delta'(e-p) - \sigma' \rho + ay$ | commodity balance equation |
| (5) | $\dot{p} - \gamma = \beta(y - \bar{y})$ | domestic price adjustment |
| (6) | $m = \gamma = \text{a constant of policy}$ | monetary expansion rule |

The notation is as follows:

e = the logarithm of the exchange rate

p = the logarithm of the domestic price level (P)

m = the logarithm of the domestic money stock (M)

y = the logarithm of the domestic output (Y)

\bar{y} = the logarithm of the full employment output

r = domestic nominal interest rate

r^* = foreign real interest rate

ρ = domestic real interest rate; $\rho \equiv r - [\alpha \dot{e} + (1-\alpha)\dot{p}]$

$\alpha, \gamma, \phi, \lambda, \alpha, \delta, \sigma, \alpha$ and β are positive parameters and dot over a variable denotes, as usual, its time derivative.

This formulation differs from that of Dornbusch in a number

of respects, the most important of which is the inclusion of a constant rate of monetary expansion γ . If expectations are formed rationally, as is assumed in the model, then γ has to be taken into account in the expectations mechanism as we do in equation (2). Since expectations are "rational" or consistent, we require that expected and actual rates of change be identical. It will be shown later that (2) is indeed an appropriate form for consistent expectations.

Another deviation from Dornbusch's assumptions is that the demand for the domestic commodity, represented by the right hand side of (4), is based on a real, rather than nominal, interest factor (ρ) .

It should be noted that domestic money affects the system only through the supply side as is the case with models of "inside money". The quantity of money is still determined by the government which regulates the volume of bank credit. A more important omission is that of the stock of foreign assets held by domestic citizens, which varies during the dynamic process through the balance of current account and through capital gains. In excluding this variable we follow the Mundellian type of models which appear frequently in the literature. It should be pointed out however that the explicit inclusion of foreign assets as a state variable in the dynamic analysis of the present model does not add much additional insight to the problem under discussion. At the same time the dynamic analysis loses the simplicity of a first order system.

It should be noted that this model assumes a monetary rigidity of the domestic price level so that in the short run the domestic market is equilibrated by output. The output gap will then determine by (5) the rate of domestic price adjustment relative to the general inflationary trend γ .

Since we shall be dealing with monetary contraction, the monetary price rigidity will lead us to $y \leq \bar{y}$, so that positive excess demand for domestic output is, in fact, ruled out.

Before we proceed, it is convenient to combine (3), (4) and (5) by solving for y in (4). This yields:

$$(7) \quad \dot{p} = \gamma + \beta[\delta(e-p) - \sigma\rho - \bar{y}] ; \delta = \frac{\delta'}{1-a} , \sigma = \frac{\sigma'}{1-a}$$

$$(8) \quad m - p = (\alpha + \phi\delta)(e-p) - \phi\sigma\rho - \lambda r$$

In a steady state $\dot{e} = \dot{p} = \gamma$ so that

$$(9) \quad \overline{(e-p)} = \frac{\sigma r^* + \bar{y}}{\delta} ; \bar{\rho} = \bar{r} = r^* + \gamma ; y = \bar{y}$$

$$\overline{(m-p)} = r^* \left(\frac{\alpha\sigma}{\delta} - \lambda \right) + \left(\frac{\alpha}{\delta} + \phi \right) \bar{y} - \lambda\gamma$$

where a bar over a variable denotes its full equilibrium value. It should be noted that the full-equilibrium real exchange rate is independent of the rate of inflations, while real balances (in terms of domestic goods) are negatively related to inflation.

Suppose that γ is reduced by $\Delta\gamma$. Clearly, this will not leave the steady state intact since the right hand side of the equation for $\overline{(m-p)}$ increases by $\lambda\Delta\gamma$. Suppose, however, that it is possible to perform a discontinuous change in the nominal money stock represented (in log form) by m . Then an increase in m by $\lambda\Delta\gamma$ would leave the steady state unchanged. Hence, it would have been possible to 'jump' immediately to the new steady state without any need for an adjustment process.

It should be recognized that our model tacitly rules out the foregoing possibility and permits only continuous variation in m . Intuitively this assumption means that the monetary authorities are not free to make extraordinarily large changes in m within a given period, i.e., changes that look "infinitely large" compared (say) with the nominal value of consumption within this period.

As a preliminary step let us derive the relationship between the expected real depreciation $\dot{\bar{e}}-p$ and the real exchange rate $(e-p)$. Using (2) and (5) we can write $\dot{\bar{e}}-p$ as $\dot{\bar{e}}-p = -w\beta(y-\bar{y})$. Note also that $y = \delta(e-p) + \sigma[r^* + (1-\alpha)(\dot{e}-p)]$. Eliminating y from these two equations we obtain

$$(10) \quad \dot{\bar{e}}-p = -A(e-p) + \text{constant}$$

$$\text{where } A = \frac{\delta\beta w}{1-\sigma\beta(1-\alpha)w} ; \text{ constant} = \frac{w\beta(\sigma r^* + \bar{y})}{1-w\beta\sigma(1-\alpha)}$$

We assume that our system is dynamically stable and hence $A > 0$. This means that exchange rate expectations are of the regressive type, i.e. if $e-p < \bar{e}-p$ then $\dot{\bar{e}}-p > 0$. Note also that a positive A implies $w > 0$, which is the only sensible possibility in view of (2).

We turn now to consider the determination of the monetary equilibrium. In this equilibrium we determine e , r and y (remembering the p is momentarily constant). For this purpose we eliminate $\dot{\bar{e}}-p$ from the system by means of (10). We may then express ρ , y and \dot{p} as follows

$$(11) \quad \rho = r^* - (1-\alpha)A(e-p) + \text{constant}$$

$$(12) \quad y = \delta^*(e-p) + \text{constant} ; \quad \delta^* = \delta + \sigma(1-\alpha)A > 0$$

$$(13) \quad \dot{p} = \gamma + \beta\delta^*(e-p) + \text{constant}$$

where the "constants" are always independent of γ .

We may now obtain two relationships in r and $e-p$ which determine these variables. From (1), (2) and (13) we obtain

$$(14) \quad r = \gamma + (1-w)\beta\delta^*(e-p) + \text{constant}$$

This relationship reflects essentially the arbitrage condition in conjunction with the output gap. From the money market equilibrium and (8) we obtain

$$(15) \quad r = \frac{1}{\lambda} [\alpha + \phi\delta^*](e-p) - \frac{1}{\lambda}(m-p) + \text{constant}$$

Since $A > 0$ we know that the relation between r and $(e-p)$ in (15) is positive, as is described by the MM curve in Figure 1. The relation between r and $(e-p)$ along (14) is ambiguous since our only restriction on w is $w > 0$. In Figure 1a and 1b the AA curves correspond to (14) under the alternative assumptions of $1-w < 0$ and $1-w > 0$.

In Figure 1a the momentary equilibrium is determined at Q . A reduction in γ from γ_1 to γ_2 shifts the AA curve downward by $(\gamma_1 - \gamma_2)$ and the short run equilibrium shifts to Q' where $e-p$ is below $\overline{e-p}$ and where r falls but remains above its new \bar{r} . Figure 1b shows again that $e-p$ and r are reduced with γ and that r overshoots momentarily its new \bar{r} . If the slope of AA in Figure 1b were steeper than that of MM the results concerning the real appreciation

caused by the reduction in γ would be reversed. However this case can be ruled out by the constraint of rational expectations, as we shall see shortly.

We may trace out the dynamic process by noting from (11) that

$$-\dot{(p-\gamma)} = \dot{(m-p)} = -\rho\delta^*(e-p) + \text{constant}$$

Hence when $(e-p)$ is reduced following the reduction in γ , $\dot{m-p}$ becomes positive so that $(m-p)$ increases. This causes the MM curve to slide downward along a constant $A'A'$ curve, so that the economy converges monotonically along $Q'Q''$ with the real exchange rate depreciating continuously after the initial appreciation. Note however that $e-p$ remains below $\overline{e-p}$ throughout the adjustment process.

An intuitive explanation for the initial appreciation can be given as follows. Suppose that γ is reduced while $(e-p)$ remains momentarily constant. Then the expectations for a lower rate of inflation will create a tendency for r to fall, as is indicated by (14). However this will increase the demand for money. Equilibrium in the money market can be restored by a reduction in $(e-p)$ which operates through two channels. First, a reduction in e increases the supply of real balances and secondly the reduction in $(e-p)$ reduces output and hence reduces demand for real balances. It is easy to see that the assumption of a (momentarily) rigid p is essential to our results. ^{2/}

An alternative explanation, which is more useful for our subsequent analysis is to start with the assumption that the money market is always in equilibrium, whereas the arbitrage condition may be out of

balance for a short instant. Suppose again that γ is reduced while $(e-p)$ is temporarily constant. Then r , as determined in the money market is constant by (15), while $r^* + \dot{e}$, as represented by the right hand side of (14), falls as a result of the expectations mechanism. This implies that borrowing abroad is now cheaper than in the domestic market. Consequently there will be an incipient capital inflow which will create a downward pressure on the exchange rate. Hence the assumption that $(e-p)$ is constant must be abandoned and the exchange rate must be allowed to fall.

The determination of $(e-p)$ and r by (14) and (15) makes the equilibrium values of these variables a function of γ and $(m-p)$. Thus $(e-p)$ is given by

$$(16) \quad e-p = -\frac{1}{\lambda D} (m-p) - \frac{Y}{D} + \text{constant}$$

$$D = \delta^* [(1-w)\beta - \phi/\lambda] - \frac{\alpha}{\lambda}$$

Differentiating (16) w.r.t. time we obtain

$$(17) \quad \dot{e-p} = -\frac{1}{\lambda D} \dot{(m-p)} \quad \text{or} \quad \dot{e} = -\frac{1}{\lambda D} \dot{m} + (1 - \frac{1}{\lambda D}) \dot{p}$$

The constraint of rational expectation requires that (17) and (2) be identical, so that

$$(18) \quad w = -\frac{1}{\lambda D}$$

Since stability requires that $w > 0$ we know by (17) and (18) that $D < 0$ and hence that $(e-p)$ and γ are positively related. (This implies that

MM in Figure 1b is steeper than AA).

Note also that by (11), (16) and (18) we obtain a second degree equation in w . It can be shown^{3/} that if

$$(19) \quad \delta\lambda > \alpha(1-\alpha)\sigma$$

then w will have one positive and one negative real root. Since stability requires $w > 0$ we choose the positive one. If the inequality in (19) is reversed then w may have two positive roots which leads to some ambiguity in the choice of w . It will therefore be convenient to assume that (19) holds.

The related impact effects of a reduction in γ can be inferred from (11)-(13). In particular, a reduction in γ (via the associated reduction in $e-p$) leads to an increase in the real rate of interest, a reduction in output and to a reduction in \dot{p} in excess of the reduction in γ . Thus the short run deflationary effect on domestic goods overshoots the long run effect. The impact effect on \dot{e} can be studied from (14) which implies $\dot{e} = \gamma + (1-w)\beta\delta^*(e-p) + \text{constant}$. Hence $\dot{e}-\gamma \begin{matrix} * \\ < \\ 0 \end{matrix}$ following the reduction in γ , depending on whether $w \begin{matrix} > \\ < \\ 1 \end{matrix}$.

The Role of the Capital Import Tax

Let us consider now the use of the capital import tax (CIT) as a means to stabilize the real exchange rate. The CIT takes the form of a variable tax of τ percent on the value of the loan in foreign currency. It should be noted that a reduction in lending abroad is economically equivalent to increased borrowing and should therefore be taxed. Similarly,

lending abroad should be subsidized by the same rate (τ) , which is used for taxing borrowing. If domestic citizens engage only in borrowing abroad then we can confine ourselves to a tax on capital imports. The proceeds of the tax are assumed to be redistributed in a neutral way to the public.

The CIT affects the model in several respects. First the arbitrage conditions becomes

$$(1') \quad r = r^* + e + \tau$$

Next the real interest rate on foreign borrowing (or "the own rate" of foreign assets) is now $r^* + \tau$, so that (7) has to be modified to

$$(7') \quad \dot{p} = \gamma + \beta [\delta(e-p) - \sigma(r^* + \tau) - \bar{y}]$$

Finally we note that if the policy is to keep the real exchange rate constant then, under rational expectations, people must expect

$$(2') \quad \dot{e} = \dot{p}$$

which replaces the original expectations equation. Hence $\rho = r^* + \tau$. If the policy is successful then $(e-p)$ is a constant equal to its full equilibrium value $\overline{e-p}$. We may then rewrite (7') above as

$$(7'') \quad \dot{p} = \gamma - \beta\sigma\tau + \beta [\delta(\overline{e-p}) - \sigma r^* - \bar{y}] = \gamma - \beta\sigma\tau$$

Note that by (5) this implies

$$(20) \quad \tau = \frac{1}{\sigma} (\bar{y} - y)$$

i.e., the CIT must be set proportional to the current output gap.

Substituting (7'') in the arbitrage condition (1') we obtain

$$(21) \quad r = r^* + \gamma + (1 - \beta\sigma)\tau$$

which gives us a relationship between r and τ . Another relationship involving r and τ can be derived from the money market equilibrium condition (8) where ρ is replaced by $r^* + \tau$. This yields

$$(22) \quad r = -\frac{\phi\sigma}{\lambda}\tau + \frac{1}{\lambda} \left[\frac{\alpha}{\delta} (\sigma r^* + \bar{y}) + \phi\bar{y} - (m-p) \right]$$

In the diagrammatic analysis τ replaces $(e-p)$. Equations (21) and (22) are now denoted in Figures 2a and 2b by AA and MM respectively. In Figure 2a $1-\beta\sigma$ is assumed positive while in 2b it is negative. It can be seen that in both cases the nominal interest rate is reduced, but the reduction in r may exceed or fall short of the reduction in γ . As $(m-p)$ increases to its new equilibrium the MM curve slides along A'A' as indicated by the arrows.

The emergence of the CIT and its relation to the change in γ can be explained intuitively as follows. Consider the situation in the free system before the CIT is imposed. Suppose the money market is always in equilibrium while the arbitrage condition may for a short instant be out of balance. Suppose function that $(e-p)$ is momentarily constant. We have seen earlier that when γ is reduced from γ_1 to γ_2 then r , as determined by the money market, is constant while the cost of borrowing

abroad $[r^* + \dot{e}]$, as represented by the right hand side of (14)] falls by $(\gamma_1 - \gamma_2)$. In order to discourage the incentive to borrow abroad induced by this gap (and the consequent downward pressure on e) the monetary authorities introduce the CIT which restores the arbitrage condition without the need to reduce e .

It may appear that if τ is set equal to $(\gamma_1 - \gamma_2)$ then the problem is solved. This however is not the case since γ causes an increase in the real increase rate ρ . The increase in ρ has a depressing effect in the commodity market which causes \dot{p} to fall in excess of γ and hence requires a further increase in τ to satisfy the arbitrage condition. However the increase in ρ (and the associated reduction in y) has also a depressing effect on the demand for money which tends to reduce r and diminish the need for τ . As a result of these conflicting influences we cannot determine whether the impact effect of γ on r is unitary.

Considering (21) and (22) as two simultaneous equations in r and τ we may solve them to obtain

$$(23) \quad r = - \frac{(1 - \beta\sigma)}{1 - \sigma(\beta - \phi/\lambda)} (m-p) + \frac{\phi\sigma}{\lambda[1 - \sigma(\beta - \phi/\lambda)]} \gamma + \text{constant}$$

and

$$(24) \quad \tau = \frac{-\frac{1}{\lambda} (m-p) - \gamma + \left\{ \frac{1}{\lambda} [\alpha(\overline{e-p}) + \phi\bar{y}] - r^* \right\}}{1 - \sigma(\beta - \phi/\lambda)} = - \frac{1}{\lambda} \frac{(m-p) - (\overline{m-p})}{1 - \sigma(\beta - \phi/\lambda)}$$

Substituting (24) back into (7'') and multiplying by (-1) we obtain

$$(25) \quad \gamma - \dot{p} = \frac{d}{dt} (m-p) = \frac{-\beta\sigma}{\lambda[1 - \sigma(\beta - \phi/\lambda)]} [(m-p) - (\overline{m-p})]$$

which is the differential equation for real balances.

A number of conclusions can be drawn from the foregoing calculations. First we see from (25) that stability requires that

$$(26) \quad 1 - \sigma(\beta - \phi/\lambda) > 0$$

It then follows from (25) that $(m-p)$ converges monotonically to full equilibrium. Second, (24) shows us that the impact effect of a reduction in γ (starting from full equilibrium) must create a positive CIT, which ensures that the slope of MM in Figure 2b is steeper than that of AA. Equation (24) also shows us that as $(m-p)$ increases monotonically to its new full equilibrium value, τ must fall monotonically to zero.

Some Comparisons Between the Two Systems

We have seen that a reduction in γ has a depressing effect on output under both systems. What can one say about the relative magnitude of these impact effects? The impact effect for the "free system" (no CIT) is obtained from (12), (16) and (18)

$$(27) \quad \left(\frac{\partial Y}{\partial \gamma}\right)_f = \delta^* \lambda w = \frac{\delta \lambda w}{1 - \sigma\beta(1-\alpha)w}$$

Under the "controlled system" (with the CIT) the corresponding expressions obtained from (3) and (24), i.e.

$$(28) \quad \left(\frac{\partial Y}{\partial \gamma}\right)_c = \frac{\sigma}{1 - \sigma(\beta - \phi/\lambda)}$$

It can be seen that as σ becomes arbitrarily small the impact effect under the controlled system tends to zero while in the free system it remains positive and bounded away from zero (since w does not vanish with σ). This conforms of course with one's intuition since when σ is very small ^{4/} there is no way in which γ can influence y under the controlled system.

Is it also true that a large σ makes $(\frac{\partial y}{\partial \gamma})_c$ larger than $(\frac{\partial y}{\partial \gamma})_f$? It is difficult to answer this question under general condition since w depends on σ . It is easy however to construct a special case where this is true. In the extreme case $\alpha = 1$ w becomes independent of σ ^{5/}. Consequently (27) is also independent of σ . By increasing σ we can then make $(\frac{\partial y}{\partial \gamma})_c$ exceed $(\frac{\partial y}{\partial \gamma})_f$. (Especially when $\lambda\beta \geq \phi$).

Both intuition and (27) suggest that when δ is large (27) may exceed (28) and conversely when δ is small. However this comparison is again complicated by the fact that w depends on δ . To sum up this point one may say that, following a reduction in γ the introduction of the CIT is more likely to result in a relatively small output gap (as compared with the free system) when σ small and δ is large. In words, when the effect of the real interest rate on aggregate demand for domestic output is small relative to the effect of the real exchange rate then the introduction of anti-inflationary policy will have a relatively small impact effect on output when the CIT is used.

It can be shown that when we consider the entire output path then the cumulative output gap must be identical under both systems. Thus noting that $\dot{p} - \dot{\gamma} = \dot{p} - \dot{m}$ we have

$$(29) \quad \int_0^{\infty} (y - \bar{y}) dt = \frac{1}{\beta} \int_0^{\infty} (\dot{p} - \dot{m}) dt = \frac{1}{\beta} [(\bar{m} - \bar{p})^0 - (\bar{m} - \bar{p})^1]$$

where $(\bar{m} - \bar{p})^0$ is the original steady state before the change in γ (which is assumed to be our starting point at $t = 0$), and $(\bar{m} - \bar{p})^1$ is the steady state which corresponds to the new value of γ . Since the steady states are independent of the CIT, it follows that (29) holds for both paths. In other words, the average value of y is the same along the two paths. This shows that if in one system the impact effect of γ on y is larger this relation must be reversed at some later stage. If however, the economic planner has a positive time preference he will consider as an advantage to have the smaller output gap in the early stages.

Let us finally turn to the balance of the current account which is assumed to depend positively on $(e - p)$ and negatively on y . As γ is reduced both $(e - p)$ and y will fall so that the effect on the balance of the current account is not clear. Under the controlled system, however, we have only the reduction in y which unambiguously improves the balance of payments. Again this is true only for the impact effect. The cumulative effect on the current account must still be the same under both systems since it is determined by the change in the stock of foreign assets across steady states which are independent of the CIT.

An Asymmetrical CIT

We have assumed so far that the CIT takes the form of a tax on borrowing abroad and a subsidy on lending abroad. In actual practice the government may intervene only on the borrowing side, as is the case in Israel. This possibility has certain implications for the model developed earlier which may pose new problems for the monetary authorities.

Let us assume that normally both lending and borrowing abroad coexist. Suppose the Government imposes a tax only on borrowing abroad, without subsidizing lending abroad. If domestic and foreign bonds are essentially the same, as we have been assuming throughout then in equilibrium we cannot have borrowing abroad and lending abroad taking place simultaneously. By "equilibrium" we mean the short run equilibrium following the reduction in γ . We assume that in the domestic capital market we always have both lending and borrowing.

To see this suppose to the contrary that both lending and borrowing abroad do take place simultaneously. Then we have

$$(30) \quad \text{Domestic interest rate} \equiv r = r^* + e + \tau \equiv \text{cost of borrowing abroad}$$

However we also have, assuming e is the same for lenders and borrowers

$$(31) \quad r^* + e \equiv \text{return on lending abroad}$$

Hence, those who lend abroad will shift their investment from the foreign to the domestic capital market. Thus the situation where (30) and (31) hold simultaneously is not an equilibrium.

Suppose first that the country in question has only borrowers of foreign funds. In this case the solution offered by the "controlled system" is valid since for all borrowers we have $r = r^* + e + \tau$. The situation is essentially the same when domestic citizens are both lenders and borrowers in the foreign capital markets but the country as a whole is a net borrower.

As we have stated earlier, lending and borrowing abroad cannot co-exist in equilibrium when the CIT is one sided. The fact that the return from lending abroad is $r^* + \dot{e}$ while the interest on domestic loans is $r = r^* + \dot{e} + \tau$ will cause lenders to shift their loans from foreign to domestic markets. The increased supply of funds on the domestic market will cause an incipient reduction in the domestic interest rate which will induce borrowers to shift their activity to the domestic market.

This reshuffle of lending and borrowing activities will generally have no effect on the foreign exchange rate since the supply of foreign exchange through reduced lending abroad will be matched by increased demand for foreign exchange in order to repay foreign debts. In the end of this "netting out" process we are back to the situation described earlier where there are only borrowers of foreign funds, so that the "controlled system" solution may still work.

Consider alternatively the case where the country is a net lender. The "netting out" process will then result in an elimination of all foreign borrowing, leaving a balance of lenders. The latter will continue to liquidate their foreign loans as long as $r > r^* + \dot{e}$. This must cause a reduction in \dot{e} and an increase in \dot{e} when expectations are regressive. If the balance of positive foreign lending is sufficiently large we shall have a short run equilibrium of the form

$$(32) \quad r = r^* + \dot{e} < r^* + \dot{e} + \tau$$

implying that the CIT is ineffective. The foregoing equilibrium is essentially the equilibrium corresponding to the "free system" discussed earlier.

If the positive balance of foreign lending is relatively small we may have an equilibrium of the form

$$(33) \quad r^* + \dot{e} < r < r^* + \dot{e} + \tau$$

where r is the actual domestic interest rate. This is the case where neither lending nor borrowing take place. The CIT is partially effective in the sense that it did not let e drop to the level corresponding to the free system.

The analysis of the asymmetric CIT is illustrated in Figure 3. For simplicity assume $\sigma = 0$ so that the demand for output is not affected by the real interest rate. The MM and $A_B A_B$ curve relate to (14) and (15), i.e. to the free system. As γ is reduced $A_B A_B$ shifts downward by the reduction in γ , say $\Delta\gamma$ ($\Delta\gamma$ is expressed in absolute value). With the symmetrical CIT a tax equal to $\tau = \Delta\gamma$ can maintain the momentary equilibrium at Q , instead of S , and thus enable to stabilise the real exchange rate. In fact, since $\sigma = 0$ this equilibrium can be maintained indefinitely.

Suppose alternatively that CIT takes the form of tax on borrowing abroad with no corresponding subsidy on lending abroad. Consider a constant τ equal to $\Delta\gamma$. From the point of view of the free system $A_B A_B$ represent the arbitrage conditions for those who borrow abroad (who have to pay the tax) while $A_L A_L$ represents the same condition for lenders. Assume that the actual interest rate in the domestic market is determined so as to equilibrate the money market. Then borrowers in the world market are in equilibrium at Q but the lenders obtain abroad $r = RV$ while in the domestic market they obtain $r = RQ$.

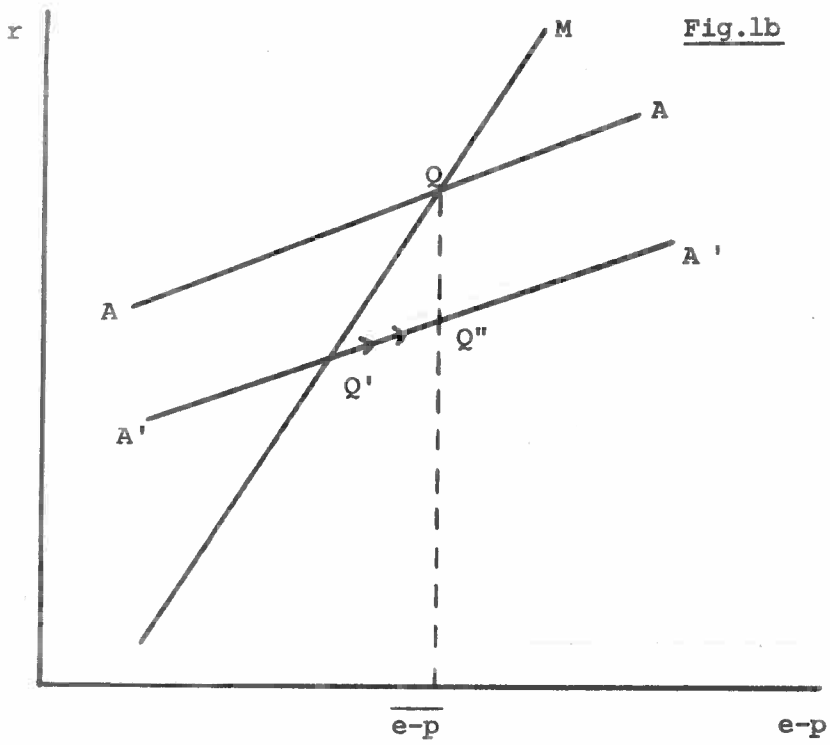
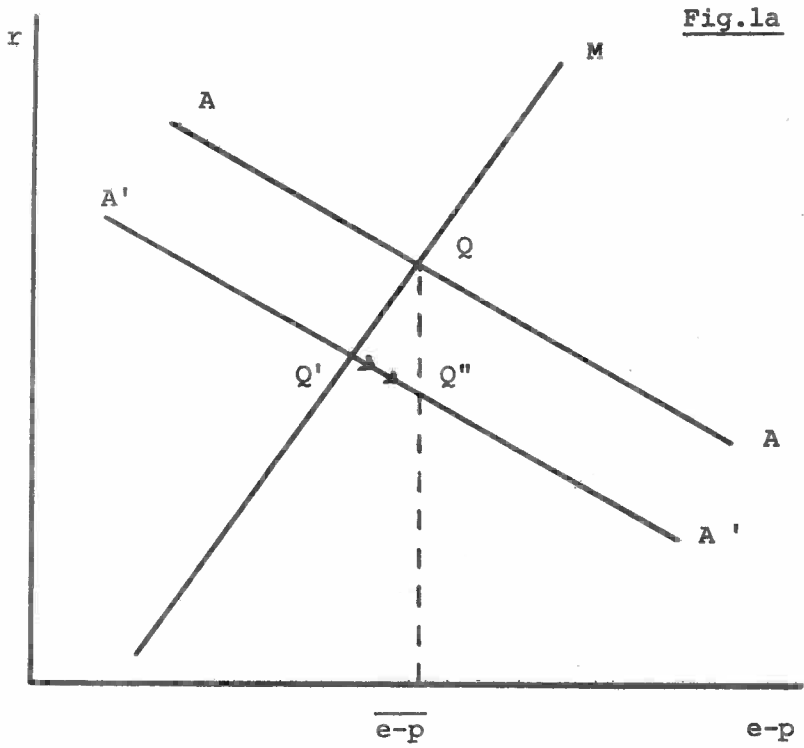
If the country is a net borrower then the "netting out" process described earlier will eliminate all lenders (abroad) and therefore Q may remain an equilibrium point, and therefore the "controlled solution" can work. If however the country is a net lender then the short run equilibrium will take place at S , if the net foreign assets are sufficiently large. The movement from Q to S is accomplished by sales of foreign bonds in order to purchase domestic ones. This depresses both e and r as indicated. The equilibrium condition for this case corresponds to (32), where r refers to MM and $r^* + e$ refers to $A_{L L}$. Since borrowing of foreign funds is eliminated then $A_{B B}$ is ineffective and represents the ineffectiveness of the CIT.

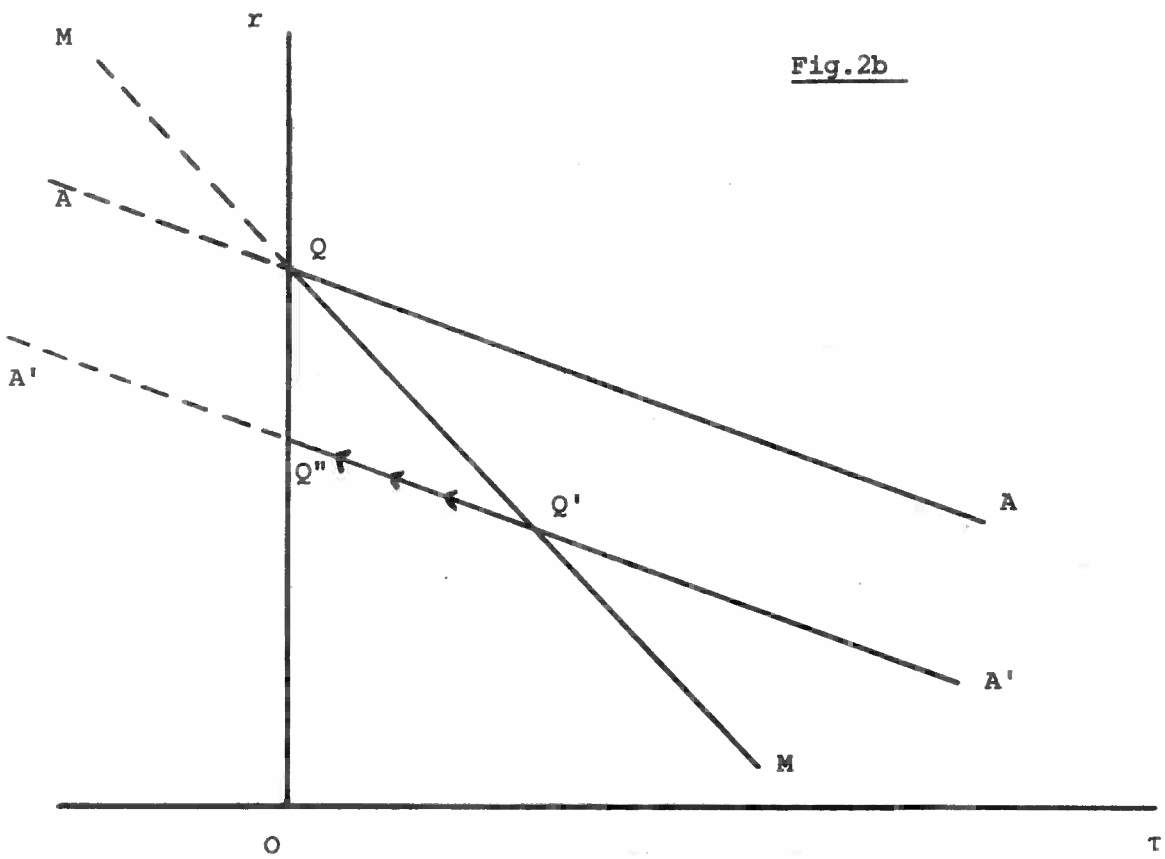
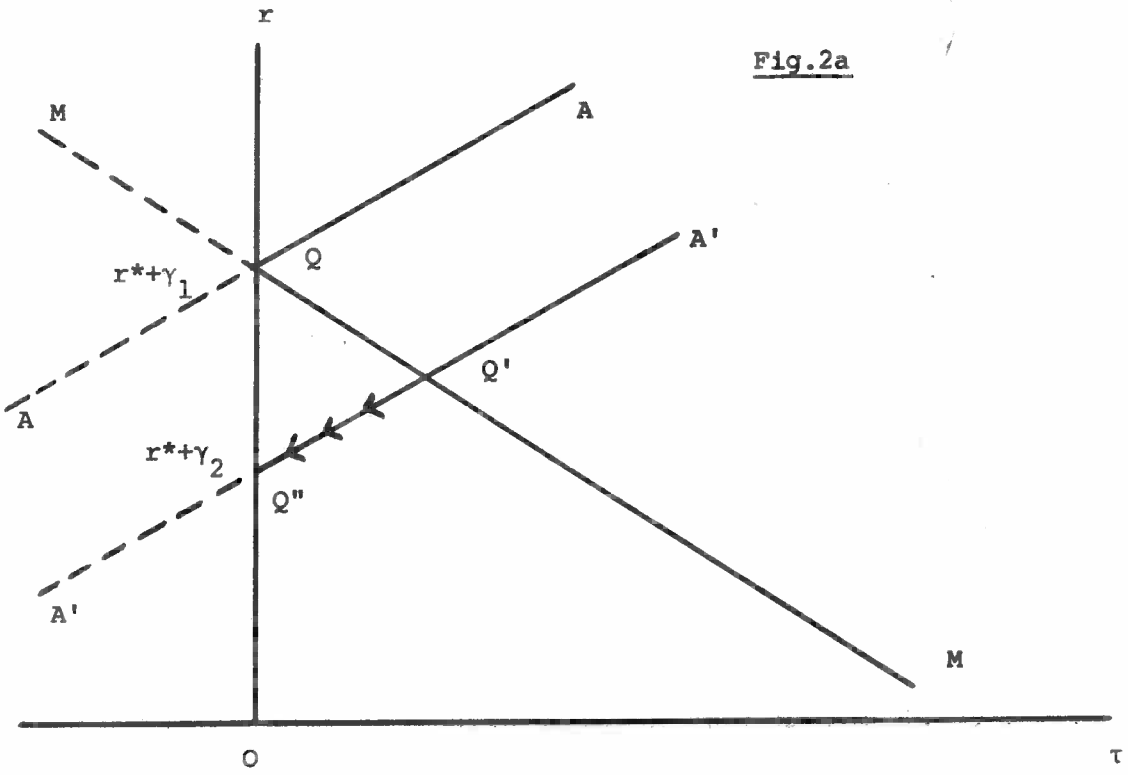
It is conceivable that when the balance of net foreign assets is small, lenders run out of foreign assets before the point S is reached. This may yield a short run "autarky" equilibrium at H , which corresponds (33), where it pays neither to borrow nor to lend in foreign markets. In this case the CIT is partially successful since it prevents the exchange rate to appreciate all the way to S .

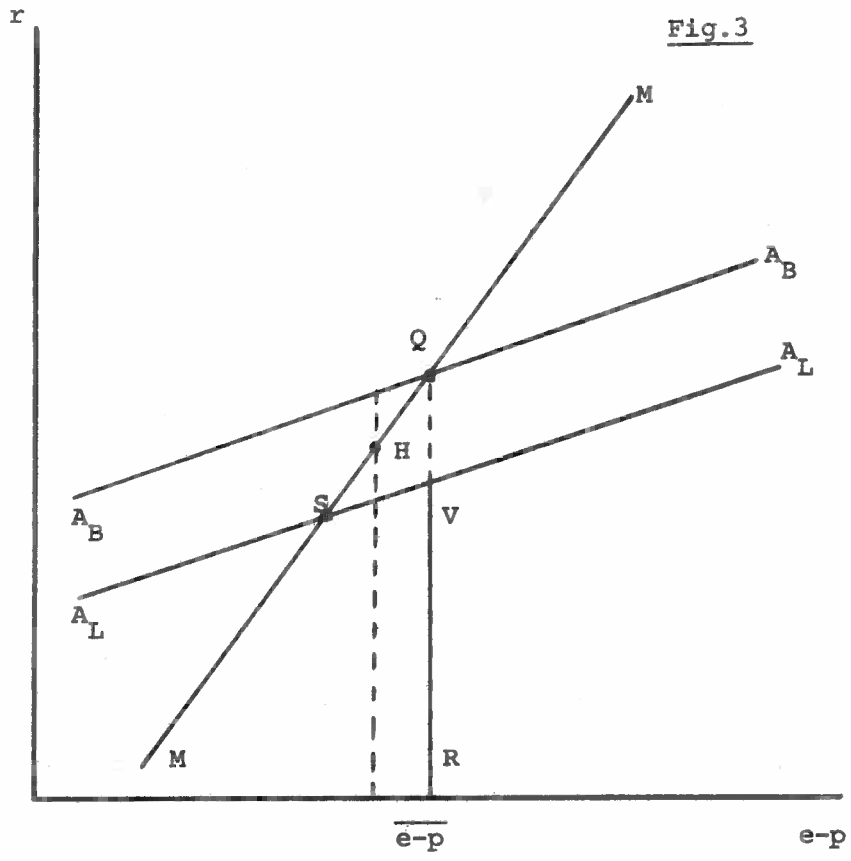
It should be pointed out that the government may use an alternative method of intervention as a substitute for a subsidy on foreign lending. Take the case where the country is a net lender so that the CIT is ineffective, as we noted earlier. As we have seen the problem in this case arises from sales of foreign exchange resulting from liquidation of foreign loans in order to buy domestic bonds. Now suppose that the central bank purchases this influx of foreign exchange and at the same time provides a supply of new government bonds. The reduction in foreign lending will then be switched to increased holdings of government bonds. This swap does not affect the stock of money and does not entail any pressure on the exchange

rate.

This is in fact the answer of the monetary authorities in Israel to the one sidedness of the CIT. When this method is adopted the country will always be in a situation of a net borrower so that the CIT can work.







FOOTNOTES

1. See Bank of Israel, Annual Report, 1978.
2. In a recent paper Calvo and Rodriguez (1977) show that even with flexible prices (but momentarily rigid money supply) a reduction in γ will cause on impact a real appreciation in a full employment two section economy, with substitutability between foreign and domestic currencies.
3. The equation for w is of the form

$$w^2 - \frac{(\beta\lambda - \phi)\delta - \alpha - \sigma\beta(1-\alpha)}{[\delta\lambda - \alpha(1-\alpha)\sigma]\beta} w - \frac{1}{[\delta\lambda - \alpha(1-\alpha)\sigma]\beta} = 0$$

Hence if $[\lambda\delta - \alpha(1-\alpha)\sigma] > 0$ then w has one positive and one negative real root.

4. The case where σ is strictly equal to zero implies in our model that in the controlled system the reduced γ has to be compensated permanently by τ equal to the reduction in γ . This will maintain not only $(e-p)$ but also $(m-p)$ and y at the original steady state level. Since we wish to consider the CIT as a temporary measure, designed for the transition period, we shall not consider the possibility of $\sigma = 0$ in our model.
5. This can be seen in footnote 3.

REFERENCES

1. R.E. Caves and R.W. Jones, World Trade and Payments, Little, Brown and Company (1973).
2. R. Dornbusch, "Expectations and Exchange Rate Dynamics", Journal of Political Economy, 1976, Vol. 84, pp. 1161 - 1176.
3. G.A. Calvo and C.A. Rodriguez, "A Model of Exchange Rate Determination Under Currency Substitution and Rational Expectations", Journal of Political Economy, 1977, Vol. 85, pp. 617 - 625.