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THE WELFARE ECONOMICS OF DEBT SERVICE

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ABSTRACT

This paper analyzes some of the implications of the dual transfer a debtor nation must undertake to service foreign debt: (a) an internal transfer from the private sector to the public sector; and (b) an external transfer from the domestic economy to foreign creditors. It shows that, under likely circumstances, a real depreciation of the home currency may complicate the internal transfer. As long as non-traded goods are a net source of revenue for the government, the depreciation called for by debt service deteriorates the public sector's terms of trade vis-a-vis the private sector and magnifies the requisite fiscal retrenchment. The paper discusses the role of trade policy (tariffs and export subsidies) in substituting for devaluation. Generating a private-sector surplus via interest-rate policy is shown to have similar costs on the government budget when the public sector has outstanding domestic debt.

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I. Introduction

Since the onset of the debt crisis in 1982, the requirement of prompt debt service has overwhelmed many other traditional objectives of government policy in highly-indebted countries. The virtual halt in commercial bank lending has reversed the sign of net resource inflows to developing countries, necessitating the transfer abroad of several percentage points of GDP annually. A reverse transfer of such magnitude has required a retrenchment in domestic expenditures and sharp changes in relative prices, which have proved particularly costly in terms of capital formation and (it would appear) income distribution.

Debt service typically involves two kinds of transfers. Commonly, foreign debt is largely the liability of the public sector, whereas the main source of foreign exchange earnings is the private sector. Consequently, it is now well-recognized that debt service entails an internal transfer of resources from the private sector to the public sector, alongside the external transfer from the latter to foreign creditors.[1] As in the two-gap style of analysis, the level of debt service is constrained by whichever of the two transfers happens to bind. When the internal transfer is the binding constraint, for example, the inability of the government to raise resources will be reflected in an ex-ante private-sector surplus, which in equilibrium may dissipate itself via such channels as capital flight, inflation, or

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1. This point has been made forcefully by Jeffrey Sachs. See, for example, Sachs (1987, pp. 21-22). See also Dornbusch (1985, pp. 348-352).

increased private consumption.

Another way of stating the same issue is that debt service entails a public-finance problem intertwined with a transfer problem. The economy has to generate a surplus of traded goods, and the government has to extract additional resources from the private sector. The internal-transfer aspect, in turn, raises interesting issues for one reason alone, and that is that the requisite fiscal retrenchment is likely to be costly.

Of course, the cynical view is that the burden of fiscal contraction will be borne by scheming bureaucrats and bloated government programs, and that it will therefore contribute a net gain to social welfare. But a more balanced appraisal would be that a quick turnaround in the fiscal stance is likely to generate important social inefficencies. There are plenty of reasons for this. First, and most obviously, any increase in taxes will be accompanied by their usual allocative distortions. On the expenditure side, since an important component of current spending is targeted on social equity objectives, a squeeze on such spending will likely reduce social welfare. A reduction in public investment expenditures, the most likely initial casualty of an increse in debt service obligations, will jeopardize capital formation and future growth. If the public sector resorts to the inflation tax and/or domestic borrowing instead, the stage may be set either for an explosion in inflation or for a sharp rise in real interest rates that might put the domestic debt on an unsustainable course.

This paper works out some of the implications of the co-existence of the internal transfer with the external one. In section II below, I show in the

context of a simple small-open economy model how any increase in debt-service must be accompanied by an enlarged extraction of private resources by the public sector. I also show that in the absence of fiscal retrenchment, the impact of a devaluation on debt service will be annulled by domestic inflation, capital flight, or both. Section III discusses in more detail the welfare costs of debt service when fiscal retrenchment is costly. The key point here is that the external transfer involves a neglected additional cost: the real exchange-rate depreciation called for by debt service deteriorates the public sector's terms of trade vis-a-vis the private sector, and magnifies the requisite fiscal retrenchment. Drawing an analogy with the literature on the transfer problem, debt service involves a "secondary burden" for the domestic economy, not because the country's external terms of trade deteriorate (which they don't in a small country context) but because the internal terms of trade move against the public sector.

In section IV, I discuss some intertemporal issues in a two-period version of the model. I stress that bringing debt service forward in time has an additional welfare cost when, as is common, the domestic interest rates exceed the interest rates on foreign debt. Moreover, with pre-existing domestic government debt, early repayment of foreign debt further deteriorates the public sector budget (and welfare) by pushing domestic real interest rates up. Section V discusses the role that trade policy, and in particular tariffs and export subsidies, can play in alleviating the welfare loss. Not surprisingly, a small level of tariffs is found to be welfare enhancing, both because tariffs raise government revenue and because they partially substitute for (costly) real depreciation. Paradoxically, however, export subsidies can increase welfare as well, when targeted on non-traditional exports with large

supply elasticities, since their beneficial role in substituting for real depreciation can offset their direct budgetary burden. Finally, section VI provides some concluding comments.

II. The Implications of the Twin Transfers

We start with the simplest model of a small open economy. The economy produces two kind of goods, traded goods (with price e) and non-traded goods (with price p). The real exchange rate is the conventional one, given by e/p. The government does not engage in production, nor does its behavior affect private sector welfare directly. Its primary surplus (i.e. excluding debt service) as a share of gross domestic product is given by τ. In the simplest case, we could think of this as a uniform production (or value added) tax at rate τ. More generally, we will not be particularly concerned with the specification of taxes and government expenditures, letting τ denote simply the net resource transfer from the private to the public sector (as a share of GDP). The implicit assumption here is that the government's pattern of revenues and expenditures (excluding debt service) match that of the private sector. This seems like the natural assumption to make. In any case, as will be explained below, the results hold for much more general specifications.

Since the model of this section is static, we assume that the private and public sectors have (exogenous) debt-service requirements of B_p and B_g (in terms of traded goods), respectively. We let E(e, p, V) stand for the private sector's expenditure function, with V denoting the level of private (and for now, social) welfare. The supply side of the economy is described by the revenue (or GDP) function R(e, p). Then the following three equations determine fully the equilibrium of the economy:

(1) $E(e, p, V) = (1-\tau)R(e, p) - eB_p$

(2) $R_e - E_e = B_p + B_g$

(3) $\tau R(e, p) = eB_g$

The first of these states the income-expenditure identity for the private sector. The second uses the fact that partial derivatives of expenditure and revenue functions yield the relevant (compensated) demand and supply functions to state the balance-of payments identity. Notice that the private sector, the only productive sector of the economy, has to generate the traded-goods surplus to service both the government and its own foreign liabilities. Equation (3), in turn, states the public-sector budget identity: the government's primary surplus has to equal its debt service. The equlibrium condition for the non-traded goods market need not be stated separately, as (by Walras' law) it is already implied by (1)-(3).

Notice that since only relative prices matter, we could have stated the system in terms of the real exchange rate (e/p) alone, as will be done in the following sections. For now, I keep e and p separate, as they will have the convenient interpretations of "nominal" exchange rate policy and the economy's response to it, respectively, for the kind of exercises to be carried out in the present section.

The system above represents three independent equations that will determine three variables, of which V is one. What the other two endogenous variables are depends on the question of interest. Suppose, the objective of policy is to service an additional amount of public debt, dB_g. Assume further, with no loss of generality (as only e/p matters), that p is fixed at unity. B_p is outside the government's control. Then achieving the target

increase in public debt service requires not only an exchange-rate policy (a real depreciation), but an increase in τ, the public sector surplus. In other words, e and τ both have to be endogenously determined, given B_p.

To see the nature of the interrelationships, we differentiate totally (1)-(3). After substituting out for dV--we will return to welfare effects in the next section--we are left with a system in two endogenous variables, e and τ:

$$(4) \quad \begin{bmatrix} (\tau R_p)/e & R \\ (E_{ee} - R_{ee}) & 0 \end{bmatrix} \begin{bmatrix} de \\ d\tau \end{bmatrix} = \begin{bmatrix} -e \\ -(1-\eta_t c_{ty}) \end{bmatrix} dB_g.$$

Here η_t denotes the share of tradables consumption in GDP (eE_e/R) and c_{ty} denotes the income elasticity of demand for tradables, so that $(1-\eta_t c_{ty})$ is positive. The determinant of the system, denoted by $\Delta \equiv R(R_{ee} - E_{ee})$, is also positive since E(.) is (strictly) concave and R(.) (strictly) convex in e. The real exchange rate depreciation called for by the increased debt service requirement can be calculated as:

$$(5) \quad de/dB_g = (R/\Delta)(1 - \eta_t c_{ty}) > 0.$$

This is the conventional depreciation required to get the economy to generate the additional traded goods; τ appears nowhere in this expression.

The new aspect, of course, is that alongside the depreciation, the external transfer requires an increase in the public sector primary surplus:

$$(6) \quad d\tau/dB_g = (1/\Delta)\ [e(R_{ee} - E_{ee}) + (1-\eta_t c_{ty})(\tau R_p/e)] > 0.$$
$$\qquad\qquad\qquad\qquad\qquad\qquad (a) \qquad\qquad (b)$$

Using the definition of Δ, we note that the <u>elasticity</u> of τ with respect to the debt service requirement exceeds unity:

$$(6') \quad (d\tau/\tau)/(dB_g/B_g) = 1 + [e^2(R_{ee} - E_{ee})]^{-1}(1-\eta_t c_{ty})\tau R_p > 1.$$

This is beacause the increase in τ has two components. The first, labeled (a), is simply the value of the additional traded goods generated in the economy (excluding the income effect).[2] The government surplus has to rise one-for-one to transfer these traded goods abroad. But, there is a second effect, labeled (b), which represents the public-sector income loss that has to be made up as a consequence of the deterioration of the government's terms of trade vis-a-vis the private sector. This income loss is proportional to the rate of <u>real</u> depreciation--compare equation (5)--and to τR_p. R_p is the economy's output of non-traded goods and τ is the government's net claim on it (as a share of output). Hence, as long as the public sector's revenues from non-traded goods exceed its expenditures on them, the real depreciation required to generate the private-sector surplus has an additional burden on the public budget.[3] The requirement would be clearly satisfied when government expenditures are nil, and τ represents the economy-wide tax rate.

More generally, we can think of τ as a vector of "net" tax rates on commodities, i.e. revenues from each group of commodities <u>minus</u> expenditures. Then, a real depreciation entails an income loss for the public sector (and an

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2. This can be seen from the total differential of equation (2): $(R_{ee}-E_{ee}) - E_{eV}dV = dBg$. The second term on the left-hand side is the income effect on demand for tradables.

3. Dornbusch (1987) expresses the budget deficit in reduced form as an increasing function of the real exchange rate, arguing that "the real value of the service of an external debt contracted in dollars will increase when the real exchange rate depreciates" (p. 68). As the discussion in the text shows, the former does not necessarily follow from the latter, as compensating increases in real revenues (and declines in real expenditures on non-debt items) also have to be taken into account.

offseting gain for the private sector) whenever the non-traded goods component of this vector is positive. For a government that has to generate a primary surplus, this will likely be the case.[4] Notice that what is required here is only that non-traded goods be a source of net revenue for the government; with respect to traded goods, the primary budget of the government could be either in surplus or in deficit.[5] When such is the case, then, a real depreciation worsens the government budget and requires an increase in the rate of taxation (or a reduction in the level of expenditures) to offset it. We will return to the welfare implications of this in the next section.

Since debt service depends both on the government's exchange-rate policy and on its resource-mobilization policy, a relevant question is what happens when the government fails on one of the two fronts. The more interesting case is the one where exchange-rate policy is not supplemented by a sufficient increase in the primary surplus of the government. This is a realistic scenario since, as shown above, the government now has to generate additional income not only to accomplish the transfer abroad, but also to restore the

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4. To see this, suppose that non-tradables make up 70 percent of the economy. Assume, contrary to the case envisaged here, that non-tradables are not a net source of revenue for the government. Then, to generate a primary surplus of five percent (of GDP), the government would have to impose a "net" tax rate of at least 16.7 percent (0.05/[1-0.7]) on tradables. Of course, in countries where government revenues derive to a large extent from exports of natural resources, the presumption would be that the effect of real depreciations go the other way.

5. Of course, the overall budget identity requires that the government have a deficit in traded goods if it has a surplus in non-traded goods. But when the relevant budgetary concept is the primary budget (revenues and expenditures excluding debt service), the government can, and typically will, have a simultaneous surplus in both traded and non-traded goods.

erosion of its real revenue base as a consequence of the real depreciation. When such resource mobilization proves impossible, the internal transfer becomes the binding constraint on debt service. The question is: how does the economy then adjust to equate the ex-post surplus of the private sector with the ex-post transfer from it to the public sector?

With no loss of generality, suppose that τ is now fixed. (Any level of τ that falls short of the requirement expressed in (6) will do.) If the level of public debt service (B_g) is also taken as exogenous, the system expressed in (1)-(3) clearly becomes under-determined. There is no way to guarantee that a pre-specified level of B_g can be transferred abroad.

The following thought experiment illustrates the likely consequences for the economy. Suppose the government depreciates the "nominal" exchange rate ($de > 0$) with a view towards acomplishing the external transfer, but that τ remains unchanged. The level of public debt service, B_g, now can be viewed as an endogenous consequence of (exogenous) exchange-rate policy. What are the two other endogenous variables? V is clearly one such variable. With respect to the other, however, the system expressed in (1)-(3) allows us a choice of p or B_p. I take up each in turn.

Case 1: Inflation. In the first case, we treat private sector capital inflows/outflows as exogenous, but allow the nominal price of non-traded goods to move. The outcome is now obvious. It can be checked easily that all variables of interest (V and B_g in particular) are homogeneous of degree zero in prices. Therefore, the new equilibrium is given by $dp/p = de/e$ and $dB_g = dV = 0$; exchange rate policy is undone by a proportional rise in domestic prices, and the initial nominal depreciation ends up transferring no additional resources abroad. It is inflation which eliminates the ex-ante gap

between the private sector surplus and the (unchanged) government primary surplus.[6] In a real model like this one, the real transfer of resources abroad remains unaffected. But in a monetary framework, the nominal devaluation would be tantamount to an expansion of the money supply, and the consequent inflation would generate some seignorage revenues. This in turn would allow some increase in the level of the external transfer, although not by the full amount intended by the devaluation.

Case 2: Capital Flight. To see how the alternative adjustment mechanism works, we now hold p fixed and allow B_p to vary. I will suggest an interpretation for this scenario below. The endogenous variables that respond to changes in e now are V, B_p, and B_g. Under these conditions, the effect on public debt service can be ascertained directly from (3):

$$(7) \quad dB_g = -(\tau R_p/e^2)de.$$

In words, the external transfer of the public sector now falls, by the full amount of its terms-of-trade deterioration. The public sector has been impoverished by the real depreciation and has to reduce its debt service. What is the outcome for B_p? Remember that B_p is the private sector's debt service; it is the net reduction in the private sector's foreign liabilities, or alternatively the net increase in its foreign assets. Solving the system for B_p yields:

$$(8) \quad dB_p/de = \{(R_{ee} - E_{ee})(1 - \eta_t c_{ty})^{-1} + (\tau R_p/e^2)\} > 0.$$

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6. In a discussion of Brazil's case, Cohen seems to suggest that inflation is a symptom of a more successful adjustment on the external front than on the internal front. This can be interpreted along the lines sketched out in the text. See Cohen (1988, pp. 93-94).

The exchange-rate depreciation leads to a build-up of the private sector's net foreign assets. There are two additive effects here moving in the same direction. First, the depreciation allows the private sector to generate a surplus of traded goods (first term in curly brackets), which can be used for capital flight in the absence of an increased rate of taxation. Second, the depreciation also increases the real income of the private sector by shrinking the real "tax base" (second term in curly brackets), and this net increase in income can also be used to build up assets abroad. Consequently, the resulting capital flight is larger than the public debt-service which would have occurred had τ been increased alongside e.[7] This is one possible interpretation of how substantial real devaluations and trade surpluses can co-exist, as in Mexico in 1984-85, with no improvement in the overall debt situation.[8]

One does not need a fancy dynamic model to generate this capital-flight possibility as an equilibrium outcome of an inter-temporal decision framework. Suppose the domestic interest rates are fixed by arbitrage with foreign capital markets. With sluggish adjustment in p, the devaluation generates an ex-ante excess savings in the private sector.[9] Since domestic interest rates

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7. The terminology I use here is clearly not without normative overtones: a decrease in the public sector's net foreign liabilities is called "debt service", whereas an analogous change for the private sector is called "capital flight." This is common terminology, however.

8. See Sachs (1987), p. 22.

9. Of course, it is not immediately clear that the devaluation on its own would generate additional private savings in a dynamic framework. I consider this case because a devaluation policy makes sense only when it does. Perhaps the simplest case to consider is the one with unemployed resources in the

cannot fall, the excess savings are used to build up foreign assets.

These two cases are of course only illustrations of the possible outcomes that await a policy which tackles the external transfer without tackling the internal one. A well-intentioned exchange rate policy can be dissipated in inflation and/or capital flight in the absence of adequate public-sector resource mobilization. Significantly, the real depreciation aggravates the requisite resource mobilization, as it deteriorates the public sector's terms of trade vis-a-vis the private sector.

In the absence of a more fully articulated model, it is impossible to tell exactly what combination of inflation and capital flight will actually occur. In particular, a serious treatment of capital flight requires an intertemporal framework. Nonetheless, the central point is clear even in this simple framework: when it is not accompanied by fiscal tightening, the "appropriate" exchange-rate policy can end up validating an ex-ante motive for capital flight, and be inflationary.

III. Welfare Consequences of Debt Service

The previous section analyzed the circumstances under which a specified level of debt service could be accomplished. The present section concentrates on the welfare consequences of doing so. Accordingly, in what follows I will assume that the requisite public-sector resource mobilization always takes

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economy. The devaluation would then spur domestic income and increase savings. Alternatively, the devaluation could be viewed as a temporary increase in the price of traded goods, in which case consumers would want to transfer some of their consumption to the second period provided the intertemporal elasticity of substitution is sufficiently larger than the intra-temporal substitution elasticity. See Svensson and Razin (1983) for a discussion of the issues.

place. The question I pose is: what is the welfare cost of an additional unit of debt service, when fiscal retrenchment is a source of social inefficiency?

The previous section did not explicitly allow for changes in r to have direct welfare consequences. As pointed out in the introduction, the nature of the costs imposed by an increase in r is generally a source of debate. These costs can range all the way from the traditional allocative distortions imposed by tax wedges to wider political costs engendered by shifts in governmental priorities, entitlements, and income distribution. Given the broad spectrum of issues involved here, I prefer to take an agnostic view and model these costs in a general but ad-hoc manner. I write social welfare as follows:

$$(9) \quad W = V - \phi(r), \qquad \phi' > 0, \quad \phi'' > 0.$$

The cost of fiscal tightening enters additively in the social welfare function. This implies that, as a first approximation, the impact of fiscal policy on relative prices can be ignored. For all its disadvantages, this specification avoids misplaced concreteness of the sort that would prevail had we attributed the costs to a well-specified, but particular source.

The rest of the model remains as before, with three cosmetic changes. First, we arbitrarily set the price of traded goods to unity, with p now denoting the <u>inverse</u> of the real exchange rate. Second, we denote by B the total debt service requirement of the economy, with γ the public sector's share in it. I will treat both B and γ parametrically. Third, we replace the balance-of-payments identity with the condition for equilibrium in the non-

traded goods market. The rest of the model can now be written as follows:

(10) $E(1, p, V) = (1-\tau)R(1, p) - (1-\gamma)B$

(11) $R_p - E_p = 0$

(12) $\tau R(1, p) = \gamma B.$

The four endogenous variables are p, τ, V, and W.

We investigate the consequences of an increase in the debt-service obligations of the economy. As discussed in the previous section, the real exchange rate has to depreciate, and the analogue of expression (5) in the present context is:

(13) $dp/dB = -[p(R_{pp} - E_{pp})]^{-1}(\eta_n c_{ny}) < 0.$

Here η_n is the share of non-tradables production in GDP, and c_{ny} is the income elasticity of demand for non-tradables. The change in private welfare is given by:

(14) $dV/dB = -\lambda < 0,$

where λ ($= 1/E_V$) is the <u>private</u> marginal utility of income. But social welfare is also a function of what happens to τ:

(15) $dW/dB = dV/dB - \phi' d\tau/dB$

$= -\{\lambda + (\phi'/R)[\gamma - \tau R_p(dp/dB)]\} < -\lambda < 0.$

where dp/dB is as expressed in (13). The expression in curly brackets can be interpreted as the <u>social</u> marginal utility of income, and is higher than the private marginal utility of income beceause transferring resources from the private to the public sector is costly. Notice that the wedge between the

private and social valuations of income has two components. One part has to do with the direct increase in the requisite internal transfer, and is proportional to γ, the share of the public sector in total foreign liabilities. The other part captures the social valuation of the public sector's real income loss as a result of the real depreciation, and is proportional to the rate of the depreciation.

Therefore, the social cost of debt service is magnified whenever the public sector holds foreign debt, or when non-tradables are a net source of revenue for the public sector. Typically both set of circumstances will apply. The determinants of the magnitude of the welfare cost can be read from (13) and (15): the welfare cost of debt service increases with the share of debt held by the public sector (γ), the size of the primary surplus of the government, and the share of non-traded goods in the economy; it decreases with the extent of price-responsiveness in the economy.

There is an interesting parallel here with the literature on the transfer problem.[10] It is well-known from this literature that a transfer from one country to another involves a "secondary burden" for the donor country insofar as the transfer requires a deterioration in its terms-of-trade, which it will if the sum of the marginal propensities to import fall short of unity. Here there is a similar secondary burden, except that this arises from a change not in the external terms of trade, but in the internal terms of trade. When fiscal retrenchment is costly, a unit of income in the public sector is socially more valuable than a unit of income in the private sector. The problem with the real depreciation is that it transfers income in the wrong

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10. For a discussion and references, see Jones and Neary (1984, pp. 7-9).

IV. The Role of Domestic Debt

The secondary burden of debt service does not arise solely from a real exchange rate depreciation. A rather similar scenario is played out, for a different reason, when the government has a pre-existing stock of domestic debt. To see this, we now turn to an alternative mechanism for generating a private sector surplus: an increase in the domestic real interest rate. Typically, real interest rates will be jacked up alongside devaluations, but in the present section we will look at the first alone. We will see that the requisite rise in interest rates deteriorates the public sector's terms of trade in much the same way that a real depreciation does.

To abstract from real exchange rate movements, I simplify the model above by lumping traded and non-traded goods into a single domestic good. The inclusion of a second period (the future), to capture simple savings dynamics, compensates for the simplification. Therefore the modified model still has two goods: today's goods and tomorrow's goods. The relative price of future goods is denoted by δ, which is also the economy's real discount factor (one over one plus the real consumption rate of interest). The government enters period one with a pre-existing net stock of domestic debt D_o, which comes due in the second (and last) period. It can undertake an additional amount D of new domestic borrowing (or amortization if D is negative) during period one. The private sector cannot borrow from or lend abroad.

Under these conditions, the model is given by:

$$(16) \quad E(1, \delta, V) = (1-r^1)q^1 + \delta(1-r^2)q^2 + D_o$$

(17) $q^1 - E_1 = \theta B$

(18) $r^1 q^1 + D = \theta B$

(19) $r^2 q^2 = (D+D_o)/\delta + (1-\theta)B/\delta^*$.

By appeal to full employment, we fix the level of output in the two periods, q^1 and q^2. B refers to the outstanding stock of foreign debt held by the public sector; θ is the share which comes due in the first period. Equation (17) is the goods-market equilibrium for the first period; the analogous expression for the second period can be left out because of Walras' law. Equations (18) and (19) are the public sector budget constraints for the two periods, with r^1 and r^2 denoting the respective primary surpluses (as a share of GDP). Since the foreign real interest rate can differ from the domestic one, different discount factors apply to domestic and foreign debt in expression (19). Notice that there are five possible endogenous variables here (V, δ, D, r^1, and r^2), but only four equations. It is convenient to use the extra degree of freedom to set $r^1 = r^2 = r$. This does not restrict the government's ability to shift resources from one period to the other, as this can still be achieved via changes in D. Alternatively, we could have fixed r^1 to examine the implications of debt service for the long-run level of fiscal stringency. The qualitative results discussed below are not affected by the "normalization" we select here.

In this intertemporal framework, the relevant question to pose about the burden of debt service is: what are the consequences of a shift forward in time of the stream of service payments? Earlier repayment of foreign debt can be here captured by an increase in θ. The implications for welfare are then

easy to calculate:

$$(20) \quad dV/d\theta = \lambda[(\delta/\delta^*) - 1]B,$$

where λ is once again the (private) marginal utility of income. The term in square brackets can also be written as $(r^* - r)/(1+r)$, with r^* and r standing for the foreign and domestic (real) interest rates, respectively. As long as domestic interest rates exceed the world rate--or, more precisely, the average rate on foreign liabilities--earlier repayment of debt is welfare worsening. The reason is straightforward: the present value of repayments discounted at the domestic rate of interest rise, even though it remains constant when discounted at δ^*. Put differently, with $r > r^*$, the home country is borrowing too little in the first period to begin with; a larger resource transfer early on exacerbates this distortion.

The effect on the domestic interest rate can be found similarly:

$$(21) \quad d\delta = -(1/E_{12}) \, [Bd\theta + E_{1V}dV],$$

the sign of which is in general ambiguous as the substitution and income effects go in opposite directions. On the one hand, the increase in θ requires a larger first-period private surplus, which can be generated only if δ falls (r rises). On the other, as consumer wealth is now lower, there is reduced consumption and increased savings in the first period. Provided r and r^* are sufficiently close to each other, it is reasonable to suppose that the first effect dominates and that the domestic (real) interest rate increases.

Finally, we can solve for the effect on the fiscal stance:

$$(22) \quad d\tau = (q^1 + \delta q^2)^{-1}\{[1 - (\delta/\delta^*)]Bd\theta - (D+D_o)(d\delta/\delta)\} > 0$$

(a) (b)

Note the effects labeled (a) and (b), which identify the two sources of the requisite fiscal tightening. First, earlier repayment of foreign debt deteriorates the government budget because the domestic real interest rate facing the government is higher than the corresponding one on the external debt. Secondly, the rise in real interest rates implies a secondary burden on the government budget as long as some domestic debt is carried over to the second period ($D+D_o > 0$) (Cohen, 1988, p. 88). On both accounts, government "wealth" declines, and has to be restored by an increase in the primary surplus. The social welfare consequences can be evaluated by using an equation like (9), but the losses are already evident.

V. Is There a Role for Trade Policy?

Since debt service involves simultaneously a public-finance and a transfer problem, optimal government policy has two components: (a) a real depreciation must be engineered to generate an excess supply of tradables; and (b) the tax structure must be re-designed to raise the government resources needed for public debt service at least cost. Of course, as the real depreciation will, in general, interact with the optimal tax structure, these two steps are not independent. But conceptually the internal transfer requires solving an optimal tax problem of the sort that is familiar from the public-finance literature (e.g. Newbery and Stern, 1987, chaps. 2-3). The optimal tax structure thereby obtained will not, except for in rare circumstances, involve trade taxes (see Dixit, 1985).

But in practice we are unlikely to face optimal tax structures in place; nor is re-optimization likely to be easy with every increase in the debt-service burden. Moreover, governments do frequently resort to trade policies for revenue reasons, largely due to their relative administrative ease. So the extent to which trade policies can be used effectively to reduce some of the welfare costs identified above should still be of relevance. Put differently, it is of interest to know if there are any new arguments for trade policy in the present context. In analyzing this question below, I will ignore the interactions between trade policies and distortions created by other pre-existing taxes.[11]

It is clear that a moderate level of tariffs can now be welfare enhancing. In the first instance, this is because tariffs raise revenue for the government.[12] But there is also a second reason for why tariffs would be beneficial: by raising the relative price of importables, tariffs partially substitute for real exchange rate depreciations. Put differently, an increase in tariffs allows a smaller real depreciation to generate the same amount of surplus in traded goods. Since depreciations are costly because they deteriorate the public sector's terms of trade, this is another rationale for the use of tariffs. Interestingly, this rationale also creates a role for export subsidies. On impact, a subsidy of course deteriorates the government's budget. But, just like a tariff, an export subsidy reduces the

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11. This can be justified by considering that when the pre-existing tax structure is not "optimal" the welfare effects of such interactions could go either way.

12. Edwards (1988) stresses the conflict between tariff reductions and fiscal adjustment when tariff revenues are an important part of government resources.

magnitude of the requisite real depreciation. When the subsidy is targeted on "marginal" exports with high supply elasticities, the second effect dominates and welfare is unambiguously increased. The present section demonstrates these points.

We return to the one-period model of section III, but distinguish now between importables and exportables. The modified model becomes:

$$(9) \quad W = V - \phi(\tau)$$

$$(10') \quad E(1+s,\ 1+t,\ p,\ V) = (1-\tau)R(1+s,\ 1+t,\ p) - (1-\gamma)B$$

$$(11') \quad R_p - E_p = 0$$

$$(12') \quad \tau R(1+s,\ 1+t,\ p) + t(E_2 - R_2) - s(R_1 - E_1) = \gamma B$$

The export subsidy and the tariff are denoted by s and t, respectively. Notice that the public sector budget has to be adjusted for tariff revenues and subsidy payments. In what follows, we perform comparative statics around an intial equilibrium where s=t=0.

Consider first the role of export subsidies. As before, we define the real exchange rate as $1/p$.[13] An instructive intermediate result is obtained when we look at the effects of the subsidy on the real exchange rate:

$$(23) \quad dp = (R_{pp} - E_{pp})^{-1}(E_{1p} - R_{1p})ds > 0.$$

As before, $(R_{pp} - E_{pp})$ is positive. The term $(E_{1p} - R_{1p})$ represents the increase in the excess demand, or conversely the reduction in the excess supply, of the exportable as the real exchange rate appreciates (i.e., p

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13. The "effective" real exchange rate would of course also incorporate the price effects of tariffs and subsidies. In the present context, we want to distinguish between the effects of exchange rate and trade policies.

increases), and we would normally expect it to be positive. Consequently, the effect of the subsidy is to increase p, or to appreciate the real exchange rate. The requisite change in τ is in turn given by:

$$(24) \quad d\tau = (1/R)[((1-\tau)R_1 - E_1)ds - \tau R_p dp]$$

The second term in the square brackets is the familiar terms-of-trade effect from real exchange rate changes. Now, however, this effect goes in the other direction, as the real rate appreciates. On this account alone, the subsidy allows a reduction in τ.

How about the sign of the first term, $((1-\tau)R_1 - E_1)$? This term captures the direct revenue effect of the subsidy: there is a revenue loss which equals the level of exports $(R_1 - E_1)$, part of which is made up, however, by increased tax revenues generated by the higher market price of the exportable (τR_1); the net effect is as expressed above. Now since $\tau = \gamma B/R$ (at s=t=0) and $(R_1 - E_1) + (R_2 - E_2) = B$, we can show that:

$$(25) \quad (1-\tau)R_1 - E_1 = B(1 - (\gamma\tau R_1/R)) - (R_2 - E_2).$$

Since good 2 is the importable, $(R_2 - E_2) < 0$. Also, both γ and $\tau R_1/R$ are less than one, implying $(1 - (\gamma\tau R_1/R)) > 0$. Consequently,

$$(1-\tau)R_1 - E_1 > 0.$$

The implication is that the sign of the fiscal correction expressed in (24) is indeterminate. But there is the possibility that a small subsidy will ease the budgetary burden, if the price elasticities of the exportable (see [23])

and the share of non-tradables in GDP (see [24]) are sufficiently high.

With a slight re-interpretation of our model, we can in fact obtain a more informative result. Let us think of good one as a specific exportable, rather than all exportables. In the absence of tariffs, good two then becomes a tradable composite of other exportables and of the importables. The export subsidy in question applies only to the specific commodity singled out as good one. With this interpretation, we can investigate the consequences of a small subsidy on a subset of exportables.

To fix ideas, consider a subsidy on a "marginal" exportable, that is a commodity which at the old relative prices stood at zero excess supply. Therefore initially $R_1 - E_1 = 0$, and it must be the case that

$$(1-\tau)R_1 - E_1 < 0,$$

which now implies that $d\tau/ds < 0$ on account of both terms in (24). The interpretation is as follows. A small export subsidy on commodities that are at the margin of being exported leads to negligible subsidy payments. In fact, because it raises the domestic market price of these commodities, the subsidy actually generates some net revenues. Consequently, a targeted program of export subsidies can reduce the budgetary burden through this channel as well as through the induced effects of real appreciation. The argument is of course generally valid for all commodities with small initial shares in total exports. Note further that the welfare impact of the resource misallocation caused by a small subsidy is of second-order magnitude, compared to the effect of the reduction in τ. Hence we can conclude that a moderate amount of export subsidization of non-traditional exports, particularly those with high price elasticities, is likely to be desirable as a complement to a

devaluation-cum-fiscal-stringency package.[14]

We can now turn to tariffs. The second-best argument for small tariffs is similar to the one sketched out above for subsidies, and is of course stronger insofar as tariffs unambiguously raise revenue for the government. Starting once again from an intial equilibrium with s=t=0, the response of p to changes in the tariff level is given by:

$$(26) \quad dp = (R_{pp} - E_{pp})^{-1}(E_{2p} - R_{2p})dt > 0.$$

The term $(E_{2p} - R_{2p})$ represents the increase in the excess demand for the importable as the real exchange rate appreciates (i.e., p increases), and it is normally positive. The effect on τ is:

$$(27) \quad d\tau = (1/R)[((1-\tau)R_2 - E_2)dt - \tau R_p dp],$$

which is now unambiguously negative since $(R_2 - E_2) < 0$.

One final aspect of trade policy worth discussion is the role of quantitative restrictions. Quotas, like tariffs, would tend to substitute for real depreciations and would therefore have similar benefits. But from the present pespective, quotas have two important shortcomings. First, and most obviously, they generate no direct revenue for the government in the likely case of no auctioning. Secondly, they transform what are essentially traded goods into non-traded goods by breaking the price linkages with foreign markets. Consequently, a smaller share of net government revenue remains

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14. The second-best package will involve a differentiated structure of export subsidies, along the lines of the inverse-elasticity rule. The general case can be worked out by indexing different exportables, and setting $dW/ds_i = 0$ for each commodity. But the general formulation yields no additional insight.

"indexed" to traded goods and the welfare cost of real depreciations are magnified (see equation [13] and the accompanying discussion). For these reasons, a conversion of quotas to tariffs will ease the future burden of the internal transfer.

VI. Concluding Remarks

The conventional advice to a country having to generate a resource transfer abroad is to depreciate the home currency in real terms. It is frequently neglected that such depreciations tend to have serious consequences for the fiscal balance. As long as non-tradables are a net source of revenue for the government, a real depreciation amounts to a real income loss for the public sector, which has to be compensated by a fiscal tightening over and above the magnitude of the external transfer. Paradoxically, by worsening the terms at which the government extracts resources out of the private sector, a devaluation can make it harder for the external transfer to be accomplished. A rather similar outcome obtains when real interest rates are raised to generate a private sector surplus. The increased interest burden on the government's domestic debt amounts to a terms-of-trade deterioration vis-a-vis the private sector.

Once the fiscal constraint is taken into account, room is created for some unorthodox policy combinations. In particular, trade policies that supplement devaluations by promoting exports and restricting imports can be shown, when judiciously employed, to increase welfare. These policies now have a role to play, not just because they may raise revenue for the

government, but because they allow a foreign-exchange surplus to be accumulated without exacerbating the debt-service burden in terms of domestic currency.

APPENDIX

Suppose the economy has n exportables, m importables, and a single non-tradable good. Then the income-expenditure identity for the private sector is given by:

$$(A1)\quad E(1+s_1,\ldots,1+s_n,\ 1+t_1,\ldots,1+t_m,\ p,\ V) = (1-\tau)R(1+s_1,\ldots,1+s_n,\ 1+t_1,\ldots,1+t_m,\ p) - (1-\gamma)B$$

The equlibrium condition in the non-traded goods market is:

$$(A2)\quad E_p - R_p = 0.$$

Let $\mathbf{R}_e$ and $\mathbf{E}_e$ denote the 1×n vector of partial derivatives with respect to the prices of the exportables, and s denote the n×1 vector of subsidy rates. $\mathbf{R}_m$, $\mathbf{E}_m$, and t are defined analogously. Then the government budget constraint is:

$$(A3)\quad \tau R - (\mathbf{R}_e - \mathbf{E}_e)\cdot s + (\mathbf{E}_m - \mathbf{R}_m)\cdot t = \gamma B.$$

Finally, social welfare is defined by:

$$(A4)\quad W = V - \phi(\tau)$$

To express the solutions, some further notation is helpful. First, let $\mathbf{E}_{pe}$ and $\mathbf{R}_{pe}$ stand for the 1×n row vectors of cross derivatives of exportables with respect to the price of non-tradables. Then let $\mathbf{E}_{pm}$ and $\mathbf{R}_{pm}$ stand for the 1×m row vectors of analogous cross derivatives for the importables. $\mathbf{R}_{ee}$ and $\mathbf{E}_{ee}$, and $\mathbf{R}_{mm}$ and $\mathbf{E}_{mm}$ are n×n and m×m matrices, respectively, of cross-derivatives within the exportables group. And $\mathbf{R}_{em}$ and $\mathbf{E}_{em}$ are the n×m matrices of cross-derivatives across importables and exportables. Finally,

define the following substitution matrices.

$$\sigma_{pp} = R_{pp} - E_{pp} \quad (1\times1)$$

$$S_{pe} = R_{pe} - E_{pe} \quad (1\times n)$$

$$S_{pm} = R_{pm} - E_{pm} \quad (1\times m)$$

$$S_{ee} = R_{ee} - E_{ee} \quad (n\times n)$$

$$S_{em} = R_{em} - E_{em} \quad (n\times m)$$

We can solve for the second-best structure of tariffs and export subsidies using this framework. When all tariffs are initially zero, for example, the optimal structure of export subsidies is implicitly defined by:

$$\text{(A5)} \quad dW = \{[\lambda^* + (1-\gamma)(\phi'/R)]s^T\cdot[\sigma_{pp}^{-1}S_{pe}^T S_{pe} - S_{ee}] - (\phi'/R)[((1-\tau)R_e - E_e) + \tau R_p\sigma_{pp}^{-1}S_{pe}]\}\cdot ds = 0,$$

where the superscript T indicates the transpose of a vector. λ^* here is the social marginal utility of income, and is defined as follows:

$$\lambda^* = E_W^{-1}\{1 + (\phi'/R)[s^T E_{eW} - \sigma_{pp}^{-1}E_{pW}(\tau R_p - s^T S_{pe}^T)]\} + (\gamma\phi')/R.$$

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