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THE INTERTEMPORAL EFFECTS OF INTERNATIONAL TRANSFERS

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ABSTRACT

The classical transfer problem is studied in an overlapping generations framework, where the transfer is from a creditor country to a debtor country. A distinction is made between tax-financed and debt-financed transfers on the one hand, and between the uses of the transfer on the other hand. The transfer can be used to increase private income or to reduce government debt. It is first shown that the transfer can make the welfare change in the same direction in both of the countries, and that this possibility cannot be ruled out by stability condition. It is also shown that for all transfers the short run and the long run welfare effects may be qualitatively different. The only form of transfer that in the long run surely increases welfare in the country receiving the transfer is the tax-financed debt-relief. But in the short run it will reduce the welfare in all countries. There exists thus a trade-off between short and long run welfare, since all other forms of transfers quarantee a short run welfare improvement for the receiving country. *

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I INTRODUCTION

One of the classical problems of the political economy is the problem of the burden of the national debt. The question is about the effects of current borrowing of the government on the well-being of current and future generations. The debt is regarded as a transfer of income from future generations to those who are alive now. A classical problem in the international political economy is the transfer problem: how does a transfer of income from one country to another affect the world equilibrium and the well-being in both of the countries?

In this essay I shall study these two problems jointly. I shall ask what the intertemporal effects of international transfers are. One motivation for my choice springs from the current problems facing developing countries. Much of the development aid has the characteristics of an income transfer. Similarly, many of the proposals to overcome the debt problem of the LDC's contain elements of transfers (e.g. those, which include a (at least partial) writing-off of the debt). Hence, one may ask, whether the transfer should be made in the form of a transfer of income, or in the form of a debt relief. Due to the importance of government debt in the LDC debt, I consider the debt relief in the form of a transfer of income to the government. The income transfer is a transfer of income to the citizens of the debtor countries. The second motivation for my study springs from the current lively debate concerning the proper level of public debt in DC's. It is thus natural to ask whether the transfer (in which ever form it is made) should be financed by issuing new debt, or by increasing taxation in the transferring country.

These issues can be studied in a compact form in the overlapping generations model. But for a meaningful study I need a framework, where the form of financing government revenue matters. Thus, I cannot use the framework adopted by Barro (1974). Instead, I can use the version of the OLG-model developed by Diamond (1965), which has been extended to allow for both private and public external borrowing. These extensions are due to Buiter (1981) and Persson (1985). In the next section I shall present the model. Thereafter, I proceed to study the effects of the possible transfers (i.e. of tax-financed debt reliefs, and debt-financed income transfers).

Kemp and Kojima (1985) have studied similar issues using the ordinary static trade theory. They show that if the transfers are "tied" (in the sense that they are either financed or spent inefficiently), then the effects of the transfers may be perverse. My analysis extends these considerations to a dynamic framework.

II THE MODEL

The world consists of two countries, a debtor nation and a creditor nation. The variables referring to the latter are marked by a *-superscript. First consider the debtor nation. At each period it is populated by citizens from two generations, one born and working in the current period and the other born in the previous period and retired in the current period. The population growth rate is $(1+n)\geq 1$. The income of the young is the net wage income from current production. They allocate it to current consumption and to savings. The income of the old is determined by their savings. The old spend all their income (a generation lives two periods). The budget constraint facing the currently (period t) representative young (all members of all generations are assumed to be identical) is:

$$(1) \qquad c_t + c_{t+1}/(1+r_{t+1}) = w_t \ ,$$

where c_t = current period consumption of the youngster, c_{t+1} = consumption in the next period, r_{t+1} = real rate of return on savings made in period t, and w_t = net wage income. Maximization of the lifetime utility $u(c_t,c_{t+1})$ (which is assumed to have all the standard properties) gives the current consumption and the saving as $c_t = c(w_t,r_{t+1})$, $s_t = s(w_t,r_{t+1})$. The next period consumption is $c_{t+1} = (1+r_{t+1})s_t$. The properties of the saving function are assumed to be the following: $s_r>0$ and $0\leq s_w<1$ (which holds if consumption in both periods is a normal good). Finally, the optimum choices yield the indirect utility function, $u_t = u(c_t,c_{t+1}) = \underline{V}[w_t,1/(1+r_{t+1})] \equiv V(w_t,r_{t+1})$, with $V_w,V_r>0$. The savings can be invested either in physical capital K, in government bonds (G and G^*) or in net borrowing from abroad (H, with $H>0$ indicating that borrowing exceeds lending). All these three forms of investment are perfectly subsitutable.

Both of the countries produce one identical good with the help of capital (K) and labour (L) (of which labour is not internationally mobile). The current period production in the debtor nation is Y_t. Assume that the production utilizes a constant returns to scale -technology. Production per currently young is thus

$$(2) \qquad y_t = f(k_t),\ y_t \equiv Y_t/L_t,\ k_t \equiv K_t/L_t,$$

where $f'>0, f''<0$.

The current period capital stock was determined by the savings decisions of the currently old. Hence, it cannot be affected by the decisions of the currently young. Instead, their decisions determine the capital stock in the next period. The production is organized on the basis of perfect competition. Thus, the gross wage of the currently young is

$$(3) \qquad \underline{w}_t = f(k_t) - k_t f'(k_t),$$

and the next period capital stock is determined from

$$(4) \qquad f'(k_{t+1}) = r_{t+1}$$

Equation (4) implies that $k_{t+1} = k(r_{t+1})$, with $k' < 0$. The net wage of a currently young is

$$(5) \qquad w_t = \underline{w}_t - \beta_t + l\mu_t,$$

where β_t = net tax imposed by the government (excluding the international transfers), and μ_t = the international transfer, of which 100xl% is given as an income transfer, $0 \leq l \leq 1$.

Capital formation and government borrowing must be financed by the savings of the young and by the foreign borrowing. Or, the capital stock, the outstanding government debt and the foreign debt must be held by the currently young (since the currently old do not save at all). Thus,

$$(6) \qquad K_{t+1} + G_{t+1} - H_{t+1} = L_t s_t$$

where $L_t s_t = A_{t+1}$ = net private wealth at the beginning of the next period. In per (t+1)-young terms (6) can be written as

$$a_{t+1} = k_{t+1} + g_{t+1} - h_{t+1} \tag{7}$$

We also have

$$a_{t+1} = s_t/(1+n). \tag{8}$$

The government budget constraint is

$G_{t+1} = (1+r_t)G_t - L_t\beta_t - (1-l)L_t\mu_t$, or

$$(1+n)g_{t+1} = (1+r_t)g_t - \beta_t - (1-l)\mu_t, \tag{9}$$

where $(1-l)\mu_t$ = transfer of foreign income to the government. If l=1, the foreign income is transferred completely to the currently young in the debtor country (i.e. it is a "poverty relief"). If l=0, the transfer μ_t is made completely to the debtor country government (i.e. it can be regarded as a "debt relief").

Finally, the current account deficit in the debtor country (CA) (and in every other country) is equal to the increase in foreign borrowing, $CA_t = H_{t+1} - H_t$, or in per young -form:

$$ca_t = (1+n)h_{t+1} - h_t. \tag{10}$$

Since, by definition, the trade balance deficit, TB, satisfies the relation $CA_t = TB_t + r_t H_t - L_t\mu_t$, we get

$$tb_t = ca_t - r_t h_t + \mu_t. \tag{11}$$

Analogous equations hold for the creditor nation. The net wage equation for it is

$$w_t^* = \underline{w}_t^* - \beta_t^* - l^*\mu_t, \tag{12}$$

and the government budget constraint is

$$(13') \qquad (1+n)g_{t+1}^{*} = (1+r_t)g_t^{*} - \beta_t^{*} + (1-l^{*})\mu_t.$$

(Notice, that capital is assumed to be perfectly mobile between the countries. This implies that interest rates are equalized.)
If $l^{*} = 1$, the transfer μ_t is completely financed by taxes on the currently young in the creditor country. If $l^{*} = 0$, the transfer is debt financed. (Note also that I assume $n = n^{*}$ in order to get a steady state where both countries have an impact on the world economy. I also assume that $L_t = L_t^{*}$ for simplicity.)

Since the world as a whole is a closed economy, there cannot exist net private international debt. Thus, the world economy equilibrium condition is that

$$(14') \qquad H_{t+1} + H_{t+1}^{*} = 0, \text{ for all } t+1, \text{ or}$$

$$(14) \qquad h_{t+1} + h_{t+1}^{*} = 0.$$

This can be written in a more transparent form as

$$(15) \qquad k_{t+1} + k_{t+1}^{*} + g_{t+1} + g_{t+1}^{*} =$$

$$= [1/(1+n)]\{s(w_t, r_{t+1}) + s^{*}(w_t^{*}, r_{t+1})\}.$$

It is easy check, that if (15) holds, then also the goods market clears (and vice versa). Equation (15) is the equation that determines the interest rate r_{t-1}.

The equations presented thus far determine the "short run" effects of the transfers. But the long run of steady state effects are also of interest. To study them, one must specify the transfer policy over time and the budgetary policies pursued by the national governments. About the transfers I assume that they are made only in the current period, $\mu_t > 0$, $\mu_{t-1} = \mu_{t+1} = 0$, i=1,2,... . About the budgetary policies I assume that the governments stabilize the per capita level of debt after the transfer. This is a standard assumption used in the literature (see e.g. Persson (1985) and the references given there), but in the present context (I refer to current events in both the DC's and LDC's) this may be the most reasonable assumption (at least normatively). Hence, the taxes $ß_{t+1}$ are determined by $ß_{t+1} = (r_{t+1}-n)g_{t+1}$, and so on. Analogues equation holds for the creditor nation. The steady state equations can now be given for the debtor nation as

(16) $y = f(k)$

(17) $f'(k) = r,$

(18) $\underline{w} = f(k)-kf'(k),$

(19) $w = \underline{w} - ß,$

(20) $a = k+g-h,$

(21) $(1+n)a = s,$

(22) $s = s(w,r),$

(23) $u = V(w,r),$

(24) $ß = (r-n)g$

(25) $ca = nh,$

(26) $tb = -(r-n)h.$

The steady state of the creditor nation can be given in similar equations. The steady state world equilibrium condition is:

$$(2') \qquad k + k^* + g + g^* = [1/(1+n)]\{s(w,r) + s^*(w^*,r)\}.$$

III. THE EFFECTS OF TRANSFERS

The model allows the study of four types of transfers. They are: tax-financed "poverty relief", debt-financed "debt-relief", tax-financed debt-relief, and debt-financed poverty relief. The first of these comes closest to the transfer usually considered in the literature. Hence, it provides a convenient starting point.

1° Tax-Financed Income Transfers

This transfer can be analyzed by setting $l=1$ in equations (5) and (9), and $l^*=1$ in equations (12) and (13). Since equation (4) (and its equivalent for the creditor country) determines k_{t+1} as a declining function of r_{t+1}, $k_{t-1}=k(r_{t+1})$, $k'<0$, (and $k_{t+1}^* = k^*(r_{t+1})$, $(k^*)'<0$), the current equilibrium rate of interest can be solved from equation (15) with the appropriate setting of l and l^*:

$$k(r_{t+1}) + k^*(r_{t+1}) + g_{t+1} + g_{t+1}^* =$$

$$= [1/(1+n)]\{s(\underline{w}_t-\beta_t+\mu_t, r_{t+1})+s^*(\underline{w}_t^*-\beta_t^*-\mu_t, r_{t+1})\}.$$

In this equation $\underline{w}_t, \beta_t, \underline{w}_t^*$, and β_t^* are determined by past decisions and are accordingly independent of r_{t+1}. Thus the equilibrium change in r_{t+1} due to the transfer is given by

$$\{(1+n)\,k'+(k^*)'-(s_r+s_r^*)\}dr_{t+1} = (s_w-s_w^*)\mu_t.$$

Since the coefficient of dr_{t+1} is negative, the effect of the transfer depends on the sign of $(s_w-s_w^*)$. If the saving propensity in the creditor country is higher than in the debtor nation, this term will be negative.

Because one reason why the other country is a creditor nation is that it has a higher saving propensity, it is reasonable to assume that

$$(28) \qquad s^*_w - s_w \geq 0.$$

With this assumption $dr_{t+1}/\mu_t \geq 0$. The rate of interest increases since the transfer reduces net savings in the world. With given levels of public debt this reduction in savings must be matched by a reduction in capital formation. This effect of the transfer on the interest rate is analogous to the terms of trade effect of the transfer in the context of the static trade theory.

The effect of the transfer on the current account of the debtor nation is

$$dca_t = (1+n)dh_{t+1} =$$

$$= [(1+n)k' - s_r]dr_{t+1} - s_w\mu,$$

which is negative: the deficit declines, and, consequently, the current account surplus in the creditor country is reduced. The effect on the trade balance deficit of the debtor country is

$$dtb_t = dca_t + \mu_t =$$

$$= [(1+n)k' - s_r]dr_{t+1} + (1-s_w)\mu_t,$$

which cannot be signed unambiguously. The real transfer is effected, i.e. the trade balance deficit increases, if the saving propensity in the debtor country is very low (so that most of the transfer is spent immediately), and if the saving propensity in the creditor nation is not "too large" (so that the rate of interest does not increase much).

Finally, the short run welfare effects of the income transfer must be considered. First, the welfare of the currently (period t) old in either country is not at all affected, since their income is not affected by the transfer. The welfare of the young in the debtor country increases

unambiguously, since their welfare is given by $u_t = V(w_t, r_{t+1})$, $V_w, V_r > 0$, and now $dw_t = \mu_t > 0$, $dr_{t+1} > 0$. The effect on the welfare of the young in the creditor nation is

$$du_t^* = V_w^* dw_t^* + V_r^* dr_{t+1},$$

with $dw_t^* = -\mu_t$ and dr_{t+1} as given above. Since V^* (and V also) satisfies all the properties of the indirect utility function, Roy's identity obtains the following form:

$$-V_{1/(1+r)}^* / V_w^* = (1+r)s^*,$$

and thus

$$V_r^* / V_w^* = s^*/(1+r).$$

Hence, the effect on the well-being of the young in the creditor nation is

$$du_t^*/V_w^* = -\mu_t + [(1+n)(k_{t+1}^* + g_{t+1}^* - h_{t+1}^*)/(1+r_{t+1})]dr_{t+1}.$$

Since $dr_{t+1} > 0$, the sign of this expression seems to be ambiguous. And it appears, that not even the stability conditions can be used to sign it. It will be shown below that the stability condition for this model is the following:

$$0 < [s_w(k+g) + s_w^*(k^*+g^*)]/[s_r + s_r^* - (1+n)(k' + (k^*)')] < 1.$$

Sufficient conditions for this to hold are that

$$0 < s_w(k+g)/[s_r - (1+n)k'] < 1, \quad 0 < s_w^*(k^*+g^*)/[s_r^* - (1+n)(k^*)'] < 1.$$

I assume these conditions to hold. The welfare effect can be rewritten as

$$du_t^*/V_w^* =$$

$$= \mu_t \{[(1+n)(k_{t+1}^* + g_{t+1}^* - h_{t+1}^*)(s_w^* - s_w)/(1+r_{t+1})A] - 1\},$$

where $A \equiv (s_r+s^*_r)-(1+n)[k'+(k^*)']$. I assume that the economy is not dynamically inefficient, i.e. that $r_{t+1}>n$. Hence, if there is no lending abroad, $h^*_{t+1}=0$, the welfare of the young in the creditor nation necessarily declines, when the economy is stable. This is the standard result in the trade theory, and the result here is completely analogous, since in the static trade theory current account deficits or surpluses are not allowed. (For the results in the static trade theory, see e.g. Woodland (1982),ch.10.) But since $h^*_{t+1}<0$ in the creditor nation, the welfare loss is not inevitable. The intuition is that the increase in the interest rate may increase the income from foreign lending to such an extent that the negative effects of the transfer are overcome. This result (though unlikely) contrasts with the results derived from more traditional models. Below it is shown that the contrast is stronger for other types of transfers. Furthermore, the world welfare, as measured by the sum of the utilities in money terms, increases, for

$$du_t/V_w + du^*_t/V^*_W = [(k_{t+1}+g_{t+1}+k^*_{t+1}+g^*_{t+1})(1+n)/(1+r_{t+1})]dr_{t+1} > 0.$$

The world as a whole is a net saver, and thus, it benefits from the increase in the interest rate.

In the next period, period t+1, there are no direct transfers, $u_{t+1}=0$. But the transfer made in the previous period has still an impact. First, the stabilization of per capita debts implies that the national taxes are set by

$$d\beta_{t+1} = g_{t+1}dr_{t+1},\ d\beta^*_{t+1} = g^*_{t+1}dr_{t+1}.$$

Thus, the transfer made in the previous period induces increases in current taxation. The effect of the transfer on the period t+1 net wage in the debtor nation is

$$dw_{t+1}/\mu_t = dw_{t+1}/\mu_t - d\beta_{t+1}/\mu_t = -(k_{t+1}+g_{t+1})dr_{t+1}/\mu_t\ ,$$

and analogously for the creditor country. The equilibrium change in the interest rate in period t+1 is thus

$$dr_{t+2}/\mu_t = \{[s_w(k_{t+1}+g_{t+1})+s^*_w(k^*_{t+1}+g^*_{t+1})]/A\}dr_{t+1}/\mu_t.$$

Since stability requires that $|dr_{t+2}/dr_{t+1}| < 1$, it is obvious that the stability condition given above is indeed the requirement for stability, i.e. we require that

$$B/A < 1, \text{ where } B = s_w(k+g)+s^*_w(k^*+g^*).$$

The effect on period t+1 current account is

$$dca_{t+1} = \{(1+n)k'(B/A)+s_w(k_{t+1}+g_{t+1})-s_r(B/A)\}dr_{t+1}/\mu_t.$$

Thus $dca_{t+1} > dca_t$, i.e. the impact of the transfer on the current account becomes weaker. The same "weakening" also holds for the levels of welfare. This is not a surprise, since the temporary tax-financed income transfer does not have any long run effects. This can be seen from equations (16)-(27) (after setting $g=g_{t+1}$ and $g^*=g_{t+1}^*$). The steady state solution is independent of μ_t, since the transfer does not have any impact on steady state exogenous variables.

2" The Debt-Financed Debt-Relief

The effects of a transfer of income from the creditor country which is financed by government borrowing and which is used to reduce the government debt in the debtor nation, can be found by using the parametrization $l=l^*=0$. Thus, the levels of government debt are changed by $dg_{t+1} = -\mu_t/(1+n) = -dg_{t+1}^*$. Since this transfer does not directly affect the current net wages in either country, it does not have any effect on the current rate of interest, i.e. $dr_{t+1}/\mu_t = 0$ (see equation (15)). Hence, all levels of welfare also remain unchanged in the current period. Only the current accounts are affected: the current account deficit of the debtor nation is reduced exactly by the extent of the transfer. There is no effect on current trade balances. But the situation changes completely in the next period, period t+1, since the altered levels of government debts have implications for national taxes. In fact,

$$d\beta_{t+1} = (r_{t+1}-n)dg_{t+1} = -(r_{t+1}-n)\mu_t/(1+n) ,$$

$$d\beta_{t+1}^* = (r_{t+1}-n)dg_{t+1}^* = (r_{t+1}-n)\mu_t/(1+n).$$

Thus, since $g_{t+2}=g_{t+1}, g^*_{t+2}=g^*_{t+1}$, it is clear that the second period effects of the debt-financed debt-relief are exactly like the impact effects of a tax-financed income transfer just studied in 1°. The pure debt transfer is thus transformed into a pure income transfer. Hence the analysis of section 1° can be directly repeated here for period t+1. But this equivalence between temporary pure debt transfers and temporary pure income transfers holds only for this single period, since the reallocation of debt has an impact on all periods and on the steady state also. The temporary pure debt transfer is equivalent to a permanent pure income transfer.

The long run effects of the pure debt transfer can be most conveniently found by analyzing the steady state effects. The steady state national taxes change by:

$$d\beta = gdr+(r-n)dg, \quad d\beta^* = g^*dr+rdg^*,$$

with $dg = -\mu_t/(1+n) = -dg^*$. Hence, the net wage incomes change by

$$dw = -(k+g)dr-(r-n)dg, \quad dw^* = -(k^*+g^*)dr-(r-n)dg^*.$$

Thus, the equilibrium change in the steady state interest rate is (as derived from equation (27)):

$$dr/\mu_t = [(s^*_w-s_w)(r-n)]/(A-B)(1+n).$$

Since A-B > 0 (by stability), the steady state interest rate increases because of the transfer, $dr/\mu_t>0$. The transfer shifts the income from a country with high saving propensity to a country with low saving propensity. Hence, the net saving in the world declines. Since the level of the net government debt is unchanged, the reduction in saving must be effected through a decline in capital formation.

The effect on the debtor country current account deficit is

$$dca/\mu_t = ndh/\mu_t =$$

$$= n\{k'dr/\mu_t - 1/(1+n) - s_w(r-n)/(1+n)^2 - [1/(1+n)][s_r-s_w(k+g)]dr/\mu\}.$$

Thus, if $s_r-(1+n)k'-s_w(k+g)>0$, which is the stability condition for the autarkic nation, then the current account deficit of the debtor nation is reduced in the long run. Since the trade balance deficit is equal to $-(r-n)h$ (i.e. the debtor country trade balance shows surplus in the steady state), the transfer will increase it (i.e. the trade surplus will grow).

The lifetime welfare of a citizen in the debtor country changes by

$$du/V_w = dw + (V_r/V_w)dr.$$

Roy's identity says that

$$V_r/V_w = s/(1+r) = (1+n)(k+g-h)/(1+r).$$

Hence,

$$du/V_w = [-(r-n)(k+g)-(1+n)h]dr/(1+r) + (r-n)\mu_t/(1+n).$$

Since $r>n$ (by assumption) the first term in this sum is negative and the second is positive (because $dr>0$). The first term catches the effect of increased interest rate on gross wage, on taxes, and on the interest on foreign debt. The positive term is due to the reduction in taxes made possible by the reduction in the level of the debtor counry public debt. The net effect of the transfer on the steady state welfare is thus ambiguous. And it is indeed possible that the welfare is reduced (as this possibility cannot be ruled out by the stability condition). Thus, the transfer increases the welfare in the debtor country in the short run, but may lead to a reduction in the long run well-being. In the creditor country the steady state welfare changes by

$$du^*/V^*_w = [-(r-n)(k^*+g^*)-(1+n)h^*]dr/(1+r) - (r-n)\mu_t/(1+n).$$

Since $h^*<0$, the sign of this expression is also ambiguous. If $h^*=0$, it would be negative, but in general there is no way to claim that the welfare is reduced, since the interest income from foreign lending may be sufficiently high. Hence, it is possible that in the long run the transfer leads to a reduction of welfare in the country receiving the transfer and to an

improvement in well-being in the country which makes the transfer. But it is also easily seen that the net world welfare declines in the long run i.e.

$$du/V_w + du^*/V^*_w < 0.$$

Hence, it is also possible that both countries loose in the long run. This again contrasts with the short run effects.

3° Tax-Financed Debt-Reliefs

The effects of transferring income to debtor country government, when the transfer is financed by a tax on the young in the creditor nation, can be found by setting $l=0, l^*=1$. The short run effect on the rate of interest is then

$$dr_{t+1}/\mu_t = -[1-s^*_w]/A.$$

Since $s^*_w<1$, $dr_{t+1}<0$. The transfer increases saving in the debtor nation by its full amount. In the creditor country the effect is on private saving, which is reduced by $s^*_w\mu_t$, and part of the transfer is reflected as a reduction in current consumption. Hence, net saving in the world increases, which leads to a reduction in the rate of interest and to an increase in capital formation.

The impact on the current account deficit of the deficit nation is

$$dca_t/\mu_t = [(1+n)k'-s_r]dr_{t+1}/\mu_t - 1.$$

Since $-[(1+n)k'-s_r]/A < 1$ and $s_w<1$, this expression is negative. Thus, the current account deficit is reduced by the transfer. The trade balance deficit changes by

$$dtb_t/\mu_t = [(1+n)k'-s_r]dr_{t+1}/\mu_t > 0 ,$$

i.e. the trade deficit increases.

The short run welfare effects of the transfer are easily stated. For the debtor country the only effect is on the welfare of the young, which declines due to the decline in the rate of interest. Thus, the transfer leads to reduced welfare. Besides by the decline in the interest rate the welfare of the young is in the creditor country adversely affected also by the increase in taxes. Thus, in the short run welfare is reduced in both of the countries.

Consider then the steady state effects of the transfer. The steady state net wages change by

$$dw = -(k+g)dr + (r-n)\mu_t/(1+n) ,$$

$$dw^* = -(k^*+g^*)dr.$$

Thus, the rate of interest changes by

$$dr/\mu_t = -\{1+[s_w(r-n)/(1+n)]\}/(A-B).$$

The world net savings are increased by the decline in debtor country government debt and by the increase in debtor country private income created by tax reduction (made possible by the reduction in debt). This increase in saving has to find its home in increased capital formation.

The steady state current account surplus of the creditor nation changes by

$$-dca^*/\mu_t = -[(1+n)(k^*)'-s^*_r+s^*_w(k^*+g^*)]dr/\mu_t.$$

Since the countries as autarkic are assumed to be stable the term in brackets is negative. Hence, $-dca^*<0$, i.e. the creditor country current account surplus decreases, and thus necessarily the debtor country current account deficit is reduced.

Consider finally the welfare effects. In the debtor country the steady state lifetime welfare changes by

$$du/V_w = [-(r-n)(k+g)-(1+n)h]dr/(1+r) + (r-n)\mu_t/(1+n).$$

Since $h>0$ and $dr<0$, this expression is unambiguously positive. Hence, the debtor country welfare increases in the long run, though it declines in the short run. In the creditor country the steady state welfare changes by

$$du^*/V^*_w = [-(r-n)(k^*+g^*)-(1+n)h^*]dr/(1+r).$$

This cannot be signed unambiguously, since $h^*<0$. If h is "small", then the loss of interest income from foreign lending is not large, and the creditor country welfare also increases. But the possibility of welfare reduction cannot be ruled out if h is "large". At any rate, the "world welfare" is increased by the transfer.

The present type of transfer can be contrasted with those studied earlier. First, it is the only transfer that guarantees that the welfare of the debtor nation increases in the long run, but it is also the only type of transfer that makes the debtor country welfare decline in the short run. Also, it is the only type of transfer that makes the interest rate decline, and thus increases real growth.

4° Debt-Financed Poverty Relief

The remaining form of transfer to be studied is the one where the transfer is given to the young of the debtor nation and which is financed by an increase in creditor country public debt. This can be studied by using $l=1, l^*=0$. The impact on the current rate of interest is

$$dr_{t+1}/\mu_t = \{1-s_w\}/A.$$

Since $s_w<1$, the interest rate increases. The current account deficit of the debtor nation declines, since

$$dca_t = [(1+n)k'-s_r]dr_{t+1} - s_w\mu_t.$$

It is easily seen that welfare increases in the short run in both of the countries.

Since the direct impact of the present transfer on the country receiving it is temporary, its long run effects are the same as the effects of the intertemporal income transfer analyzed by Persson (1985). The steady state welfare in the debtor nation changes by

$$du/V_w = [-(r-n)(k+g)-(1+n)h]dr.$$

Since $h>0$ and $dr>0$ (as is easily checked), it is clear that the debtor country welfare is reduced in the long run. In the creditor country

$$du^*/V^* = [-(r-n)(k^*+g^*)-(1+n)h^*]dr - (r-n)\mu_t/(1+n).$$

Since $h^*<0$, this cannot be signed unambiguously, though again with "small" h the welfare is reduced. The "world welfare" is, however, unambiguously reduced.

Hence, of all the transfers studied in this essay this last one appears to be the most doubtful from the welfare point of view. It is the only transfer which unambiguously leads to reduced welfare in the debtor nation in the long run. But it must be remembered that the short run effects are beneficial for all the countries.

IV THE EFFECT OF TRANSFERS TIED TO THE LEVEL OF DEBT OR TO THE LEVEL OF CREDITOR INCOME

In the previous section the size of the transfer was unrelated to the level of international indebtedness. Here I shall study permanent transfers of the form $\mu_t = zh_t$ for all t, where z, $0<z<1$ determines the size of the transfer. I assume that the transfer is tax-financed and is given as an income transfer.

The short run effects of the transfer are exactly like the short run effects of the pure income transfer analyzed above. The effect on the rate of interest is

$$dr_{t+1}/dz = (s_w^* - s_w)h_t/A$$

and on the current account deficit

$$dca_t = (1+n)dh_{t+1} = [(1+n)k' - s_r]dr_{t+1} - s_w h_t dz < 0.$$

The welfare effects are also exactly the same as in section III.

The effect on the interest rate in the next period is

$$Adr_{t+2} = Bdr_{t+1} + (s_w^* - s_w)h_{t+1}dz > 0.$$

This shows that A>B is still necessary for stability.

The steady state effects on the level of international indebtedness and on the rate of interest can be solved from the following two equations:

$$(1+n)h = (1+n)[k(r)+g] - s(w-\beta+zh,r)$$

$$(1+n)[k(r)+k^*(r)+g+g^*] =$$

$$= s(w-\beta+zh,r) + s^*(w^*-\beta^*-zh,r).$$

The change in the level of debt is

$$dh/dz =$$

$$= -\{s_w h(A-B) - (s_w^* - s_w)h[(1+n)k' - s_r + s_w(k+g)]\}/(1+n)(A-B).$$

Hence, dh/dz<0, the level of debt is reduced. (Notice that I have evaluated all derivatives at the initial point with z=0.)

The effect on the long run interest rate is

$$dr/dz = (s_w^* - s_w)h/(A-B)$$

i.e. the interest rate increases.

The effect on the steady state welfare in the debtor nation is

$$du(1+r)/d_z V_w =$$

$$= (1+r)h-[(1+n)h-(r-n)(k+g)](s_w^* - s_w)h/)A-B).$$

Again, this cannot be signed unambiguously.

Hence, one can conclude that the effect of tied transfers do not differ qualitatively from the effects on untied transfers studied in section III. This holds also, if the transfer is tied to the level of income in the creditor nation. This type of tie has been recommended e.g. gy the U.N. In the present model this could be modelled with the specification

$$\mu_t = zw_t^* \quad , \quad 0<z<1.$$

V CONCLUSIONS

The analysis leads to following points:

1) The form of the international transfers matters very much for both their short run and long run effects.

Assuming that the saving propensity in the debtor nation (which receives the transfer) is smaller than in the creditor nation (which makes the transfer) the following results hold:

2) All other forms of transfers except the tax-financed debt-reliefs make the world interest rate increase in the short run (or have no effect like the debt-financed debt-relief). With tax-financed debt-reliefs the interest rate declines.

3) This same separation also holds for the long run effects: only the tax-financed debt-relief makes the interest rate decline, and thus helps to promote real growth. (Of course the tax-financed income transfer does not have any long run effects.)

4) The debt-reliefs have permanent effects even though the actual transfer is made only in one period, because they make the transfer equivalent to the permanent income transfer. On the other hand, the debt-financing has long run effects in the transferring country, since it implies a permanent increase in taxes. (These two equivalence resuits are naturally very much contingent on the assumed stabilization of per capita levels of public debt in all countries.)

5) The same taxonomy that applies to interest rate effects applies also to welfare effects. In the short run all other transfers except the tax-financed debt-relief make the debtor country welfare increase. In case of tax-financed debt-relief the debtor country welfare declines. But the long run effects are just the opposite. The only form of transfer that unambiguously makes the debtor country welfare increase is the tax-financed debt-relief. With debt-financed poverty-relief the debtor nation welfare necessarily declines, and for all other types of transfers the effect is negative. It thus appears that there is a trade-off between short and long run welfare benefits.

6) The welfare effects on the country making the transfer are also of interest. In contrast to the results of the static trade theory, the impact of the transfer on the welfare of the transferring country can be in the same direction as for the country receiving the transfer. Thus, the tax-financed income transfer can (in the short run improve the welfare in both of the countries. This possibility cannot be ruled out by stability arguments. This discrepancy in results can be explained, when one remembers that in the static trade theory no net foreign borrowing is allowed, whereas here foreign indebtedness and the interest rate effects on foreign loans are the crux of the analysis.

7) All forms of transfers share the property that the current account deficit of the country receiving the transfer is reduced both in the short run and in the long run (except for tax-financed property reliefs, which do not have any long run effects).

Finally, one must remember that the analysis conducted here is based on very simple assumptions. Especially important are the omissions of all strategic considerations, which certainly have an impact on international transfers. Hamada (1985) has provided an interesting strategic analysis of fiscal policies within the overlapping generations model. Similar thoughts can most certainly be applied to the problem of international transfers.

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