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## Logic of Aid in an Intertemporal Setting

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This paper studies the welfare implications of temporary foreign aid in the context of a simple two-country model of trade. In addition to its usual effects, a transfer of income in one period is assumed to influence the preferences of the recipient country in the following period. The implied changes in the terms of trade over the two periods are consistent with a number of possible outcomes with respect to the intertemporal welfare of the donor, the recipient, and the world as a whole. Particular attention is devoted to the conditions for strict Pareto improvement and the circumstances under which temporary aid transactions are likely to occur.

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# 1 Introduction

The theoretical literature on international transfer payments emerged from the discussion on whether the reparations made by Germany after WWI would cause a deterioration or an improvement in its terms of trade. The debate eventually led to the question of whether the terms of trade of the paying country can improve so much that it actually benefits by paying a transfer. In a setting without distortions, it was demonstrated by Samuelson (1947) that such an outcome is ruled out if the model exhibits Walrasian stability. It was subsequently shown that, in the presence of distortions, a donor-enriching transfer can occur even if the markets are stable.<sup>1</sup>

Most of the literature on the welfare implications of transfers in the presence of distortions has evolved within the static framework of analysis.<sup>2</sup> This concentration on static models overlooks one potentially important distortion: possible existence of imperfections in the international capital markets or outright barriers to lending and borrowing between rich and poor nations. One of the contributions of the present study is to illustrate the role of such barriers in the welfare analysis of foreign aid transactions.

Another element which may be important in the analysis of foreign aid, yet neglected in static models, is the possibility that aid may have effects which manifest themselves only later on in time. In some cases aid may serve to increase the donor's influence over foreign as well as domestic policies of the recipient. Exercise of such influence can yield significant future benefits

for the donor.<sup>3</sup> Similarly, aid in the form of infrastructure projects, technical assistance and training programs can alter the recipient country's production possibilities over time in a way that increases future demand for the donor's exports or raises the future supply of its imports. Another possibility is that a transfer of aid in one period may, as a result of habit-formation or "good-will" effects, cause a shift in preferences of the recipient country in the following period. Aid can then be seen as an instrument with the power to influence future consumption of the recipient in a direction that is beneficial to the donor.<sup>4</sup>

In studying the welfare implications of foreign aid transactions in the presence of such links between the present and the future, we need to specify the mechanism that enables the donor country to possibly benefit from aid. While our point can be made most convincingly by focusing on the influence of aid on foreign and domestic policies of the recipient country or its future production possibilities, we wish to minimize the complexity of our argument by choosing the very simple case in which the preferences of consumers of the recipient country are affected by aid. We utilize a basic two-country, two-period model of trade, where aid is given only in the first period. If we confine our analysis strictly to this first period, the standard (non-paradoxical) results emerge with the donor country losing and the recipient country benefiting from the transfer. However, a look at the two economies over time reveals other possibilities. Due to either the "good will" impact of aid or habit formation, the aid-related increase in the recipient's consumption in

the first period is transmitted to the next, generating a period-two terms-of-trade effect. Under certain conditions, this effect improves the donor's welfare in the second period at the expense of the recipient, giving rise to a number of possible outcomes with respect to the intertemporal welfare of the donor, the recipient, and the world as a whole. The paper proceeds to derive the conditions for world welfare improvement and individual country (strict Pareto) welfare improvement.

The case of strict Pareto improvement is of particular significance. It is consistent with the notion that the acts of giving and receiving aid are voluntary. The principal objective of the paper is to analyse the conditions for strict Pareto improvement and provide insights related to the circumstances under which temporary aid transactions are likely to occur. It is argued that temporary aid may serve as a vehicle for "intertemporal" trade between economies with different discount rates when other, more efficient mechanisms for international lending and borrowing are not available.

## 2 The Framework of Analysis

Let us consider a two-period model in which two countries exchange in each period two goods. International lending and borrowing is assumed to be prohibited.<sup>5</sup> In what follows, we use capital letters for first-period variables, lower case letters for second- period variables and an asterisk (\*) for the variables of the foreign country. In our analysis of a transfer, it is assumed that the foreign country is the donor, home country is the recipient, and the

transfer is temporary in the sense that it occurs only in period one. The transfer is financed in the foreign country by means of a lump-sum tax and distributed in the home country in the form of a lump-sum subsidy.

The budget constraints and the commodity-market equilibrium condition pertaining to the first period are described below using standard expenditure (E) and revenue (R) functions, where the relative price of the non-numeraire good (P) and the domestic and foreign utility levels (U and U<sup>\*</sup>) enter as arguments:

$$E(1; P; U) = R(1; P) + T \quad (1)$$

$$E^*(1; P; U^*) = R^*(1; P) - T \quad (2)$$

$$E_P(1; P; U) + E_P^*(1; P; U^*) = R_P(1; P) + R_P^*(1; P) \quad (3)$$

Equations (1) and (2) are the budget constraints for the representative consumer in each country, reflecting a transfer amounting to T units of the numeraire from the foreign to the home country. Equation (3) is the market-clearing condition for the non-numeraire good, equalizing the world demand to the world supply.<sup>6</sup> The market-clearing condition for the numeraire good is omitted due to Walras' Law.

In the second period there are no transfers and the two countries only exchange goods with each other. However, we assume that there is an intertemporal consumption externality that allows first period aid to affect the recipient's preferences in the second period.<sup>7</sup> The aid-induced increase in period-one consumption of the non-numeraire good, which we take to be

the donor's export good, is assumed to shift the recipient's second-period preferences in favor of that commodity. This shift may reflect a number of different phenomena related to a transfer of aid. One possibility is that aid given in period one contributes to an atmosphere of 'good will' which may be instrumental in attracting consumers of the recipient country to the donor's export good in period two. Alternatively, the aid-related increase in period-one consumption of the donor's export good may, due to increased exposure to and familiarity with that good, have a similar effect on the recipient's preferences in the second period. In what follows, we describe the process more precisely and refer to it as 'habit formation'.<sup>8</sup>

The equilibrium conditions for the second period can be written as follows:

$$e(1; p; u; E_P) = r(1; p); \quad \text{where } e_{1E} < 0; e_{pE} > 0; \quad (4)$$

In addition  $e_E = 0$  and  $e_{uE} = 0$  are assumed to hold locally.<sup>9</sup>

$$e^a(1; p; u^a) = r^a(1; p); \quad (5)$$

$$e_p(1; p; u; E_P) + e_p^a(1; p; u^a) = r_p(1; p) + r_p^a(1; p); \quad (6)$$

As indicated in (4), due to habit formation, an increase in the period-one consumption of the non-numeraire good tends to shift the period-two expenditure of the recipient (at any given level of utility and prices) away from the numeraire commodity and towards the non-numeraire.<sup>10</sup> Equations (5) and (6) are, respectively, the period-two budget constraint for the foreign country and the market-clearing condition for the non-numeraire commodity in period two.

Finally, the intertemporal utility functions for the two countries  $W(U; u)$  and  $W^*(U^*; u^*)$  are assumed to take the following form:

$$W(U; u) = U + \frac{u}{1 + \pm} \quad (7)$$

$$W^*(U^*; u^*) = U^* + \frac{u^*}{1 + \pm^*}; \quad (8)$$

where  $\pm$  and  $\pm^*$  are the (constant) rates of time preference of the recipient and the donor country, respectively. Equations (1) to (8) can be solved for the eight endogenous variables of the model ( $U; U^*; u; u^*; W; W^*; P; p$ ) as functions of  $T$ .<sup>11</sup>

The next section examines the implications for these variables of a small change in  $T$ .

### 3 The Effects of Aid

Total differentiation of (1) and (2) yields:

$$E_U dU = \pm M dP + dT \quad (9)$$

$$E_U^* dU^* = M^* dP \mp dT \quad (10)$$

where  $M = E_P \mp R_P (= \pm M^*)$  is the recipient's excess demand for the non-numeraire good which we assume to be positive. Thus, for each country there is an indirect terms-of-trade effect and a direct income effect of a transfer. With the aid of (1)-(3), the former effect can be related to the transfer as follows:

$$\pm dP = (C_Y^* \mp C_Y) dT; \quad (11)$$

where  $Z = Z + Z^a$ ;  $MC_Y + MC_Y^a < 0$  is the Walrasian stability condition for the first period equilibrium;<sup>12</sup>  $C_Y \succ E_{PU} = E_U > 0$  (thus  $PC_Y$  is the marginal propensity to consume the non-numeraire commodity in the first period), and  $Z = E_{PP} \succ R_{PP} < 0$  is the (inverse of the) slope of the compensated excess demand function for the non-numeraire good in the recipient country.  $C_Y^a$  and  $Z^a$  are similarly defined. Equation (11) confirms the standard result that the donor's terms-of-trade improve if and only if the recipient's marginal propensity to consume the non-numeraire commodity is larger than that of the donor, i.e.,  $dP = dT > 0$  if and only if  $C_Y^a \succ C_Y < 0$ .

Making use of (11) we can now rewrite (9) and (10) as follows:

$$E_U dU = \frac{Z + Z^a}{Z} dT > 0 \quad (12)$$

$$E_U^a dU^a = \prec \frac{Z + Z^a}{Z} dT > 0: \quad (13)$$

Thus, regardless of the magnitude and direction of the terms-of-trade effect, in a stable world economy, aid always benefits the recipient and harms the donor in the first period. In other words, the transfer paradox cannot occur in this one-period world.

However, the transfer in the first period also has a second period effect due to habit formation. Having assumed that  $e_E = 0$ , welfare is affected only through changes in second-period prices.<sup>13</sup> From (4) and (5) we obtain:

$$e_u du = \prec m dp \quad (14)$$

$$e_u^a du^a = m dp \quad (15)$$

where  $m = e_p \mid r_p = \mid m^a > 0$  is the recipient's second period excess demand function for the non-numeraire commodity.

From (6), and using (14) and (15), we can solve for the second period terms-of-trade effect relating  $dp$  to  $dE_p$ . With the aid of (3) and (11) to (13), we can then express  $dE_p$  as a function of  $dT$  to obtain:

$$zdp = \mid \frac{e_{pE}}{Z} [C_Y (Z + Z^a) + E_{PP} (C_Y^a \mid C_Y)] dT \quad (16)$$

where  $z = z + z^a \mid mc_y + mc_y^a < 0$  is the stability condition in the second period,  $c_y \mid e_{up}=e_u > 0$  (so that  $pc_y$  is the second period marginal propensity to consume the non-numeraire good), and  $z = e_{pp} \mid r_{pp} < 0$  is the (inverse of the) slope of the second period compensated excess demand function, with similar notation used for the foreign country. Assuming that the non-numeraire good is normal, the bracketed term on the right hand side is negative.<sup>14</sup> The existence of the habit formation effect ( $e_{pE} > 0$ ) then results in a terms-of-trade improvement for the donor in period two, i.e.  $dp=dT > 0$ . Recalling equations (14) and (15), it follows that a grant of aid in the ...rst period bene...ts the donor and harms the recipient in the second period.

In order to simplify the notation in what follows, let us write (16) as  $zdp = \mid HdT$ , where

$$H = \frac{e_{pE}}{Z} [C_Y (Z + Z^a) + E_{PP} (C_Y^a \mid C_Y)] > 0; \quad (17)$$

assuming normality of the non-numeraire commodity. The value of  $H$  measures the impact of a unit transfer in period one on the recipient's demand for the non-numeraire good in period two at any given value of  $p$ .

It remains to determine the effect of a transfer on the intertemporal welfare of the two economies. What we know so far is that the recipient gains in the first period and loses in the second period, while the opposite happens to the donor country. Differentiating (7) and (8) and using (12)-(17) we derive the following intertemporal welfare effects:

$$E_U \frac{dW}{dT} = \frac{Z + Z^*}{Z} + \frac{mH}{(1 + \frac{1}{2})Z}; \quad (18)$$

$$E_U^* \frac{dW^*}{dT} = - \left[ \frac{Z + Z^*}{Z} + \frac{mH}{(1 + \frac{1}{2}^*)Z} \right]; \quad (19)$$

where

$$\frac{1}{2} = \frac{(1 + \pm)e_U}{E_U} - 1 \quad \text{and} \quad \frac{1}{2}^* = \frac{(1 + \pm^*)e_U^*}{E_U^*} - 1$$

are the market-clearing real rates of interest at home and abroad. Due to the assumed absence of international lending and borrowing,  $\frac{1}{2}$  is generally not equal to  $\frac{1}{2}^*$ .

### 3.1 Potential Pareto improvement

Having derived the basic welfare equations, we shall now examine the necessary and sufficient conditions for aid to be: (i) potentially Pareto improving, in the sense of increasing the sum of the individual country welfare, (ii) strictly Pareto improving, and (iii) donor enriching and recipient immiserizing.

We start with the case of world welfare improvement, i.e., potential Pareto

improvement. Summing up equations (18) and (19) we obtain:

$$E_U \frac{dW}{dT} + E_U^* \frac{dW^*}{dT} = \frac{mH}{z} \left[ \frac{1}{1 + \frac{1}{2}i} - \frac{1}{1 + \frac{1}{2}i^*} \right] \quad (20)$$

Since  $mH/z < 0$ , Proposition 1 follows directly from the above equation.

**Proposition 1:** In the presence of habit formation, as defined above, an income transfer between countries increases world welfare if and only if the real rate of interest of the recipient country is greater than that of the donor country. Formally,

$$E_U \frac{dW}{dT} + E_U^* \frac{dW^*}{dT} > 0 \quad \text{if and only if} \quad i^* > \frac{1}{2}i$$

The intuition behind this result is rather simple. What matters for world welfare are only the gains and losses in the second period. This is because the first-period welfare changes of the two countries sum to zero (see (12) and (13)). In period two we know that the donor gains and the recipient loses and that the undiscounted sum of the two equals zero (see (14) and (15)). However, in the presence of international borrowing and lending constraints, the real rates of interest are generally different in the two economies, i.e.  $i \neq i^*$ , making the discounted value of the gains and losses different. Obviously, if the donor country has a lower real rate of interest than the recipient, the discounted gains enjoyed by the donor in period two are larger than the discounted losses of the recipient, giving rise to a possibility of a potential Pareto improvement due to a transfer.<sup>15</sup>

### 3.2 Strict Pareto improvement

When it comes to transactions involving temporary aid, the condition under which there is a strict Pareto improvement, allowing both the donor and the recipient to benefit, is of particular interest. It is the only case consistent with the presumption that both parties engage in the transaction on a voluntary basis. Recalling equations (18) and (19), we arrive at Proposition 2.

**Proposition 2:** In the presence of habit formation, as defined above, an income transfer results in a strict Pareto improvement, i.e.  $dW=dT > 0$  and  $dW^a=dT > 0$ , if and only if the following relation holds:

$$\frac{1}{1 + \frac{1}{2}^a} > A > \frac{1}{1 + \frac{1}{2}^i}; \quad (21)$$

where

$$A = \frac{(Z + Z^a) - Z}{i \cdot mH = z} > 0;$$

The variable  $A$ , defined in proposition 2, is the ratio of the recipient's first period gain to the current value of the second period loss associated with the transfer. Correspondingly, from the point of view of the donor,  $A$  is the ratio of the period-one loss to the current value of the period-two gain.

In assessing the possible range of magnitude of  $A$ , we note that the value of the numerator is positive (assuming stability), but could be either greater or smaller than unity, depending on whether the period-one terms-of-trade effect favors the recipient or the donor. In the denominator,  $H$

measures the impact of a unit transfer in period one on the recipient's demand for the non-numeraire good in period two at any given value of  $p$ . As noted earlier, assuming the non-numeraire commodity is normal,  $H > 0$ . Moreover, it is proportional to the magnitude of the habit-formation effect ( $e_{pE}$ ). Finally, the expression  $\frac{m}{z}$  measures the decline in current income of the home country in period two as a result of the terms-of-trade deterioration caused by a (habit-induced) unit increase in its period-two demand for the non-numeraire good. This expression is positive, assuming stability, and is larger in magnitude the greater the volume of non-numeraire imports of the recipient country in period two and the lower the price elasticity of the uncompensated world excess demand for that same commodity. Accordingly,  $A$  can be either smaller or larger than unity.

Let us now turn to condition (21) as a whole and ask under what particular circumstances is it likely to be satisfied. Clearly, the likelihood of a potential aid project satisfying this criteria is larger, the larger the gap between the real rates of interest of the two countries. A given aid project which is beneficial to the donor, satisfying  $1 = (1 + \frac{1}{2}r) > A$  is more likely to benefit the recipient, the higher the real rate of interest in the recipient country, i.e., the greater the scarcity of present goods in relation to the expected scarcity of future goods. In reality this type of environment is typically observed in less developed countries following a crop failure (or some other natural or man-made disaster) which suddenly creates a shortage of present goods. Lack of marketable assets that can be traded internationally prevents

the affected economy in such cases from acquiring goods from abroad, except through aid. Each unit of aid is then precious to the recipient, at least in relation to a unit of output in the future when production is expected to return to normal. That is, disasters experienced by populations lacking tradable assets drive the real rate of interest to high levels, approaching infinity in some extreme cases. But then  $A$  is necessarily greater than  $1/(1 + r)$ , making the recipient of temporary aid better off, even if the current value of the period-two loss is very large in relation to the period-one gain.<sup>16</sup>

This disaster environment (or any other disturbance which generates a sharp increase in an economy's real rate of interest) presents an ideal opportunity for a potential donor country with a low real rate of interest to offer temporary aid in exchange for 'future income'. The modality of shifting future income back from the recipient to the donor can take many different forms. It may involve future trade liberalization by the recipient country or other forms of cooperation, including those with economic, political or military dimensions. One mode that is consistent with the traditional approach to the transfer problem and with the example developed in this paper, involves a period-two terms of trade improvement for the donor as temporary aid helps cultivate a friendly and receptive market for its exports in the recipient country.

Corresponding to these benefits of the donor are the period-two losses of the recipient which have a low present value when discounted using the recipient's high real rate of interest. From this perspective, temporary aid is

essentially a vehicle for exchanging present for future income between countries with different discount rates when other more efficient mechanisms for intertemporal trade are absent.

## 4 Concluding Remarks

This paper examines the welfare implications of temporary foreign aid in the context of an intertemporal model of trade. The intertemporal framework has the virtue of enabling us to consider the case where the net benefits of an aid transfer may change over time for both the donor and the recipient. Explicit consideration of time also brings into focus issues related to the international credit market. An important share of foreign aid goes from the rich to poor countries which are separated by barriers to international lending and borrowing. Such barriers, while obviously overlooked in a static setting, constitute a distortion which plays an important role in the welfare analysis of temporary transfers.

The present study considers these intertemporal dimensions of the transfer problem in the context of a two-period, two-country model of trade. Assuming stability, a temporary transfer of income in the first period is shown to increase period-one welfare of the recipient and lower that of the donor. However, in the presence of habit formation or 'good will' effects, period-one aid may serve to shift preferences of the recipient in favor of the donor's export good in period two. The terms-of-trade effect associated with this shift improves the second-period welfare of the donor at the expense of the

recipient. When the effect is sufficiently large and the real rate of interest sufficiently low, the donor's period-two gain dominates its period-one loss.

The same transaction can also result in a net increase in welfare of the recipient country, provided the real rate of interest used to discount the period-two loss is sufficiently high, making its present value smaller than the period-one gain. From this perspective, temporary aid is seen as a vehicle for 'intertemporal' trade between economies with different discount rates when other more efficient mechanisms for international lending and borrowing are absent. By contrast, if the real rates of interest are equalized across countries, a temporary transfer which shifts income from the donor to the recipient in one period and in the opposite direction (via the terms-of-trade effect) in the next, has no power to generate a welfare improvement in the world economy as a whole. This rules out the possibility of both countries benefiting from a temporary aid transaction. Our conclusions, however, require appropriate modification in a more general setting where the donor enjoys satisfaction from the act of the transfer itself or when the transfer serves to overcome the effects of some other distortion, thereby improving the efficiency of production or consumption in one or both economies.

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## Notes

<sup>1</sup>Kemp (1992) surveys a range of issues related to the transfer paradox and provides references to the literature. See also Bhagwati, Brecher and Hatta (1983, 1985) for a lucid discussion on the role of distortions in the analysis of the transfer problem.

<sup>2</sup>The exceptions are Galor and Polemarchakis (1987) and Haaparanta (1989), which employ an overlapping generations model. See also Djajić, Lahiri and Raimondos-Møller (1999) for an intertemporal analysis of transfers in the context of a two-sector model with endogenous investment.

<sup>3</sup>While the theoretical literature regards donor-enriching transfers as paradoxical, empirical evidence seems to suggest that bilateral foreign aid transactions are typically motivated by donor's foreign policy and commercial interests, rather than by the needs of the recipient. According to the UNDP Human Development Report for 1994, "Bilateral donors direct only 7% of their aid to such priority areas as basic education, primary health care, rural water supplies, nutrition programs and family planning services" (p.73). Empirical studies that attempt to test the validity of donor-interest and recipient-need models of foreign aid distribution, (Maizels and Nissanke, 1984; McKinlay and Little, 1978, 1979), broadly conclude that aid flows primarily reflect donor's interests rather than the needs of the recipients.

<sup>4</sup>Arvin and Baum (1997), Arvin and Choudhry (1997), and Arvin et al. (2000) provide theoretical analysis and empirical evidence suggesting that donors maintain a flow of untied aid to replenish the stock of "good-will" that facilitates the sale of its exports in the recipient country. This parallels the notion in the marketing literature that corporate sponsorship of sporting and cultural events is an effective way of promoting sales.

<sup>5</sup>This assumption of zero international borrowing and lending is no doubt an extreme one. Admittedly, in reality one finds imperfections in the international capital market, but only rarely the complete absence of it. As reported in the IMF's 1996 Annual Report on Exchange Arrangements and Exchange Restrictions, of the 179 members, 127 were maintaining formal restrictions on payments for capital transactions. Various problems associated with sovereign debt, for example, can also prevent equalization of interest rates between countries (see the survey by Eaton and Fernandez, 1995). There are cases, however, of economies undergoing extreme international payments difficulties, for one reason or another, which raise the lender's risk to levels that preclude any voluntary lending from

foreign sources. Because of these financial difficulties, such economies are typically also recipients of foreign aid.

<sup>6</sup>Partial derivative of the revenue (expenditure) function with respect to price gives the supply (compensated demand) function for the good.

<sup>7</sup>A potential source for this intertemporal consumption externality could be switching costs. For an analysis of consumer switching costs and its application to international economics see Froot and Klemperer (1989) and Klemperer (1995).

<sup>8</sup>Mansoorian (1993) and Obstfeld (1992) are recent examples of interest in the implications of habit formation for macro behavior and economic policy.

<sup>9</sup>The recipient country's expenditure function for period 2 can be derived in the following way. Let  $f(g_1(c_1; C_2); g_2(c_2; C_2))$  be the utility function in period 2 where  $c_i$  is the consumption of good  $i$  in period 2,  $C_2 (= E_P)$  is the consumption of good 2 in period 1, and the sub-utility functions  $g_1(\cdot)$  and  $g_2(\cdot)$  satisfy the conditions  $\partial^2 g_1 / \partial c_1 \partial C_2 < 0$  and  $\partial^2 g_2 / \partial c_2 \partial C_2 > 0$ . The restrictions on the sub-utility functions ensure that an increase in  $C_2$  increases the marginal utility of consumption of good 2, and reduces that of good 1, in period 2. The expenditure function  $e(1; p; u; E_P)$  is then defined by:

$$e(1; p; u; E_P) = \min_{c_1, c_2} p_1 c_1 + p_2 c_2 \quad \text{subject to} \quad f(g_1(c_1; E_P); g_2(c_2; E_P)) = u$$

Two of the restrictions imposed on the second-period expenditure function in (4), viz.  $e_{1E} < 0$ ;  $e_{pE} > 0$ , are satisfied because of the assumptions made above on the sub-utility function  $g_1(\cdot)$  and  $g_2(\cdot)$ . The other two restrictions, viz.  $e_E = 0$ ;  $e_{uE} = 0$  are assumed to be satisfied only in the neighbourhood of the equilibrium. These restrictions enable us to focus on the 'habit-formation' or 'good-will' effect by assuming away any other effect of  $C_2$  on utility in period 2.

<sup>10</sup>Alternatively, if we were to model the 'good will' effect of period-one aid, we would write (4) as  $e(1; p; u; T) = r(1; p)$  where  $e_T = e_{uT} = 0$  and  $e_{1T} < 0$ ;  $e_{pT} > 0$ .

<sup>11</sup>Our model may be presented in a somewhat different, although equivalent form, which shows explicitly the role of the real rate of interest in each country in equalising income to expenditure in each period. With a weakly separable intertemporal utility function, our

model can be rewritten as follows:

$$\begin{aligned} E(1; P; \frac{1}{2}; \frac{1}{2}p; W) &= R(1; P) + \frac{1}{2}r(1; p) + T; \\ E^a(1; P; \frac{1}{2}^a; \frac{1}{2}^a p; W^a) &= R^a(1; P) + \frac{1}{2}^a r^a(1; p) + T; \\ E_2 + E_2^a &= R_2 + R_2^a; \quad E_4 + E_4^a = r_2 + r_2^a; \\ E_1 + P E_2 &= R(1; P) + T; \quad E_1^a + P E_2^a = R^a(1; P) + T; \end{aligned}$$

where  $\frac{1}{2} \sim 1/(1 + \frac{1}{2})$  and  $\frac{1}{2}^a \sim 1/(1 + \frac{1}{2}^a)$ ,  $\frac{1}{2}$  and  $\frac{1}{2}^a$  being the market clearing domestic real rates of interest of the recipient and the donor.  $E(t)$  and  $E^a(t)$  are the intertemporal expenditure functions in the two countries, where for a function  $f(t)$ , we denote by  $f_i$  its partial derivative with respect to its  $i$ th argument. These six equations can be solved for  $P; p; \frac{1}{2}; \frac{1}{2}^a; W$  and  $W^a$  as functions of  $T$ . An important advantage of this approach is that it shows explicitly the role of the domestic real rates of interest in both countries. Its disadvantage, however, is that the utility levels in the two countries in each period are treated implicitly. By contrast, our approach provides an explicit treatment of the temporal utility levels, while leaving the real rates of interest implicit until we come to (18) and (19) below.

Also note that in the representative consumer framework of our model, the volume of transactions in the domestic capital markets is zero, while the domestic real rate of interest adjusts to equate the intertemporal flow of income to that of expenditure. The real rate of interest is equal to the rate of time preference if the flow of consumption is the same in the two periods. As we shall see in section 3.2, the focus of our analysis is on situations where the recipient's period-one income (and consumption) is low relative to that of period 2, resulting in the real rate of interest being greater than the rate of time preference. With temporary aid, a recipient's period-one consumption increases relative to that of period two, lowering the real rate of interest towards the rate of time preference.

<sup>12</sup>Local Walrasian stability is assured when  $Z$ , the slope of the world uncompensated excess demand function is negative.

<sup>13</sup>While we assume that  $e_e = 0$  locally, it is important to note that, in general, consumption experience in one period may affect the value of  $e$  necessary to attain a particular level of utility at any given set of prices. Thus Mansoorian (1993) and Obstfeld (1992) assume that, at a given level of utility,  $e$  is an increasing function of the habitual standard

of living. Alternatively, if consumption experience serves to enlighten the consumer by revealing beneficial characteristics of a commodity, it may serve to lower the amount of expenditure needed to attain a given level of utility. Our assumption that  $e_E = 0$  enables us to focus on the benchmark case where a transfer affects welfare, as in the traditional setting, only through its direct income and terms-of-trade effects. If we assumed, instead,  $e_E < 0$  ( $e_E > 0$ ) we would be stacking the cards in favor of (against) a welfare improvement for the recipient country and the world economy as a whole.

<sup>14</sup>Simple substitution of  $Z$  will demonstrate that  $C_Y(Z + Z^a) + E_{PP}(C_Y^a - C_Y) = C_Y(Z^a - R_{PP}) + E_{PP}(C_Y^a)$ . Positive values of  $C_Y^a$  and  $C_Y$  guarantee that this expression is negative.

<sup>15</sup>In a number of ways our model is very similar to the existing models which show the possibility of transfer paradox and potential Pareto improvement (see, for example, Bhagwati et al., 1985; Kemp, 1992; Turunen-Red and Woodland, 1988). There are two important elements that our model has in common with these earlier contributions: The presence of a distortion and what effectively amounts to inferiority of one of the goods. The market distortion in our model is the absence of international borrowing and lending while the “good-will” or “habit-formation” effect acts very much like inferiority of one of the goods in earlier models. That is, a transfer in period one tends to reduce the demand for the recipient’s export good in period two. What the present paper contributes to the existing literature is an extension of the analysis to an intertemporal framework where, unlike in a static setting, the role of impediments to international borrowing and lending may be explicitly considered. Moreover, the intertemporal framework allows for a distinction among temporary, permanent and expected future transfers. It is precisely these features of the model that enable us to show how a temporary transfer may serve to partly circumvent an existing distortion and thereby generate strict Pareto improvement.

<sup>16</sup>For evidence and analysis of interest rates in rural economies of developing countries see, for example, Basu (1997, ch. 13) and Townsend (1994).