Díaz, Antonia; Echevarría, Cristina. Solidarity, Transfers and Poverty. *Review of Development Economics*. 2002, vol. 6, nº 3, p. 337-350. Available in: http://dx.doi.org/10.1111/1467-9361.00159

Solidarity, Transfers, and Poverty

*Antonia Díaz and Cristina Echevarria**

Abstract

There is abundant evidence that inter-vivos transfers are more important in low-income countries than in industrialized countries. The authors use a new specification of altruism to explain this stylized fact. Under this specification, individuals feel altruistically towards other individuals genetically related to them. However, they worry about them only when their relatives' consumption falls below a certain level. Simulation results mimic the stylized facts concerning the relation between inter-vivos transfers and income.

1. Introduction

In this paper we propose a new definition of altruism that we consider most appropriate to study inter-vivos transfers. In our framework, an individual worries about a specific relative only if this relative's consumption falls below a certain threshold and assuming that her own consumption is above this threshold. We use this specification to explain some stylized facts concerning the relation between inter-vivos transfers and income: namely, the fact that inter-vivos transfers are much more important in low-income countries than in industrialized countries, and the evidence gathered in Cox et al. (1996) which shows that, within a country, altruism is mainly operative at low levels of income.

We classify transfers as either inter-vivos or bequest-type. We take the stand that some inter-vivos transfers (dowries or investment on human capital) should be considered as early bequests. Bequest-type transfers and inter-vivos transfers respond to two different needs. While the first are meant to improve the recipients' welfare in the future, the second are meant to help the recipients change a present unpleasant situation. Bequest recipients are usually descendants, whereas inter-vivos transfer recipients are not necessarily so.[1] This paper focuses on the last type of transfers.

The economic literature on inter/intra-family transfers began with Becker (1974). The key feature of Becker's altruism model is that the utility of the agent is related to the utility of the descendants, and it is assumed that the agent cares more for his children than his grandchildren, more for his grandchildren than his great-grandchildren, and so on. In his framework, altruistic transfers have the effect that consumption of each member of the spending unit is independent of the distribution of income across unit members.

Individuals feel altruistically not only towards their descendants, but also towards other individuals genetically related to them.[2] However, it is clear that we do not feel in the same way towards other relatives as towards our children. Our concept of

---

* Díaz: Universidad Carlos III de Madrid, 28903 Getafe Madrid, Spain. Tel: 34-91-624-5733; Fax: 34-91-624-9875; E-mail: andiaz@eco.uc3m.es. Echevarria: University of Saskatchewan, 9 Campus Drive, Saskatoon SK S7N 5A5, Canada. Tel: 1-306-966-5211; Fax: 1-306-966-5232; E-mail: echevarr@duke.usask.ca. We thank two anonymous referees, Joan M. Esteban, participants in various workshops and a session at the ESEM98 for their comments; and IVIE for financial support. Díaz acknowledges financial support from the Spanish Ministry of Education (PB96-0339). Echevarria thanks the Spanish Ministry of Education (SAB95-0503) and SSHRC (410-99-0862) for financial support.

altruism differs from Becker's in that individuals become concerned about their relatives only if their relatives' consumption falls below a certain level (a poverty line or subsistence minimum). As a consequence, transfers among members of families in which all members have an income above the threshold level are not seen. Thus, while our concept of altruism is more restrictive than Becker's, it can be used to analyze altruism towards non-descendants. Although Becker's concept seems adequate to analyze bequests and anticipated bequests, it does not seem suitable to analyze inter-vivos transfers purely directed to help out relatives in distress. Our formulation seems better fitted to analyze this last type of transfers. Thus, this formulation of altruism is complementary to the most standard one.

2. A Review of the Empirical Evidence

Our formulation accounts for the three following regularities concerning inter-vivos transfers:

1. Within a country, altruistically motivated transfers are much more important at low levels of income than at high levels of income. Good evidence concerning this regularity is hard to find. The best evidence is gathered in Cox et al. (1996). As they explain, the reason why evidence is hard to find in developed countries is because substantial public transfers may have already crowded out private transfers to a large extent. Using Filipino data, they test a generalized model of private transfers which encompasses both the altruist hypothesis and the exchange motives for transfers. They conclude: "If recipients are poor, altruistic motives are likely to be operative, . . . But once recipient incomes rise above a certain threshold, non-altruistic transfer motives are effective at the margin." The sample is split between urban and rural households, considered separately because of the large difference in standards of living. The threshold is estimated at 15,272 Filipino pesos for urban households, equivalent to 26% of average urban household income; and at 10,078 pesos for rural households, or 40% of average rural income. However, 15,272 pesos corresponds to the 16th urban sample income quantile and 10,078 pesos corresponds to the 18th rural sample income quantile; so the thresholds are very similar in terms of the relevant income distributions. In 1999, the urban threshold corresponded roughly to the Filipino poverty level.

2. The number of inter-vivos transfers, either in cash or in kind, is larger in low-income countries than in industrialized countries. Table 1 in Cox and Jimenez (1990) lists information on private transfers for several countries. Neither the definition of transfers nor the segment of the population sampled are strictly comparable, but their table illustrates the difference. If we attend to the number of transfers, among a sample of urban poor in El Salvador, 33% reported having received private transfers; 93% of a rural south Indian sample received transfers from other households; and 47% of a sample of Filipino households received private cash transfers. In contrast, only 15% of the sample of US households received private transfers.

3. The amount of inter-vivos transfers, in relative terms, is larger in low-income countries than in industrialized countries. Table 1 in Cox and Jimenez (1990) shows that the average transfer represented 11% of the average household income in the Salvadorean sample; 20% in a sample of urban households in Java (Indonesia); but only 1% in the US sample.

3. The Model

Let us start by assuming that our extended family has two individuals, whom we call mother and daughter for the sake of exposition. Individuals should be understood as households, possibly comprising young children. Logarithmic preferences are used across this paper to illustrate some points. We assume a static environment. We can think of household i as the household of the mother and j as that of the daughter. The mother derives utility from her own consumption, according to the function $u(.)$, and from her daughter's utility. However, the satisfaction the mother obtains by a daughter's increase in consumption is bounded. We model this idea in the following way. There exists a threshold consumption level, $\bar{c}$, above which the mother does not obtain higher utility from her daughter's increasing wellbeing. Likewise, the mother does not care about her daughter if her own consumption falls below the level c_s. Thus, the mother's utility is described in the following way:

$$W_i(c_i, c_j) = \begin{cases} U(c_i) + \beta V(c_j) & \text{if } c_i \geqslant c_s, \\ U(c_i) & \text{if } c_i < c_s, \end{cases}$$

where the function V is

$$V(c_j) = \min\{U(c_j), U(\bar{c})\}.$$

The parameter β can be interpreted in the usual way: it is an altruism factor whose value lies in the interval $(0, 1)$. $\bar{c}$ is the level above which an increase in the daughter's wellbeing does not increase the mother's utility; in some sense, it should be understood as the consumption level above which the extended family as a source of insurance disappears. c_s is the consumption level below which the mother cares only about her own wellbeing: these two points do not need to be the same, but we assume that they are the same for simplicity. Thus, we assume

$$W_i(c_i, c_j) = \begin{cases} U(c_i) + \beta V(c_j) & \text{if } c_i \geqslant c_s \\ U(c_i) & \text{if } c_i < c_s. \end{cases}$$

We will refer to the threshold level, c_s, as the subsistence consumption, just for convenience, but it should not be understood as the agent dying if her consumption falls below this level. Our results carry through when assuming $\bar{c} \neq c_s$.

Let us denote as I_i the income (endowment of the consumption good) of the mother and I_j as that of the daughter. There are three possible cases: both incomes are above the subsistence level, both incomes are below the subsistence level, or only one income falls below this level. In the first case, there are no transfers because there is no need for help.

In the third case, if the mother is the one whose income is above the subsistence level, the mother solves the following problem:

$$\max W_i(c_i, c_j),$$
$$\text{s.t.} \quad c_i + t \leq I_i, \quad c_j \leqslant I_j + t, \quad t \geqslant 0.$$

(Likewise, if the daughter is the one whose income is above this level.) With logarithmic preferences, the transfer will be

$$t = \max\left\{\min\left\{c_s - I_j, \frac{\beta I_i - I_j}{1+\beta}, I_i - c_s\right\}, 0\right\}.$$

Notice that not only the amount but also the pattern of the transfer varies with the individuals' levels of income.

A Generalization: Efficient Allocations

The framework described above can be generalized to model an extended family composed of more than two households. A natural generalization of our specification of altruistic preferences to this case is

$$W_i(c_i, c_{-i}) = \begin{cases} U(c_i) + \sum_{j \neq i} \beta^{d_{ij}} V(c_j) & \text{if } c_i > c_s \\ U(c_i) & \text{if } c_i \leqslant c_s. \end{cases}$$

β is raised to the power d_{ij}, where d_{ij} is the degree of kinship between agents i and j. Relatives of first degree are parents, children, and siblings. Relatives of second degree are grandparents, aunts and uncles, grandchildren, and nieces and nephews. Cousins are third-degree relatives. Thus, the way in which the agent discounts her relative's utility is based on biologists' Hamilton's rule.[3]

For convenience of exposition, in this section we consider a family of three members. Then the agent's utility is

$$W_i(c_i, c_l, c_k) = \begin{cases} U(c_i) + \sum_{j=l,k} \beta^{d_{ij}} V(c_j) & \text{if } c_i > c_s \\ U(c_i) & \text{if } c_i \leqslant c_s. \end{cases}$$

There may be a situation in which all agents' incomes are above the subsistence level; another in which all incomes are below the subsistence level; a third in which only one relative's income is above this level; and the last in which one relative's income is below this level. In the first two cases each individual consumes his income. In the third case, assume that the relative whose income is above the subsistence level is the one labeled i. The problem that she solves is

$$\begin{aligned} &\max_{c_i, t_{il}, t_{ik}} W_i(c_i, c_l, c_k), \\ &\text{s.t.} \quad c_i + t_{il} + t_{ik} \leqslant I_i, \\ &\qquad c_j \leqslant I_j + t_{ij}, \quad j = l, k, \\ &\qquad t_{ij} \geqslant 0, \quad j = l, k. \end{aligned} \tag{1}$$

If $(1 + \beta^{d_{il}} + \beta^{d_{ik}})c_s < I_i + I_l + I_k$, individual i's consumption is above c_s and the solution to the problem satisfies the constraints and the first-order conditions

$$U'(c_i) \leqslant V'(I_j + t_{ij})\beta^{d_{ij}}, \quad j = l, k$$

where

$$V'(c_j) = \begin{cases} U'(c_j) & \text{if } c_j < c_s \\ 0 & \text{if } c_j \geq c_s. \end{cases}$$

If $(1 + \beta^{d_{il}} + \beta^{d_{ik}})c_s \geqslant I_i + I_l + I_k$, the person whose income is above the subsistence level consumes the subsistence level, and the other two consume

$$\frac{\beta^{d_{ij}}(I_i + I_l + I_k - c_s)}{\beta^{d_{ij}} + \beta^{d_{ik}}}, \quad j = l, k$$

(an amount below c_s), provided that these quantities are greater than income for both of them. Otherwise, they consume their own income. For individual i's to transfer some income, it needs to be that

$$\frac{\beta^{d_{ij}}(I_i + I_l + I_k)}{1+\beta^{d_{il}}+\beta^{d_{ik}}} \leqslant I_j, \quad j = l,\ k; \tag{2}$$

i.e., in almost all cases, she transfers income. If she does not, it is either because her degree of altruism is very low or because her income, although greater than c_s, is very close to her relatives' income.

In the fourth case, let us assume that the two relatives with incomes above the subsistence level are those labeled l and k and that individual i's income is below the subsistence level. When there are two or more individuals able to help the person in need, the question arises of how poor relatives are helped. Cooperation seems natural in our environment. Furthermore, we assume that there is no private information within the family: each member's income is observable by the rest of the family. We take the view that relatives have a good idea of all members' income. This eliminates the possibility of strategic behavior.

Since all agents with income above subsistence level care about the level of consumption of the poor relative, consumption of the poor relative is a public good. As in many public-good problems, the amount of public good to be provided (level of consumption of the poor relative) and the distribution of the cost of this consumption among the two other relatives need to be solved. To solve this public-good problem, we follow an efficiency approach similar to the one used by Chiappori (1992). The idea underlying this approach is the following. Relatives whose income is above the subsistence level engage in cooperative bargaining to decide the amount transferred to the poor relative. Any allocation resulting from this process is Pareto-efficient and, thus, there exist weights α_l and α_k ($\alpha_l + \alpha_k = 1$) such that the solution to the bargaining is a solution to the following problem:

$$\begin{aligned} &\max \sum_{j=l,k} \alpha_j W_j(c_j, c_i) \\ &\text{s.t.} \quad c_j + t_{ji} \leqslant I_j, \\ &\qquad c_j \geqslant c_s, \\ &\qquad t_{ij} \geqslant 0, \quad j = l, k, \\ &\qquad c_i \leqslant I_i + \sum_{j=l,k} t_{ji}. \end{aligned} \tag{3}$$

With logarithmic preferences, the constraints and the following set of inequalities

$$\frac{\alpha_j}{c_j} \leq V'\left(I_i + \sum_{j=l,k} t_{ji}\right) \sum_{j=l,k} \alpha_j \beta^{d_{ji}}, \quad j = l,\ k \tag{4}$$

characterize the efficient solutions if

$$(\alpha_j + \alpha_l \beta^{d_{li}} + \alpha_k \beta^{d_{ki}}) c_s < \alpha_j (I_i + I_l + I_k), \quad \text{for } j = l,\ k. \tag{5}$$

If the poor relative receives less than the subsistence minimum, a solution is characterized by the following relation:

$$\frac{c_i}{c_j} = \sum_{r=l,k} \frac{\alpha_r}{\alpha_j} \beta^{d_{ri}}, \quad \text{for } j = l,\ k$$

and transfers are proportional to the weights α. If the poor relative receives the subsistence minimum, transfers are also proportional to the weights α.

If the inequality shown in expression (5) is reversed for one of the two individuals whose income is above the subsistence level, let us say $j = l$, this person consumes c_s and transfers her remaining income to the poor relative. Then the other individual whose income is above the subsistence level, $j = k$, transfers the following amount:

$$\frac{\beta^{d_{ki}} I_k - I_i}{1+\beta^{d_{ki}}}.$$

In almost all cases, both relatives help the relative in distress. Analytically, they both help if the following set of (sufficient) conditions is satisfied:

$$\beta^{d_{ji}} I_j > I_i, \quad \text{for } j = l,\ k \tag{6}$$

$$\frac{\alpha_l}{\alpha_k}\frac{1}{(1+\beta^{d_{ki}})} I_k < I_l < \frac{\alpha_l}{\alpha_k}(1+\beta^{d_{li}}) I_k. \tag{7}$$

Expression (6) has the same interpretations as expression (2). Expression (7) says that, in the case of very disparate incomes, one of them may not help.

Given the weights α, this efficiency approach results in an allocation rule that is tractable, anonymous, and efficient by construction. As explained above, any set of α characterizes one of the possible solutions to the underlying bargaining in which the family engage.

4. Results and Discussion

Of the four results presented here, the first and the third are analytical. The other two are derived with the aid of computer simulations.

Family Income and Transfers

In this subsection we study how, according to our model, inter-vivos transfers vary with income across families within the same country. We show that, under certain assumptions about distribution of income and intergenerational correlation of income, our model predicts that, inside a country, both the number and the amount of inter-vivos transfers inside a family are inversely correlated with family income.

Suppose that each family is composed of a grandparent, who has N children, who in turn have N children. Therefore, the family has $1 + N + N^2$ members and each member worries about $N + N^2$ relatives. That the first and the second generation have the same number of children is not essential in any way.

This is a static model and usually three generations coexist at the same point in time. Income of a member g of the first generation is denoted I_g, and I is the average income for this generation. The members of the second generation have an income dependent on their parents' income and an idiosyncratic shock. Income of a member p of this generation is I_p. Income of a member c of the third generation is I_c, which also depends on the parents' income and a shock.

If the intergenerational correlation of income is high enough and the distribution of the shock is symmetric of mean zero, each generation has an income distribution similar to the previous one and so does the aggregation of the three generations. However, according to Solon (1992) and Zimmerman (1992), the correlation between parents' and children's income, as deviation from the mean of their generation, in the

US economy is roughly 0.4. Although this correlation is probably higher in less-developed countries, this means that, in general, to preserve an income distribution similar to a Lorenz curve a shock that is skewed is needed; i.e., if your parents enjoy a high income, the probability of becoming richer than your parents is lower than that of becoming poorer than them—there exists regression to the mean. In this paper we assume a uniform distribution of the shock, $\varepsilon \sim u(0, 2\sigma)$, but then, and to preserve the income distribution, we assume that an individual income depends also on average income I. Thus:

$$I_p = \rho I_g + (1-\rho)I + \varepsilon,$$

$$I_c = \rho I_p + (1-\rho)I + \varepsilon.$$

In this way, there is regression to the mean as well.

Average family income and expected number of transfers. Suppose the income of the grandparent is I_g. Expected average family income is then

$$\frac{I_g(1+\rho+\rho^2)+I(2-\rho-\rho^2)}{3},$$

which is equal to I_g when $\rho = 1$. Since there is a simple relation between expected family income and grandparent's income, and since it is easier to relate expected number of transfers to grandparent's income rather than to expected family income, we do so.

The probability $\Phi_p(I_g)$ of a member of the second generation being poor is

$$\Phi_p(I_g) = P(\rho I_g + (1-\rho)I + \varepsilon) \leqslant c_s,$$

or

$$\Phi_p(I_g) = P(\varepsilon) \leqslant c_s - \rho I_g - (1-\rho)I.$$

If the distribution function of ε is $f(\varepsilon)$, then

$$\Phi_p(I_g) = \int_{-\infty}^{c_s-\rho I_g-(1-\rho)I} f(\varepsilon)d\varepsilon.$$

With this uniform distribution:

$$\Phi_p(I_g) = \min\left\{\max\left\{\frac{c_s - \rho I_g - (1-\rho)I + \sigma}{2\sigma},\ 0\right\},\ 1\right\}.$$

Then, the probability of m members of the second generation being poor is a binomial function

$$\binom{N}{m}(\Phi_p(I_g))^m(1-\Phi_p(I_g))^{N-m}.$$

So the expected number of poor persons in the second generation is $N\Phi_p(I_g)$.

The conditional probability of a member of the third generation being poor, given the parent shock $\varepsilon_p \equiv P(I_c \leqslant c_s|\varepsilon_p)$, is

$$\varepsilon_p = \int_{-\infty}^{c_s-\rho^2 I_g-(1-\rho^2)I-\rho\varepsilon_p} f(\varepsilon_c)d\varepsilon_c,$$

where ε_c is the shock for the third generation. Therefore, the probability of a member of the third generation being poor is

$$\Phi_c(I_g) = \int_{-\infty}^{\infty}\int_{-\infty}^{c_s-\rho^2 I_g-(1-\rho^2)I-\rho\varepsilon_p} f(\varepsilon_c)d\varepsilon_c d\varepsilon_p.$$

With the proposed uniform distribution:

$$\Phi_c(I_g) = \min\left\{\max\left\{\frac{c_s-\rho^2 I_g-(1-\rho^2)I+\sigma}{2\sigma},\ 0\right\},\ 1\right\}.$$

Thus, the probability of m members of the third generation being poor is the binomial function

$$\binom{N^2}{m}(\Phi_c(I_g))^m(1-\Phi_c(I_g))^{N^2-m}.$$

The expected number of poor people in the third generation is $N^2\Phi_c(I_g)$.

The expected number of poor relatives, Enp, inside a family, given the grandparent's income, is

$$Enp(I_g) = N\Phi_p(I_g)+N^2\Phi_c(I_g). \tag{8}$$

The expected number of poor relatives depends positively on the number of members in each generation and on the subsistence level, and negatively on grandparent's income. It depends positively on the degree of correlation ρ if the grandparent's income is below the mean and negatively otherwise.

The effect of changes in the standard deviation depends on the level of grandparent's income relative to the difference between the subsistence level and a certain proportion of income per capita. If the grandparent's income is low enough, an increase in volatility can only increase the number of individuals whose income is above the subsistence level. Likewise, if the grandparent's income is sufficiently high, an increase in volatility increases the expected number of poor relatives. Since the effect depends on the difference between the subsistence level and a proportion of income per capita, if the latter is high enough the expected number of poor relatives increases (or does not change) with volatility for any level of grandparent's income.

Assuming that all relatives whose income is above the subsistence level transfer some income to those whose income is below this level, the expected number of transfers is

$$\begin{aligned}&[1+N+N^2-Enp(I_g)]Enp(I_g) && \text{if } I_g \geqslant c_s,\\ &[N+N^2-Enp(I_g)](Enp(I_g)+1) && \text{if } I_g < c_s.\end{aligned}$$

The expected number of transfers is maximized at the level of income I_g that satisfies

$$Enp(I_g)\begin{cases} = \dfrac{1+N+N^2}{2} & \text{if this } I_g \geqslant c_s,\\ = \dfrac{N+N^2-1}{2} & \text{if this } I_g < c_s.\end{cases}$$

The function $Enp(I_g)$ is strictly decreasing and, assuming that $c_s \leqslant \sigma$:

$$Enp(c_s) < \frac{1+N+N^2}{2}.$$

The condition $c_s \leqslant \sigma$ is sufficient but not necessary. As we will see, σ is likely to be greater than c_s. Therefore, the expected number of transfers inside a family is maximized when

$$I_g = \min\left\{c_s,\ \frac{N(1+N)c_s + \sigma - [N(1-\rho) + N^2(1-\rho^2)]I}{N\rho(1+N\rho)}\right\};$$

i.e., when I_g is at or below the subsistence level. That the number of transfers is maximized around the subsistence level is intuitive, since the number of transfers is maximized when half of the family members have an income above and half of them have an income below the subsistence level. This is most likely to occur when the grandparent's income is around the subsistence level. This result is independent of the income distribution across members of the first generation.

RESULT 1. *Within a country, the expected number of transfers inside a family is maximized when the grandparent's income is at or below the subsistence level.*

Now, in most countries, families at the subsistence level belong to the lowest quantiles of the income distribution. Thus, generally speaking, within a country, the number of altruistically motivated transfers is larger at low income levels than at high income levels.

Average family income and expected amount of transfers. Here we use computer simulations. We compute an example and we find that the expected amount of transfers behaves in a similar way to the expected number of transfers.

To use computer simulations, we need to give some value to the parameters N, c_s, β, σ, and the set of α. We also need to make some assumptions about income distribution. For computational simplicity, N equals 1; i.e., each family has three members—the grandparent, the parent, and the child.

According to the World Bank (1990), the absolute poverty threshold is 370 annual 1985 purchasing power parity adjusted US dollars. Therefore, c_s is set at this level.

We assume that there is a continuum of families. Income for the first generation is distributed according to

$$I_g = (1+n)g^n I, \quad g \in [0,\ 1].$$

This function implies an income distribution similar to a Lorenz curve. In this simulation we set $n = 1.08$, which implies a Gini coefficient of 0.35. This was the decade average of the Gini coefficient for the industrial countries in the 1960s (Deininger and Squire, 1996).

Recall that the discount factor between relatives equals $\beta^{d_{ij}}$, where d_{ij} equals the degree of consanguinity. Thus β can be considered the basic degree of altruism which, for this simulation, is set to 0.5. Changing the degree of altruism does not change the results much, since the degree of altruism affects the amount of transfers only at very low levels of income. At higher levels of income, when the other relatives are sufficiently rich, the total transfer received by the poor relative is the difference between the subsistence level and his income and does not depend on the intensity of altruism.

According to Kremer (1997), a child's educational attainment can be expressed as 0.39 times the educational attainment of the parents, plus 0.15 times the average educational attainment of the neighborhood in which the child grew up, plus an intercept, plus an error term with a standard deviation of 1.79 years. Across countries, a regression between mean years of schooling of people 25 years and older in 1992 and GNP per capita, measured in purchasing power adjusted dollars, in 1991 (according to the UNDP, 1994) suggests than an extra year of schooling increases income by $375. Thus, 1.79 years of schooling would represent $675, a figure that we use as a benchmark. For this simulation we use a standard deviation of $700.

Finally, the last parameters to set are the α. In view of the lack of any evidence on how families decide to help relatives in distress, making these weights proportional to the individuals' income seems a natural solution. These weights are not crucial to our results—we have tried other weights with similar results.

Figure 1 shows the relation between the expected amount of transfers within a family and the grandparent's income for the parameters aforementioned. For very low levels of income per capita, the relation between grandparent's income and expected amount of transfers within a family is nonmonotonic (Figure 1(a)). When the grandparent's income is below the subsistence level, the most likely situation is that only a member of the family has an income above c_s. In this case, the larger the income of the other members, the smaller the transfer. This is what happens in Figure 1(a) as grandparent's income increases. Once the grandparent's income is above c_s, in most cases there are two members whose income is above the subsistence level. Nevertheless, the transfer received by the poor relative is less than the amount he needs to consume c_s. As the grandparent's income increases, the amount transferred increases too, as can be seen in Figure 1(a). If grandparent's income were to increase further, the poor relative eventually would receive the necessary transfer to consume c_s. The larger the grand-

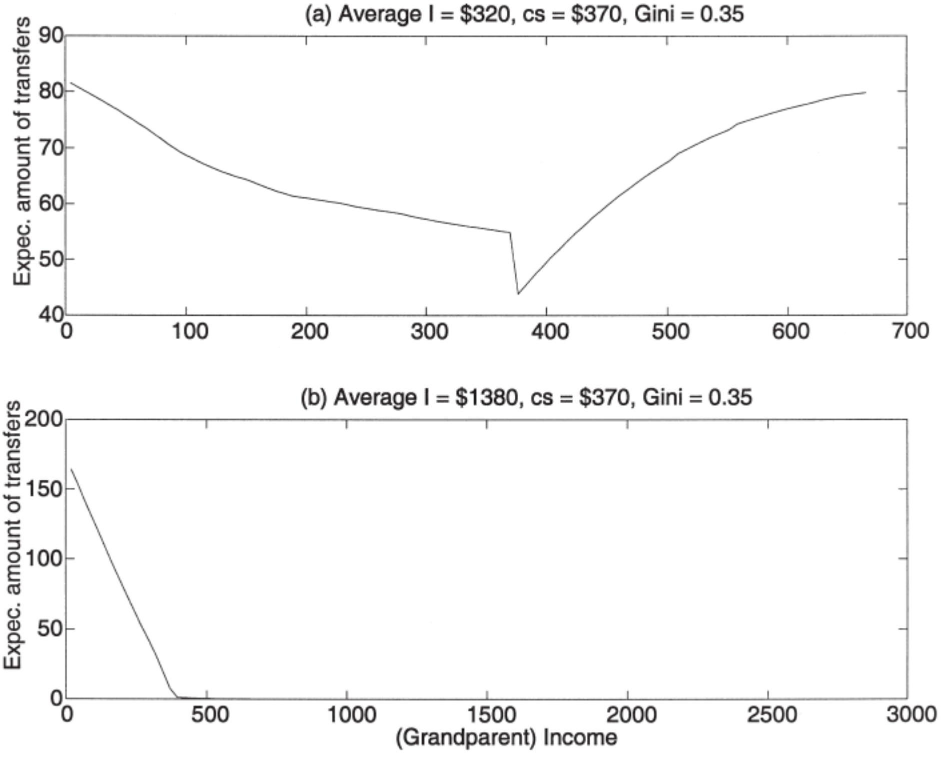

Figure 1. Average Family Income and Expected Amount of Transfers

parent's income, the richer this poor relative would likely be and, thus, the smaller the transfer.

In richer countries, with the same parameters, even at very low levels of grandparent's income, because of the regression toward the mean in income, the most likely situation is that there is just one poor relative in the family and the other two can afford the necessary transfer for him to consume c_s. Thus, the expected amount of transfers decreases with the average family income (Figure 1(b)). This is the case once income per capita reaches a certain level, lower than the mean income per capita for lower-middle income countries; i.e., only for very poor countries is this not the case.[4]

Result 2. *As a general rule, the expected amount of transfers decreases with the average family income inside a country.*

These first two results jointly match our first empirical regularity in section 2: within a country, altruistically motivated transfers are much more important at low levels of income than at high levels of income. Although not directly comparable, Figure 1(b) looks remarkably similar to Figure 2 in Cox et al. (1996), if we ignore nonaltruistic transfers. Recall that this figure plots the nonlinear relation between amount of transfers and recipient's income in the Philippines (a lower-middle income economy) estimated by Cox and his coauthors. Below the threshold of 15,272 Filipino pesos, altruistic transfers are operative. The flat transfer function above the threshold is consistent with the hypothesis of nonaltruistic transfers for this group.

Income Per Capita and Transfers: A Comparison Across Countries

This subsection studies how the number and amounts of transfers vary across countries. Countries are characterized by their level of income per capita I. We maintain income distribution constant across countries. We know that, at the same level of income per capita, the more unequal the income distribution the larger the proportion of families whose average income falls below the subsistence level and, therefore, the larger the number of transfers. We want to abstract from this effect. We conclude that our specification of altruism implies that both the number and the amounts of transfers are higher the lower the per capita income of the country.

Income per capita and expected number of transfers. As long as all relatives whose income is above the subsistence level transfer some income to those whose income is below this level, results in this section do not depend on the solution chosen to the public good problem. Since we have assumed that there is a continuum of families g inside each country, for each country we integrate over g the expected number of transfers inside a family to obtain the expected total number of transfers per country:

$$ENT(I) = \int_0^{gc} [N^2 + N - Enp(I_g)](Enp(I_g) + 1)dg + \int_{gc}^{1} [N^2 + N + 1 - Enp(I_g)]Enp(I_g)dg.$$

Since $g \in [0,1]$, results are normalized and can be understood as expected total number of transfers per family. The term gc denotes the family whose grandparent has an income of exactly c_s It also denotes the proportion of families whose grandparent's income is below the subsistence level.

For countries for which

$$I \leqslant \frac{c_s - \sigma}{1 + n\rho},$$

income per capita is so low that all members in all families in the country are poor and so there are no transfers: $ENT(I) = 0$. Otherwise, there are transfers inside the country: $ENT(I) > 0$. For countries for which

$$I \geqslant \frac{(N + N^2)(c_s + \sigma)}{N(1-\rho) + N^2(1-\rho^2)},$$

$ENT(I)$ is strictly decreasing with the level of income per capita I—the higher the income per capita, the larger the fraction of families rich enough not to have transfers and, thus, the smaller the number of transfers per family. Notice that the above expression denotes a fairly low level of income per capita. Thus, $ENT(I)$ is 0 for low levels of income per capita, then increases with the level of income per capita, and finally decreases, and it reaches a maximum for some relatively low level of income per capita.

If the value of σ is greater than the value of c_s, the first group of countries does not exist. Now, recall that according to the World Bank calculations the absolute poverty threshold is 370 1985 US dollars, a figure lower than the benchmark above calculated for σ (\$675).

RESULT 3. *The expected number of transfers increases with the level of income per capita at very low levels of income. It reaches a maximum for some relatively low level of income per capita. Finally it decreases with income per capita. That is, the number of transfers is higher in low-income economies than in high-income economies.*

This third result matches the second empirical regularity in section 2: the number of inter-vivos transfers is larger in low-income countries than in industrialized countries.

Income per capita and expected amount of transfers. We again use computer simulations. For each country, we integrate the expected amount of transfers per family over g to obtain the expected total amount of transfers. As in the previous subsection, results are normalized and can be understood as expected total amount of transfers per family. We assume $N = 1$ for simplicity. The results are similar to those obtained above.

Figure 2 shows the relation between expected amount of transfers per family, expressed as a percentage of per capita income, and level of per capita income.

RESULT 4. *The expected amount of transfers, as a percentage of per capita income, decreases with the level of income per capita.*

This last result matches the third and last empirical regularity in section 2: the amount of inter-vivos transfers, in relative terms, is larger in low-income countries than in industrialized countries.

5. Conclusion

There is abundant evidence showing that inter-vivos transfers, either in cash or in kind, are much more important in low-income countries than in industrialized countries. There is also some evidence that, within a country, altruistically motivated transfers are more important at low levels of income. We have shown that these stylized facts

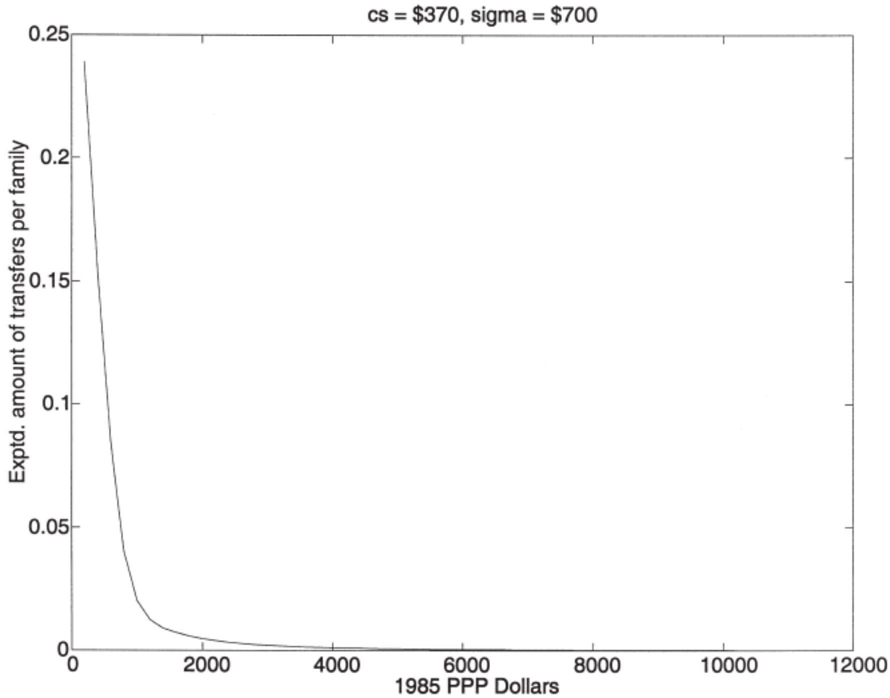

Figure 2. Expected Amount of Transfers per Family (percentage of family income)

can be explained by using an alternative specification of altruism under which individuals care about their relatives only if their relatives' consumption falls below a certain threshold that we have called "subsistence consumption." This new formulation has two advantages. First, it does not imply neutrality (i.e., a redistribution of one unit of income from recipient to donor does not imply an extra unit being transferred). Second, it is operative at low levels of income.

This paper opens up other questions to empirical investigation. The most important in our opinion is the manner in which families decide to help relatives who are going through a rough period—a question we consider worth investigating.

References

Becker, Gary S., "A Theory of Social Interactions," *Journal of Political Economy* 82 (1974):1063–93.

Bergstrom, Theodore C., "Economics in a Family Way," *Journal of Economic Literature* 34 (1996):1903–34.

Chiappori, Pierre-André, "Collective Labor Supply and Welfare," *Journal of Political Economy* 100 (1992):437–67.

Cox, Donald and Emmanuel Jimenez, "Achieving Social Objectives through Private Transfers: A Review," *World Bank Research Observer* 5 (1990):205–18.

Cox, Donald, Bruce E. Hansen, and Emmanuel Jimenez, "Are Households Altruistic? Private Transfers in a Laissez-faire Economy," manuscript (1996).

Dawkins, Richard, *The Selfish Gene*, New York: Oxford University Press (1976).

Deininger, Klaus and Lyn Squire, "A New Data Set Measuring Income Inequality," *World Bank Economic Review* 10 (1996):565–91.

Eichler, Margrit, *Families in Canada Today: Recent Changes and Their Policy Consequences*, Toronto: Gage Publishing (1983).

Kremer, Michael, "How Much Does Sorting Increase Inequality?" *Quarterly Journal of Economics* 112 (1997):115–39.

Solon, Gary, "Intergenerational Income Mobility in the United States," *American Economic Review* 82 (1992):393–408.

United Nations Development Program, *Human Development Report 1994*, New York: Oxford University Press (1994).

World Bank, *World Development Report 1990*, New York: Oxford University Press (1990).

Zimmerman, David J., "Regression Toward Mediocrity in Economic Stature," *American Economic Review* 82 (1992):409–29.

Notes

1. These two classes of transfers correspond to what sociologists call the two main societal functions of families: the social placement function and the support function (see, e.g., Eichler, 1983, pp. 106–10).
2. Biologists predict altruistic behavior not only between parents and children but also among siblings and other close relatives. See, for instance, Dawkins (1976).
3. For an explanation of Hamilton's rule, see Bergstrom (1996).
4. The levels of income chosen in Figure 1 correspond to the mean income per capita per low-income and lower-middle-income countries, respectively, in 1988, according to the World Bank (1990).