Family Transfers on Education and Money and Income Distribution: Empirical Evidence

Juan Mora* and Ana I. Moro†

January, 2003‡

Abstract

This work presents a theoretical framework to study the motivation for monetary family transfers, based on an overlapping generation model. Our contribution is that we explicitly include in the model transfers on education and examine how they allow to discriminate between the two possible motivations for monetary family transfers: altruism and exchange. We also derive some econometric specifications from these models, and present empirical evidence on them using data from the PSID. We find evidence against the altruism hypothesis, whereas the exchange hypothesis is compatible with our estimation results. We also compare empirically the income distribution generated by family transfers models and the actual U.S. income distribution. We obtain that the degree of similarity between them is reasonably good.

*Departamento de Fundamentos del Análisis Económico, Universidad de Alicante, Apartado de Correos 99, E-03080 Alicante, Spain. (e-mail: juan@merlin.fae.ua.es).

†Departamento de Economía Aplicada, Universidad de Granada, Campus Cartuja s/n, E-18011 Granada, Spain. (e-mail: aimoro@ugr.es)

‡We are grateful to M.D. Collado, L. Maliar, S. Maliar, I. Ortuño, A. Romeu, C. Urrutia and seminar participants at ESEM-2002 and EEA-2002 for their helpful comments.

1 Introduction

The nature and degree of transfers within a family is an important economic issue for various reasons, e.g. because family plays a substantial role in redistributing income among their members, because family can insure their members against economic risks, many of which may not be insurable in the market place or also because family transfers can alleviate individual liquidity constraints. There are two principal alternative explanations for family transfers. One of them is that family members are altruistic and, hence, they share their income and provide each other with in-kind assistance of several kinds (see e.g. Becker 1974 and Barro 1974, where they present a model in which there exists an individual, called parent, who cares about the well-being of other individuals, called children, and transfers them money). The other one considers family transfers as pure exchange, as family members are selfish and assist each other only as part of an arrangement (see e.g. Bernheim et al. 1985, where they describe a model in which parents make transfers to children in return for services received from them).

Many empirical works have analyzed the motives for family transfers using the model proposed by Barro (1974) and Becker (1974) and U.S. data. Altonji et al. (1992) test the motivation of transfers facing a Dynasty Model (altruistic) versus a Life-Cycle Model (non-altruistic). However, their results are inconclusive, because both models are rejected when considered as null hypothesis. Altonji et al. (1995) complement their previous work testing for altruism only among those parents who are actually transferring money to their children. The hypothesis of altruism they test is whether reducing the income of a donor parent by one dollar and increasing the income of a recipient child by one dollar reduces the transferred amount by one dollar; this is called a transfer-income derivatives test. Their results show evidence against the altruism hypothesis.

Other related works distinguish between inter-vivos transfers and bequests. Among those focused on bequests, Tomes (1981) finds that bequests are inversely proportional to recipient's income, which is evidence in favor of altruism. However, Menchik (1980) and David and Menchik (1985) find that bequests tend to be split uniformly among recipients. In contrast to bequests, inter-vivos transfers are likely to be more intentionally chosen. The percentage of families which make this kind of transfers is greater and the volume of them is three times bigger. Taking the role of the family as the mechanism of redistribution of income, Cox (1987) and Cox and Rank (1992) find that transfers are motivated by exchange; however, taking the role of the family as a credit institution against liquidity constraints, Cox and Japelli (1990) find that liquidity constraints are important in the decision of transfers but not in the amount. They also find that some estimated parameters do not exclude the possibility of altruism.

This work presents a theoretical framework to study the motivation for monetary family transfers, based on an overlapping generation model. Our contribution is that we explicitly include in the model transfers on education and examine how they allow to discriminate between the two possible motivations for monetary family transfers: altruism and exchange. We also derive some econometric specifications from these models, and present empirical evidence on them. Finally, we compare empirically the income distribution generated by family transfers models and the actual U.S. income distribution.

Our data come from the 1968-1989 Panel Study of Income Dynamics, particularly the recently released 1988 wave, which contains a supplemental survey on family transfers. This data base collects separate panel data on parents and most of their adult children. Consequently, we can control for the main theoretical determinants of monetary transfers, namely current and permanent incomes of parents and children. We have analyzed separately inter-vivos transfers and bequests. In both cases, we find evidence against the altruism hypothesis, whereas the exchange hypothesis is compatible with our results; moreover, transfers on education play a crucial role to reach these conclusions.

This work continues as follows. In Section 2 we describe an overlapping generation model with two periods in which a parent decides two types of transfers to the child: education (first period) and money (second period). In Section 3 some alternative econometric models are derived from the theoretical model and estimated using the PSID data. In Section 4 we analyze the income distribution which is generated from this type o econometric models, describe how it can be compared with the actual U.S. income distribution and discuss the empirical results. Finally, Section 5 concludes. All technical details are confined to Appendices 1 and 2.

2 Theoretical Framework for Family Transfers

2.1 The altruistic model

We present a two-period model of overlapping generations with an altruistic parent and a child. The parent cares about their own consumption at each period (c_i^p for $i = 1, 2$) and the child's consumption at the second period (c^c). In the first period, the parent decides the amount of money spent on education of the child (g, transfers on education), in a context of uncertainty about the child's future income. In the second period, the parent decides the amount of money which is transferred to the adult child (b, monetary transfers). The key aspect of our model is that the factor altruism δ may depend on the transfers on education g decided in the first period; as we discuss below, this will allow us to analyse how transfers on education may affect the existence and motivation for monetary transfers. Other authors have already considered variable altruism factors which depend on parental resources and other characteristics. For instance, Mulligan (1997) considers models in which income and price of consumption affect parental concern for their children; and Barro and Becker (1989) introduce fertility decisions in the modelling of altruistic transfers.

We assume that the parent's utility is separable. To maximize the parent's utility, the dynamic programming starts in the second period. In this period the parent values their own consumption and the child's consumption. The problem which she faces is:

$$\begin{aligned} &\max_b \; U(c_2^p) + \delta(g)V(c^c) \\ &\text{s. to:} \quad c_2^p = Y_2^p - b \\ &\qquad\quad\;\; c^c = W^c + b \\ &\qquad\quad\;\; b \geq 0 \end{aligned} \tag{1}$$

where $U(\cdot)$ and $V(\cdot)$ are, respectively, parent and child utility functions, which are assumed to be concave. Observe that in the second period child's labour income W^c, parent's income in this period Y_2^p (which comes from returns on the savings decided in the first period and/or other resources) and transfers on education g (decided in the first period) are exogenous variables. As a solution to (1), monetary transfers $b(Y_2^p, W^c, \delta(g))$ are decided and the following first-order condition is satisfied:

$$-U'(Y_2^p - b) + \delta(g)V'(W^c + b) \leq 0 \tag{2}$$

This condition holds with equality for interior solutions of monetary transfers. It follows that there exists a function $b^*\left(Y_2^p, W^c, \delta\left(g\right)\right)$ such that the optimal solution for monetary transfers is:

$$b(Y_2^p, W^c, \delta(g)) = \begin{cases} 0 & \text{if } b^*\left(Y_2^p, W^c, \delta\left(g\right)\right) \leq 0 \\ b^*(Y_2^p, W^c, \delta(g)) & \text{if } b^*\left(Y_2^p, W^c, \delta\left(g\right)\right) > 0 \end{cases}$$

The parent's second-period utility proves to be:

$$H(Y_2^p, W^c, \delta(g)) \equiv U(Y_2^p - b(Y_2^p, W^c, \delta(g))) + \delta(g)V(W^c + b(Y_2^p, W^c, \delta(g)))$$

In the first period, the problem which the parent maximizes is:

$$\begin{aligned} &\max_{s,g}\ U(c_1^p) + \beta E[H(Y_2^p, W^c, \delta(g))] \\ &\text{s. to: } \ c_1^p = Y_1^p - g - s \end{aligned} \tag{3}$$

where β is the intertemporal discount factor, Y_1^p is parent's income in the first period, s are the savings and the expectation is conditional with respect to Y_1^p and characteristics of the parent Z. This expectation appears because in this first period W^c is unknown (assumed to be determined by g and other random characteristics such as innate ability) and Y_2^p might also be unknown. As a solution to (3) transfers on education $g(Y_1^p, Z)$ and savings $s(Y_1^p, Z)$ are decided.

When the optimal solution for monetary transfers is positive, $\frac{\partial b}{\partial Y_2^p}$, $\frac{\partial b}{\partial W^c}$, $\frac{\partial b}{\partial g}$ are easily obtained differentiating (2) (see Appendix). By the concavity of $U(\cdot)$ and $V(\cdot)$, $\frac{\partial b}{\partial Y_2^p} > 0$ and $\frac{\partial b}{\partial W^c} < 0$, i.e. higher parent's income and lower child's income lead to more monetary transfers, a typical result in a model of altruism. The adding-up condition $\frac{\partial b}{\partial Y_2^p} - \frac{\partial b}{\partial W^c} = 1$ is also satisfied, i.e. if the parent gains one dollar and the child loses the same amount, the monetary transfer will restore the initial optimal allocation; this is also a well-known result in altruistic models (see e.g. Becker 1974). Finally, $\frac{\partial b}{\partial g}$ has the same sign as $\delta'(g)$. If the altruism factor δ does not depend on transfers on education $\delta'(g) = 0$; hence $\frac{\partial b}{\partial g} = 0$ and our model collapses into the traditional altruism model. If δ does depend on transfers on education, the first-period educational transfers and the second-period monetary transfers are compensatory[1], thus $\delta'(g) < 0$ and hence $\frac{\partial b}{\partial g} < 0$.

2.2 The exchange model

We also describe here a two-period model with a parent and a child. The first-period problem has the same characteristics as the altruism model. However, in an exchange model, in the second period the parent does not care about the child's consumption possibilities; but she does value the attention of the child (for example, telephone calls or visits) and she is willing to pay for them even more than she would pay for the same services in the market. Following Cox (1987), the monetary transfers b are then interpreted as the payment for the attention of the child, i.e. $b = px$, where x is the quantity of services bought from the child and p is the implicit price of these services. As these services have an opportunity cost for the child, the implicit price will depend on child's income W^c. In our model, we will assume that this implicit price may also depend on the transfers on education g decided in the first period, as this may help us to examine the motivation for monetary transfers.

We also assume that the parent's utility is separable. In the second period the parent values their own consumption and the services received from the child. The problem which she faces is

$$\begin{aligned} \max_b \ & U_1(c_2^p) + U_2(x) \\ \text{s. to:} \ & c_2^p = Y_2^p - b \\ & b = px \\ & b \geq 0 \end{aligned} \tag{4}$$

where $U_i(\cdot)$, for $i = 1, 2$, are concave utility functions and $p \equiv p(W^c, g)$. Proceeding as before, the first-order condition which determines monetary transfers is:

$$-U_1'(Y_2^p - b) + \frac{1}{p} U_2'(\frac{b}{p}) \leq 0. \tag{5}$$

[1] Altruistic parents choose between investing in child's human capital and making monetary transfers when the child has left school (see e.g. Drazen 1978 or Becker 1991).

This condition holds with equality for interior solutions. As in the previous model, there exists a function $b^*(Y_2^p, p(W^c, g))$ such that

$$b(Y_2^p, p(W^c, g)) = \begin{cases} 0 & \text{if } b^*(Y_2^p, p(W^c, g)) \leq 0 \\ b^*(Y_2^p, p(W^c, g)) & \text{if } b^*(Y_2^p, p(W^c, g)) > 0 \end{cases}$$

and the parent's second-period utility proves to be:

$$H(Y_2^p, p(W^c, g)) \equiv U_1(Y_2^p - b(Y_2^p, p(W^c, g))) + U_2(\frac{b(Y_2^p, p(W^c, g))}{p(W^c, g)}).$$

In the first period, the problem which the parent maximizes is:

$$\begin{aligned} &\max_{s,g} \; U(c_1^p) + \beta E[H(Y_2^p, p(W^c, g))] \\ &\text{s. to:} \;\; c_1^p = Y_1^p - g - s \end{aligned} \tag{6}$$

where β is the intertemporal discount factor, Y_1^p is parent's income in the first period and s are savings. As a solution transfers on education $g(Y_1^p, Z)$ and savings $s(Y_1^p, Z)$ are decided.

When the optimal solution for monetary transfers is positive, $\frac{\partial b}{\partial Y_2^p}$, $\frac{\partial b}{\partial W^c}$, $\frac{\partial b}{\partial g}$ can be obtained differentiating (5) (see Appendix). Again, by the concavity of $U_1(\cdot)$ and $U_2(\cdot)$, $\frac{\partial b}{\partial Y_2^p} > 0$. On the other hand, the signs of $\frac{\partial b}{\partial W^c}$ and $\frac{\partial b}{\partial g}$ depend on the signs of $\frac{\partial b}{\partial p}$, $\frac{\partial p}{\partial W^c}$ and $\frac{\partial p}{\partial g}$. Now, $\frac{\partial b}{\partial p}$ has the same sign as $-\alpha + \frac{b}{p}$, where $\alpha \equiv -\frac{U_2'(\frac{b}{p})}{U_2''(\frac{b}{p})}$ is the elasticity of the demand for child services. If $\alpha = b/p$, what happens when $U_2(\cdot) = \ln(\cdot)$, then $\frac{\partial b}{\partial p} = 0$ and, therefore, $\frac{\partial b}{\partial W^c} = 0$ and $\frac{\partial b}{\partial g} = 0$. Otherwise, the signs of $\frac{\partial b}{\partial W^c}$ and $\frac{\partial b}{\partial g}$ depend on the signs of $-\alpha + \frac{b}{p}$, $\frac{\partial p}{\partial W^c}$ and $\frac{\partial p}{\partial g}$.

The implicit price p is an opportunity cost for the child; hence it increases with child's income i.e. $\frac{\partial p}{\partial W^c} > 0$. As for $\frac{\partial p}{\partial g}$, if p does not depend on transfers on education $\frac{\partial p}{\partial g} = 0$, hence $\frac{\partial b}{\partial g} = 0$ and our model collapses into the traditional exchange model. But if p does depend on g, parents will be less willing to pay for services if transfers on education are high, i.e. $\frac{\partial p}{\partial g} < 0$. Hence, if $\alpha > b/p$ (high enough elasticity), then $\frac{\partial b}{\partial p} < 0$ and therefore $\frac{\partial b}{\partial W^c} < 0$, $\frac{\partial b}{\partial g} > 0$, i.e. lower child's income and higher transfers on education lead to more monetary transfers. However, if $\alpha < b/p$ (low enough elasticity), $\frac{\partial b}{\partial p} > 0$ and therefore $\frac{\partial b}{\partial W^c} > 0$, $\frac{\partial b}{\partial g} < 0$.

2.3 Comparative Summary

The objective of this work is to examine how the inclusion of transfers on education may help to discriminate between altruism and exchange. The two models we have described allow us to establish a relationship between second-period monetary transfers b and second-period parent's resources Y_2^p, child's labor income W^c and first-period educational transfers g. Note that, when transfers on education are relevant in parent's decision, $\delta'(g) < 0$ in the altruism model and $\frac{\partial p}{\partial g} < 0$ in the exchange model, i.e. in both cases the more transfers on education are given in the first period, the more reluctant parents are to transfer money to their child in the second period. However, the nature of the relationship between b, Y_2^p, W^c and g varies according to the underlying motivation. The following table summarizes what this relationship is like when transfers on education are relevant in the second-period decision:

Model		$\frac{\partial b}{\partial Y_2^p}$	$\frac{\partial b}{\partial W^c}$	$\frac{\partial b}{\partial g}$
Altruism	$\delta'(g) < 0$	$+$	$-$	$-$
Exchange	$\alpha < b/p$	$+$	$+$	$-$
	$\alpha = b/p$	$+$	0	0
	$\alpha > b/p$	$+$	$-$	$+$

The main conclusion of this table is that it is possible to distinguish between the two alternative motivations, because under altruism both $\frac{\partial b}{\partial W^c}$ and $\frac{\partial b}{\partial g}$ are negative, whereas under exchange they both are zero or have different sign.

Observe that if transfers on education are not relevant in the second-period decision, i.e. if $\delta'(g) = 0$ in the altruism model or if $\frac{\partial p}{\partial g} = 0$ in the exchange model, we are in the same situation as in Cox (1987): it might not be possible to distinguish between altruism and exchange because the case $\frac{\partial b}{\partial W^c} < 0$ would be compatible with both models. When incorporating transfers on education, again $\frac{\partial b}{\partial W^c}$ could not allow us to distinguish between altruism and exchange, as a negative sign would be compatible with both models; however, now even in this case we can discriminate between both motivations if transfers on education are relevant, simply by looking at the sign of $\frac{\partial b}{\partial g}$.

3 Econometric Analysis of Family Transfers

3.1 Data

We first discuss our data base in order to analyse which econometric model will be appropriate. Our data come from the 1968-88 Panel Study of Income Dynamics (PSID), which includes a special supplement on transfers between relatives. We have selected those 1968 families which satisfy: i) the head of household was still alive in 1988; and ii) the oldest child had left home in 1988 or before, and had positive labour income in 1988. An observation consists of a matched pair "parents/oldest child". The total number of observations in our sample is 485. We will use the term "family" for the household where parents live. For each observation, we have information about family income in every year between 1968 and 1988, father's and mother's level of education in 1968, level of education attained by the child in 1988, child's labour income in 1988 and monetary transfers from the family to the child in 1988. In all cases, the level of education is a discrete variable which ranges from 1 to 8.

We want to consider two different transfers: education and money. The transfers on education are defined as the amount of expenditure on education realized by parents. This variable is not observable, but we do observe the level of education attained by the child, which should be highly correlated with the transfers on education. On the other hand, two different types of transfers on money will be considered: inter-vivos transfers and bequests. The former includes gifts and the monetary equivalent of time devoted to children, computed with the mean wage per hour w (we consider $w = 3.7$, value obtained from 1988 PSID data). Bequests are defined as the answer to the following question, included in the PSID: *"Suppose your parents were to sell all of their major possessions (including their home), turn all their investments and other assets into cash, and pay all their debts. Would they have something left over, break even, or be in debt? How much would they have left over?"*

In Table 1 we report the mean and standard deviation of the variables of interest. In our theoretical models we have considered two variables of family income, one for each period Y_1^p, Y_2^p. There are several possible ways to define these variables from data. To check the robustness of our results, we have considered various definitions. Specifically, for Y_1^p we consider family mean income in 1968-1972, and in 1968-1977; and for Y_2^p we consider family mean income in 1974-1988, in 1979-1988, and in 1984-1988. These variables are also included in Table 1. It is observed that: (i) the mean level of child's education is greater than that of parents' education; (ii) the proportion of children receiving inter-vivos transfers is greater than the proportion of children receiving bequests; (iii) many families do not devote any resources to monetary family transfers and, hence, limited dependent variable models will have to be used.

3.2 Econometric Specifications

For comparative purposes, we will first consider two econometric specifications for monetary family transfers which do not take into account transfers on education. If we assume in (1) that δ is constant, the solution to the second period problem are monetary transfers $b(Y_2^p, W^c)$. As there is a non-negativity restriction for b, the first specification we consider is:

$$\text{Specification 1:} \qquad \begin{aligned} b_i^* &= \beta_0 + \beta_1 \ln Y_{2i}^p + \beta_2 \ln W_i^c + u_i \\ b_i &= \begin{cases} \exp(b_i^*) & \text{if } b_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \end{aligned}$$

where b^* is a latent variable and u is an error term. As in related literature, we also consider a specification in which the decision to give monetary transfers is considered separately from the quantity which is decided to transfer, that is:

$$\text{Specification 2:} \qquad \begin{aligned} d_i &= \lambda_0 + \lambda_1 \ln Y_{2i}^p + \lambda_2 \ln W_i^c + \xi_i \\ b_i^* &= \beta_0 + \beta_1 \ln Y_{2i}^p + \beta_2 \ln W_i^c + u_i \\ b_i &= \begin{cases} \exp(b_i^*) & \text{if } d_i > 0 \\ 0 & \text{otherwise} \end{cases} \end{aligned}$$

where d is the decision variable and ξ is another error term.

Let us consider now specifications which take into account transfers on education. Under both altruism and exchange, second-period monetary transfers b eventually depend on second-period family income Y_2^p, child's labor income W^c and first-period transfers on education g; on the other hand, first-period transfers on education g eventually depend on first-period family income Y_1^p and other characteristics of the family Z. As g is not directly observable, we introduce another equation relating g with the child's level of education, measured from 1 to 8, and consider:

Specification 3:

$$\ln g_i = \gamma_0 + \gamma_1 \ln Y^p_{1i} + \gamma_2 \ln F_i + \gamma_3 \ln M_i + \varepsilon_i$$
$$E_i = \begin{cases} 1 & \text{if } \ln g_i + \eta_i \leq 0 \\ 2 & \text{if } \ln g_i + \eta_i \in (0, \mu_1] \\ ... & \\ 7 & \text{if } \ln g_i + \eta_i \in (\mu_5, \mu_6] \\ 8 & \text{if } \ln g_i + \eta_i > \mu_6 \end{cases}$$
$$b^*_i = \beta_0 + \beta_1 \ln Y^p_{2i} + \beta_2 \ln W^c_i + \beta_3 \ln g_i + u_i$$
$$b_i = \begin{cases} \exp(b^*_i) & \text{if } b^*_i > 0 \\ 0 & \text{otherwise} \end{cases}$$

where F is father's level of education, M is mother's level of education, E is child's level of education and ε, η are error terms. Observe that no intercept or slope parameters are included in the equation relating E and g because they would not be identifiable since g is not observable; for the same reason, only six threshold parameters μ are included. Finally, in this context it is also possible to consider separately the decision to give transfers and the quantity to transfer introducing, as before, a decision equation:

Specification 4:

$$\ln g_i = \gamma_0 + \gamma_1 \ln Y^p_{1i} + \gamma_2 \ln F_i + \gamma_3 \ln M_i + \varepsilon_i$$
$$E_i = \begin{cases} 1 & \text{if } \ln g_i + \eta_i \leq 0 \\ 2 & \text{if } \ln g_i + \eta_i \in (0, \mu_1] \\ ... & \\ 7 & \text{if } \ln g_i + \eta_i \in (\mu_5, \mu_6] \\ 8 & \text{if } \ln g_i + \eta_i > \mu_6 \end{cases}$$
$$d_i = \lambda_0 + \lambda_1 \ln Y^p_{2i} + \lambda_2 \ln W^c_i + \lambda_3 \ln g_i + \xi_i$$
$$b^*_i = \beta_0 + \beta_1 \ln Y^p_{2i} + \beta_2 \ln W^c_i + \beta_3 \ln g_i + u_i$$
$$b_i = \begin{cases} \exp(b^*_i) & \text{if } d_i > 0 \\ 0 & \text{otherwise} \end{cases}$$

Observe that it is possible to put together the first two equations of Specifications 3 and 4, removing the non-observable variable g, and obtain:

$$\Pr\{E_i = j\} = \Pr\{\gamma_0 + \gamma_1 \ln Y^p_{1i} + \gamma_2 \ln F_i + \gamma_3 \ln M_i + \nu_i \in (\mu_{j-2}, \mu_{j-1}]\} \quad (7)$$

for $j = 1, ..., 8,$ where $\nu \equiv \varepsilon + \eta$, $\mu_{-1} \equiv -\infty$, $\mu_0 \equiv 0$, $\mu_7 \equiv +\infty$. Hence, there are only two relevant error terms (ν and u) in Specification 3 and three (ν, ξ and u) in Specification 4.

We assume that the observations are independent and identically distributed (i.i.d.). As we will use maximum likelihood techniques, we also assume in all models that the joint conditional distribution of errors given the exogenous variables is normal with mean $\mathbf{0}$. As ξ (Specifications 2 and 4) and ν (Specifications 3 and 4) are errors in equations with discrete dependent variable, for identifiability it is also necessary to assume that the conditional variance of these errors given the exogenous variables is 1. Hence, the total number of parameters to estimate in Specification 1 is 4 (three coefficients and one variance), in Specification 2 is 8 (six coefficients, one variance and one correlation), in Specification 3 is 16 (eight coefficients, six thresholds, one variance and one correlation) and in Specification 4 is 22 (twelve coefficients, six thresholds, one variance and three correlations).

3.3 Empirical Results

All specifications have been estimated by maximum likelihood. The likelihood function of each model is described in Appendix 2. The maximum likelihood estimation has been performed using the CML routines of GAUSS. All programs are available from the authors on request.

We are interested in two different types of monetary family transfers: inter-vivos transfers and bequests. Hence, for each specification we present first the results with inter-vivos transfers as dependent variable, and then the results with bequests as dependent variable. Additionally, we have considered various possible choices for each parent's income variable; as noted before for Y_1^p we consider family mean income in 1968-1972 and in 1968-1977, denoted as Y_{68-72}^p and Y_{68-77}^p, respectively; and for Y_2^p we consider family mean income in 1984-1988, in 1979-1988, and in 1974-1988, denoted as Y_{84-88}^p, Y_{79-88}^p and Y_{74-88}^p, respectively. In Tables 2, 3, 4 and 5 the estimations of Specifications 1, 2, 3 and 4, respectively, are reported. In all cases, estimates are reported with their t-statistics, which have been computed using outer-product based standard errors.

First we discuss the results obtained when modelling inter-vivos transfers. When considering Specifications 1 and 2, the parameter which could allow us to discriminate between exchange and altruism is β_2, coefficient of W^c. In these specifications this coefficient is significant and negative, hence there is no evidence against altruism, but not against exchange either. All other estimates have the expected signs. However, the estimation with Y^p_{84-88} yields an unexpected non-significant coefficient β_1; hence, we discard this variable as a possible choice for Y^p_2 in all other estimations with inter-vivos transfers. The inclusion of a decision equation in Specification 2 does not yield any change in the conclusions.

When considering Specifications 3 and 4, what we first observe is that in all estimations the parameters in the equation which determines the transfers on education have the expected sign and magnitude: family income and father's level of education are positive and highly significant, but mother's level of education is non-significant. Parameter β_2, coefficient related to W^c, is negative and significant, what is compatible with both altruism and exchange models. However, parameter β_3, coefficient related to g, is positive and, in most cases, significant. Hence, the altruism hypothesis is rejected, but there is no evidence against exchange, though a more significant parameter β_1, coefficient related to Y^p_2, should be expected. If a decision equation is included, conclusions do not change, though it is worth noting that now the t-statistic of parameter λ_3, coefficient related to g in the decision equation, is greater than the t-statistic of parameter β_3, which proves to be non-significant, possibly due to lack of precision in the estimation, as this specification contains 22 parameters. To sum up, when analysing motives for inter-vivos transfers, the specifications without transfers on education do not allow to discriminate between exchange or altruism, but the inclusion of transfers on education provides evidence in favor of exchange and against altruism.

When modelling bequests, in Specifications 1 and 2 the coefficient related to W^c is clearly non-significant, what gives evidence against altruism, but not against exchange. Additionally, the three possible choices for Y^p_2 yield similar results for β_1. As with inter-vivos transfers, hereafter we only report the estimations considering Y^p_{79-88} and Y^p_{74-88} as second-period family income. On the other hand, in most cases the independent variables in the decision equation are non-significant, i.e., there is no evidence that a previous process of decision to leave bequests takes place. This result is not a surprise taking into account that, by definition, the variable "bequests" is a measure of potential inheritance rather than actual inheritance.

When considering Specifications 3 and 4, the altruism hypothesis is even more decisively rejected, as the coefficient related to W^c continues to be non-significant, whereas β_1 and β_3 are both positive, and significant in some cases. On the other hand, the exchange hypothesis is compatible with the results obtained for both specifications, almost for any choice of family income variables. However, all parameters in the decision equation included in Specification 4 prove to be non-significant, what again might be a consequence of lack of precision in the estimation. To sum up, when analysing motives for bequests, the altruism hypothesis is rejected in all specifications, but the exchange hypothesis is consistent with most of the results.

Some specification tests have also been performed in order to test the validity of the econometric assumptions. The normality assumption has been tested using a Conditional Moment Test and Stute's Test (see Cameron and Trivedi, 1986 and Stute, 1997). In almost all cases the null hypothesis of normality was accepted using 0.05 as significance level (the only exception was Specification 3, estimated with bequests as dependent variable, in which case p-values vary between 0.03 and 0.1, depending on the test and the choice of independent variables). The homoskedasticity assumption was also tested in all equations with discrete dependent variable, with the general formulation proposed by Harvey (1976) and using Wald statistics (see e.g. Greene 1997, Section 19.4.1); in all cases the null hypothesis of homoskedasticity was accepted.

4 Income Distribution in Models with Family Transfers

The second aim of this work is to analyze the degree of similarity between the distribution of income which derives from overlapping-generation models with family transfers and the actual empirical distribution of income. We will focus on the two components of income which our theoretical models consider: labour income W^c and monetary family transfers b. Hence, for our purposes we define income Y^c as $Y^c = W^c + b$ (we maintain the superscript c because our labour income data correspond to children in 1968 who became heads of household in 1988). We have already proposed and estimated several models for b; our first step now is to propose and estimate a model for W^c.

In our context, it is standard to assume that labour earnings of an individual depend multiplicatively on the expenditure incurred by their parents

g and a random variable α which may reflect innate ability (see e.g. Loury 1981). This leads to the relationship $W_i^c = \theta_0 (g_i \alpha_i)^{\theta_1}$, or equivalently:

$$\ln W_i^c = \ln \theta_0 + \theta_1 \ln g_i + \omega_i, \tag{8}$$

where $\omega = \theta_1 \ln \alpha$ can be interpreted as an error term. As before, θ_0 and θ_1 cannot be estimated in (8) because g is not observable. If we put together (8) and the first equation in Model 3, then we obtain

$$\ln W_i^c = \ln \theta_0 + \theta_1 \gamma_0 + \theta_1 \gamma_1 \ln Y_{1i}^p + \theta_1 \gamma_2 \ln F_i + \theta_1 \gamma_3 \ln M_i + \psi_i \tag{9}$$

where $\psi \equiv \theta_1 \varepsilon + \omega$. Now it is possible to estimate jointly this equation and (7) by maximum likelihood assuming, as before, that i.i.d. observations and and joint normality of errors conditional to regressors. The likelihood function is derived in Appendix 2. Observe that the error term ω which appears in (8) is likely to be positively correlated with the error term η which was introduced in the second equation of Model 3, because both reveal individual ability; hence a positive correlation between the error terms in (7) and (9) is expected.

The joint estimation of (7) and (9) is reported in Table 6, with t-statistics computed from outer-product based standard errors. As before, there are two possible choices for Y_1^p : Y_{68-72}^p and Y_{68-77}^p; note that results are similar in both cases. Observe that expenditure on education has decreasing returns in labour income; also observe that, as in previous estimations, $\ln M_i$ is not statistically significant, but the other variables are. As expected, correlation among errors is significant. We have also tested the linear specification assumed in (9) using the tests proposed in Horowitz and Härdle (1994) and Stute (1997). Horowitz-Härdle's test was performed with various bandwith values ($h = 0.01$, 0.05 and 0.2) and in all cases the p-value was greater than 0.2. The same conclusion was reached with Stute's test. The homoskedasticity assumption in (9) was also tested using Harvey's formulation and a Wald statistic, and the resulting p-value was 0.24. Hence, no misspecification was detected.

Our main objective in this section is to check whether the income distribution generated by the theoretical models fits the data. To be more specific, assume that we have econometric models for labour income W^c and monetary transfers b which are completely specified except for vectors of parameters

$\psi_1 \in \Psi_1 \subset \mathbb{R}^{p_1}$ and $\psi_2 \in \Psi_2 \subset \mathbb{R}^{p_2}$, respectively. If these two models are correct, then the distribution function of income $Y^c = W^c + b$ is also determined except for the vector of parameters $\psi \equiv (\psi_1', \psi_2')' \in \Psi \equiv \Psi_1 \times \Psi_2$. Let us denote $F(\cdot, \psi)$ the distribution function of Y^c determined by these two models. Then we can test the appropriateness of the econometric specifications, as regards income, by testing if the true distribution function of Y^c is $F(\cdot, \psi)$ for some $\psi \in \Psi$, i.e., if we denote $F_Y(\cdot)$ the distribution function of Y^c, we want to test:

$$\begin{array}{ll} H_0: & F_Y(\cdot) \in \{F(\cdot, \psi), \quad \psi \in \Psi\}; \\ H_1: & F_Y(\cdot) \notin \{F(\cdot, \psi), \quad \psi \in \Psi\}. \end{array}$$

This is the classical statistical problem of "goodness-of-fit". However, as we do not have an analytical expression for $F(\cdot, \psi)$ and ψ is unknow, it is not possible to apply the standard goodness-of-fit procedures.

To face H_0 and H_1 we proceed as follows: given observations $\{W_i^c, b_i\}_{i=1}^n$, we compute the empirical distribution function of $\{Y_i^c\}_{i=1}^n$, denoted $\hat{F}_Y(\cdot)$, and maximum-likelihood estimates $\hat{\psi}_1, \hat{\psi}_2$; then by Monte Carlo we generate simulated observations $\{\hat{W}_i^c, \hat{b}_i\}_{i=1}^n$ which do follow the specified models; we can now obtain $\hat{Y}_i^c = \hat{W}_i^c + \hat{b}_i$ and compute the empirical distribution function of $\{\hat{Y}_i^c\}_{i=1}^n$, denoted $\hat{F}_{\hat{Y}}(\cdot)$. If H_0 is true, then $\hat{F}_Y(\cdot)$ and $\hat{F}_{\hat{Y}}(\cdot)$ are both consistent estimates of $F_Y(\cdot)$ and should be close. Hence, a Kolmogorov-Smirnov test-statistic such as:

$$D_n = \max_{x \in \mathbb{R}} \left| \hat{F}_Y(x) - \hat{F}_{\hat{Y}}(x) \right|$$

could be used to face our hypotheses taking $\{D_n \geq c_{1-\alpha}\}$ as critical region, for a suitable critical value $c_{1-\alpha}$ chosen so that the significance level is α. To obtain the critical value the following bootstrap procedure is used: generate B bootstrap samples with n observations which satisfy the specified models; for each bootstrap sample repeat the previous computations to obtain a bootstrap test-statistic $D_n^{(b)}$; then $c_{1-\alpha}$ can be approximated by the $(1-\alpha)$-quantile of $\{D_n^{(b)}\}_{b=1}^B$.

As a first approach to examine the goodness of fit, in Figure 1 we plot estimated density functions corresponding to real data with inter-vivos transfers as b_i, and simulated data from Models 1 and 3, taking $Y_{1i}^p = Y_{68-77}^p$ and $Y_{2i}^p = Y_{74-88}^p$ and in Figure 2 similar plots are depicted replacing inter-vivos transfers by bequests. The density functions have been estimated using non-parametric kernel estimates. In Figure 1 we observe that those curves which correspond to simulated data are extremely close to each other; moreover, they both have similar shape as the one which corresponds to real data, though certain differences are appreciated between them at medium incomes. In Figure 2 we observe that the three curves are very similar at all levels of income. In Table 7 we report the results of our test procedure. In most cases the null hypothesis is accepted with usual significance levels.

5 Conclusions

The main objective of this work is to explain the motivation behind family transfers. Two principal alternative explanations have appeared in the related literature. One of them is that family members are altruistic; the other one considers family transfers as an exchange, which is part of an arrangement. The empirical literature on this topic is inconclusive. Our contribution is that we include in the model transfers on education, decided before monetary family transfers take place. We prove that this inclusion helps to discriminate between these two motives for private transfers. Our empirical results using PSID data reveal evidence against altruism and are consistent with the exchange hypothesis. This result holds with the two kinds of monetary transfers which we consider: inter-vivos family transfers and bequests.

The second objective of this work is to examine if the distribution of income induced from standard overlapping-generation models with transfers captures the principal features of real income distribution. We propose a procedure for testing the equality between real and generated income distributions. We consider only two components of income: labour income plus monetary family transfers. We consider a simple model to generate labour income and the models previously considered for monetary family transfers. The results we obtain reveal that the degree of similarity between real and generated income distributions is reasonably good.

APPENDIX 1: Comparative Statics

We compute the partial derivatives of the behavioral equation corresponding to the second period problem for interior solution of monetary transfers in both scenarios: the altruistic and the exchange model. We start with the altruistic model. Differentiating of the first order condition (2), evaluated in the optimal interior solution $b(Y_2^p, W^c, \delta(g))$-denoted for simplicity b, yields:

$$\begin{aligned} 0 &= db\left(U''(Y_2^p - b) + \delta(g)V''(W^c + b)\right) + dg\left(\delta'(g)V'(W^c + b)\right) \\ &\quad + dY_2^p\left(-U''(Y_2^p - b)\right) + dW^c\left(\delta(g)V''(W^c + b)\right) \end{aligned}$$

If $\delta'(g) \leq 0$, this equation implies the following partial derivatives:

$$\begin{aligned} \frac{db}{dY_2^p} &= \frac{U''(Y_2^p - b)}{U''(Y_2^p - b) + \delta(g)V''(W^c + b)} > 0; \\ \frac{db}{dW^c} &= \frac{-\delta(g)V''(W^c + b)}{U''(Y_2^p - b) + \delta(g)V''(W^c + b)} < 0; \\ \frac{db}{dg} &= \frac{-\delta'(g)V'(W^c + b)}{U''(Y_2^p - b) + \delta(g)V''(W^c + b)} \leq 0. \end{aligned}$$

In the exchange model we differentiate the first order condition (5) for the interior solution, obtaining:

$$\begin{aligned} 0 &= db\left(U_1''(Y_2^p - b) + \left(\frac{1}{p}\right)^2 U_2''\left(\frac{b}{p}\right)\right) + \\ &\quad dp\left(-\left(\frac{1}{p}\right)^2 U_2'\left(\frac{b}{p}\right) - \left(\frac{1}{p}\right)^3 bU_2''\left(\frac{b}{p}\right)\right) + dY_2^p\left(-U_1''(Y_2^p - b)\right) \end{aligned}$$

If we assume that $\frac{dp}{dW^c} > 0$ and $\frac{dp}{dg} \leq 0$, this equation implies the following comparative static:

$$\begin{aligned} \frac{db}{dY_2^p} &= \frac{U_1''(Y_2^p - b)}{U_1''(Y_2^p - b) + \left(\frac{1}{p}\right)^2 U_2''\left(\frac{b}{p}\right)} > 0; \\ \frac{db}{dp} &= \frac{U_2'\left(\frac{b}{p}\right) + \frac{b}{p}U_2''\left(\frac{b}{p}\right)}{U_1''(Y_2^p - b)p^2 + U_2''\left(\frac{b}{p}\right)} \gtreqless 0 \Leftrightarrow \frac{U_2'\left(\frac{b}{p}\right)}{U_2''\left(\frac{b}{p}\right)} + \frac{b}{p} \gtreqless 0. \end{aligned}$$

APPENDIX 2: Likelihood Functions

To simplify notation, hereafter we denote:

$$
\begin{aligned}
&m_{gi} \equiv \gamma_0 + \gamma_1 \ln Y_{1i}^p + \gamma_2 \ln F_i + \gamma_3 \ln M_i;\\
&m_{bi} \equiv \beta_0 + \beta_1 \ln Y_{2i}^p + \beta_2 \ln W_i^c;\\
&m_{bi}^* \equiv \beta_0 + \beta_1 \ln Y_{2i}^p + \beta_2 \ln W_i^c + \beta_3 m_{gi};\\
&m_{di} \equiv \lambda_0 + \lambda_1 \ln Y_{2i}^p + \lambda_2 \ln W_i^c;\\
&m_{di}^* \equiv \lambda_0 + \lambda_1 \ln Y_{2i}^p + \lambda_2 \ln W_i^c + \lambda_3 m_{gi};\\
&m_{wi} \equiv \ln \theta_0 + \theta_1 \gamma_0 + \theta_1 \gamma_1 \ln Y_{1i}^p + \theta_1 \gamma_2 \ln F_i + \theta_1 \gamma_3 \ln M_i.
\end{aligned}
$$

The standard univariate normal distribution function is denoted $\Phi(\cdot)$ and the standard bivariate normal distribution function with correlation coefficient ρ is denoted $\Phi^*(\cdot, \cdot, \rho)$.

Likelihood Function for Specification 1: It can be derived as in Amemiya (1988), Section 10.2:

$$
\ln L_1 = \sum_{b_i=0} \ln \Phi(-\frac{m_{bi}}{\sigma_u}) + \sum_{b_i>0} [-\ln b_i - \frac{1}{2}\ln(2\pi) - \frac{1}{2}\ln \sigma_u^2 - \frac{(\ln b_i - m_{bi})^2}{2\sigma_u^2}].
$$

Likelihood Function for Specification 2: It can be derived as in Amemiya (1988), Section 10.7:

$$
\ln L_2 = \sum_{b_i=0} \ln \Phi(-m_{di}) + \sum_{b_i>0} \{-\ln b_i - \frac{1}{2}\ln(2\pi) - \ln \sigma_u - \frac{(\ln b_i - m_{bi})^2}{2\sigma_u^2}\} +
$$

$$
\sum_{b_i>0} \ln \Phi(\frac{m_{di} + \frac{\rho_{u\xi}}{\sigma_u}(\ln b_i - m_{bi})}{(1-\rho_{u\xi}^2)^{1/2}}).
$$

Likelihood Function for Specification 3: We must obtain:

$$
\ln L_3 = \sum_{j=1}^{8} \left[\sum_{\substack{E_i=j\\ b_i=0}} \ln \Pr(E_i = j, b_i^* \leq 0) + \right.
$$

$$\left.\sum_{\substack{E_i=j\\ b_i>0}} \ln\{f(b_i \mid E_i=j, b_i^*>0)\Pr(E_i=j, b_i^*>0)\}\right].$$

where $f(\cdot \mid E_i = j, b_i^* > 0)$ denotes the conditional density of b_i given $E_i = j, b_i^* > 0$. The first term on the right-hand side can be computed using the standard bivariate normal distribution function. As for the second term, using the same reasoning as in Amemiya (1988), Section 10.7, it is possible to derive the conditional density function of b_i^* given $E_i = j, b_i^* > 0$, denoted $f_*(\ln b_i \mid E_i = j, b_i^* > 0)$. Taking into account that, for $b_i > 0$, $f(b_i \mid E_i = j, b_i^* > 0) = b_i^{-1} f_*(\ln b_i \mid E_i = j, b_i^* > 0)$, we deduce the following expression for $\ln L_3$:

$$\ln L_3 = \sum_{j=1}^{8}\left[\sum_{\substack{E_i=j\\ b_i=0}} \ln\{\Phi^*(\mu_{j-1} - m_{gi}, -\frac{m_{bi}^*}{\sigma_u}, \rho_{uv}) - \Phi^*(\mu_{j-2} - m_{gi}, -\frac{m_{bi}^*}{\sigma_u}, \rho_{uv})\}+\right.$$

$$\sum_{\substack{E_i=j\\ b_i>0}} \{-\ln b_i - \frac{1}{2}\ln(2\pi) - \ln\sigma_u - \frac{(\ln b_i - m_{bi}^*)^2}{2\sigma_u^2}\}+$$

$$\left.\sum_{\substack{E_i=j\\ b_i>0}} \ln[\Phi\{\frac{\mu_{j-1} - m_{gi} - \frac{\rho_{u\nu}}{\sigma_u}(\ln b_i - m_{bi}^*)}{(1-\rho_{u\nu}^2)^{1/2}}\} - \Phi\{\frac{\mu_{j-2} - m_{gi} - \frac{\rho_{u\nu}}{\sigma_u}(\ln b_i - m_{bi}^*)}{(1-\rho_{u\nu}^2)^{1/2}}\}]\right].$$

Likelihood Function for Specification 4: We must now obtain:

$$\ln L_4 = \sum_{j=1}^{8}\left[\sum_{\substack{E_i=j\\ b_i=0}} \ln\Pr(E_i=j, d_i \leq 0)+\right.$$

$$\left.\sum_{\substack{E_i=j\\ b_i>0}} \ln\{f(b_i \mid E_i=j, d_i>0)\Pr(E_i=j, d_i>0)\}\right],$$

where $f(\cdot \mid E_i = j, d_i > 0)$ denotes the conditional density of b_i given $E_i = j, d_i > 0$.The first term on the right-hand side can be computed as before. As for the second term, observe that the conditional density function of b_i^* given $E_i = j, d_i > 0$, denoted $f_*(b_i^* \mid E_i = j, d_i > 0)$, may be obtained as before, and, again, for $b_i > 0$, $f(b_i \mid E_i = j, d_i > 0) = b_i^{-1} f_*(\ln b_i \mid E_i = j, d_i > 0)$. From this we can deduce that if we denote $\rho_* \equiv (\rho_{v\xi} - \rho_{u\nu}\rho_{u\xi})/\{(1-\rho_{u\nu}^2)(1-\rho_{u\xi}^2)\}^{1/2}$, then $\ln L_4$ can be expressed as:

$$\ln L_4 = \sum_{j=1}^{8} \Bigg[\sum_{\substack{E_i=j\\ b_i=0}} \ln\{\Phi^*(\mu_{j-1} - m_{gi}, -m_{di}^*, \rho_{v\xi}) - \Phi^*(\mu_{j-2} - m_{gi}, -m_{di}^*, \rho_{v\xi})\} +$$

$$\sum_{\substack{E_i=j\\ b_i>0}} \{-\ln b_i - \frac{1}{2}\ln(2\pi) - \ln\sigma_u - \frac{(\ln b_i - m_{bi}^*)^2}{2\sigma_u^2}\} +$$

$$\sum_{\substack{E_i=j\\ b_i>0}} \ln[\Phi\{\frac{\mu_{j-1} - m_{gi} - \frac{\rho_{u\nu}}{\sigma_u}(\ln b_i - m_{bi}^*)}{(1-\rho_{u\nu}^2)^{1/2}}\} - \Phi\{\frac{\mu_{j-2} - m_{gi} - \frac{\rho_{u\nu}}{\sigma_u}(\ln b_i - m_{bi}^*)}{(1-\rho_{u\nu}^2)^{1/2}}\} +$$

$$\Phi^*\{\frac{\mu_{j-1} - m_{gi} - \frac{\rho_{u\nu}}{\sigma_u}(\ln b_i - m_{bi}^*)}{(1-\rho_{u\nu}^2)^{1/2}}, -\frac{m_{di}^* + \frac{\rho_{u\xi}}{\sigma_u}(\ln b_i - m_{bi}^*)}{(1-\rho_{u\xi}^2)^{1/2}}, \rho_*\} +$$

$$\Phi^*\{\frac{\mu_{j-2} - m_{gi} - \frac{\rho_{u\nu}}{\sigma_u}(\ln b_i - m_{bi}^*)}{(1-\rho_{u\nu}^2)^{1/2}}, -\frac{m_{di}^* + \frac{\rho_{u\xi}}{\sigma_u}(\ln b_i - m_{bi}^*)}{(1-\rho_{u\xi}^2)^{1/2}}, \rho_*\}] \Bigg].$$

Likelihood Function for Joint Estimation of (7) and (9): In this case, we must obtain:

$$\ln L_5 = \sum_{j=1}^{8} \sum_{E_i=j} \ln\{\Pr(E_i = j) f(\ln W_i^c \mid E_i = j)\},$$

where $f(\cdot \mid E_i = j)$ denotes the conditional density of $\ln W_i^c$ given $E_i = j$. Using the same reasoning as before, it is possible to derive the following expression:

$$\ln L_5 = \sum_{j=1}^{8} \sum_{E_i=j} \Bigg[-\frac{1}{2}\ln(2\pi) - \ln\sigma_\psi - \frac{(\ln W_i^c - m_{wi})^2}{2\sigma_\psi^2} +$$

$$\ln[\Phi\{\frac{\mu_{j-1} - m_{gi} - \frac{\rho_{\psi\nu}}{\sigma_\psi}(\ln W_i^c - m_{wi})}{(1-\rho_{\psi\nu}^2)^{1/2}}\} - \Phi\{\frac{\mu_{j-2} - m_{gi} - \frac{\rho_{\psi\nu}}{\sigma_\psi}(\ln W_i^c - m_{wi})}{(1-\rho_{\psi\nu}^2)^{1/2}}\}] \Bigg].$$

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TABLES

TABLE 1: Mean and Standard Deviation of Selected variables

Not.	Variable[a]		Mean	St. Dev.
	Family Income at 1968		10.8822	6.4174
	Family Income at 1988		41.3496	42.7059
Y^p_{68-72}	Family Mean Income in 1968-1972		11.9246	6.8851
Y^p_{68-77}	Family Mean Income in 1968-1977		14.2823	7.9043
Y^p_{74-88}	Family Mean Income in 1974-1988		25.5278	13.9868
Y^p_{79-88}	Family Mean Income in 1979-1988		29.5677	17.0406
Y^p_{84-88}	Family Mean Income in 1984-1988		33.3954	20.0206
W^c	Child's Labour Income at 1988		29.2524	19.9661
F	Father's Level of Education		4.4569	1.9112
M	Mother's Level of Education		3.7958	1.8834
E	Child's Level of Education		5.5833	1.5150
	Gift Transfers		0.4951	2.0638
	Positive Gift Transfers	$p = 0.280$[b]	1.7526	3.5969
	Time Transfers		0.1122	0.3434
	Positive Time Transfers	$p = 0.383$	1.0828	1.8699
b	Inter-vivos Transfers		0.9104	0.2417
	Positive Inter-vivos Transfers	$p = 0.539$	1.7179	3.1071
b	Bequests		77.780	209.387
	Positive Bequests	$p = 0.398$	195.455	295.632

[a] All monetary variables are measured in Thousand Dollars
[b] Proportion of non-zero observations

TABLE 2: Estimation Results for Specification 1

b_i = Inter-vivos	$Y_2^p = Y_{84-88}^p$	$Y_2^p = Y_{79-88}^p$	$Y_2^p = Y_{74-88}^p$
β_0	-0.39531 (-0.079)	-11.0811 (-1.843)	-16.3841 (-2.546)
β_1	0.63315 (1.154)	1.70620 (2.778)	2.18935 (3.430)
β_2	-1.34294 (-2.704)	-1.51733 (-3.667)	-1.55982 (-3.814)
b_i = Bequests	$Y_2^p = Y_{84-88}^p$	$Y_2^p = Y_{79-88}^p$	$Y_2^p = Y_{74-88}^p$
β_0	-37.4633 (-1.965)	-42.3684 (-1.927)	-43.8922 (-1.909)
β_1	3.77369 (1.901)	4.02702 (1.870)	4.05394 (1.852)
β_2	-0.25027 (-0.264)	-0.11852 (-0.128)	-0.02981 (-0.032)

Specif. 1: $\ln b_i = \beta_0 + \beta_1 \ln Y_{2i}^p + \beta_2 \ln W_i^c + u_i, \quad \text{if } b_i^* > 0$

TABLE 3: Estimation Results for Specification 2

b_i = Inter-vivos	$Y_2^p = Y_{84-88}^p$	$Y_2^p = Y_{79-88}^p$	$Y_2^p = Y_{74-88}^p$
λ_0	-0.14174 (-0.143)	-2.27282 (-1.899)	-3.51272 (-2.709)
λ_1	0.10491 (0.981)	0.32263 (2.663)	0.43955 (3.462)
λ_2	-0.25180 (-2.898)	-0.29490 (-3.467)	-0.31180 (-3.719)
β_0	4.30438 (2.635)	1.93008 (0.925)	1.29476 (0.542)
β_1	0.26905 (1.571)	0.50026 (2.436)	0.54927 (2.402)
β_2	-0.44845 (-2.933)	-0.47504 (-3.026)	-0.47066 (-2.974)
b_i = Bequests	$Y_2^p = Y_{84-88}^p$	$Y_2^p = Y_{79-88}^p$	$Y_2^p = Y_{74-88}^p$
λ_0	-2.48942 (-2.369)	-2.48387 (-1.986)	-2.47961 (-1.834)
λ_1	0.24570 (2.127)	0.23036 (1.796)	0.22248 (1.657)
λ_2	-0.04844 (-0.585)	-0.02030 (-0.490)	-0.03315 (-0.407)
β_0	8.50685 (3.373)	6.04473 (2.096)	4.31719 (1.411)
β_1	0.50227 (1.825)	0.71573 (2.417)	0.85802 (2.823)
β_2	-0.01424 (-0.078)	-0.02154 (-0.1225)	-0.01558 (-0.091)

$$\text{Specif. 2:} \begin{cases} d_i = \lambda_0 + \lambda_1 \ln Y_{2i}^p + \lambda_2 \ln W_i^c + \xi_i \\ \ln b_i = \beta_0 + \beta_1 \ln Y_{2i}^p + \beta_2 \ln W_i^c + u_i \qquad \text{if } d_i > 0 \end{cases}$$

TABLE 4. Estimation Results for Specification 3

b_i = Inter-vivos	$Y_1^p = Y_{68-72}^p$ $Y_2^p = Y_{79-88}^p$	$Y_1^p = Y_{68-77}^p$ $Y_2^p = Y_{79-88}^p$	$Y_1^p = Y_{68-72}^p$ $Y_2^p = Y_{74-88}^p$	$Y_1^p = Y_{68-77}^p$ $Y_2^p = Y_{74-88}^p$
γ_0	−1.99909 (−1.966)	−1.70985 (−1.579)	−1.94952 (−1.910)	−1.54267 (−1.412)
γ_1	0.46640 (3.909)	0.41891 (3.160)	0.46007 (3.830)	0.39810 (2.970)
γ_2	0.66689 (5.729)	0.69149 (5.720)	0.67343 (5.724)	0.70765 (5.769)
γ_3	0.07426 (0.734)	0.10529 (1.072)	0.07391 (0.725)	0.10909 (1.099)
β_0	−6.13522 (−0.951)	−5.20054 (−0.770)	−10.9149 (−1.479)	−9.66746 (−1.253)
β_1	0.74963 (1.001)	0.48625 (0.641)	1.33190 (1.559)	1.03407 (1.193)
β_2	−1.51576 (−3.048)	−1.46854 (−2.982)	−1.55583 (−3.133)	−1.51332 (−3.068)
β_3	1.51905 (2.074)	1.90976 (2.350)	1.18406 (1.603)	1.54813 (1.887)
b_i = Bequests	$Y_1^p = Y_{68-72}^p$ $Y_2^p = Y_{79-88}^p$	$Y_1^p = Y_{68-77}^p$ $Y_2^p = Y_{79-88}^p$	$Y_1^p = Y_{68-72}^p$ $Y_2^p = Y_{74-88}^p$	$Y_1^p = Y_{68-77}^p$ $Y_2^p = Y_{74-88}^p$
γ_0	−1.77924 (−1.763)	−0.98130 (−0.911)	−1.77003 (−1.752)	−0.96824 (−0.899)
γ_1	0.44107 (3.702)	0.33129 (2.501)	0.43986 (3.690)	0.32964 (2.489)
γ_2	0.66872 (5.568)	0.72896 (5.836)	0.66936 (5.573)	0.72946 (5.840)
γ_3	0.07300 (0.731)	0.12425 (1.265)	0.07386 (0.739)	0.12557 (1.278)
β_0	−37.2894 (−1.761)	−39.9815 (−1.783)	−37.5592 (−1.688)	−40.9853 (−1.718)
β_1	3.19364 (1.457)	3.48557 (1.523)	3.13615 (1.365)	3.51606 (1.444)
β_2	−0.12484 (−0.133)	−0.10155 (−0.108)	−0.03740 (−0.040)	0.01933 (0.020)
β_3	1.39100 (0.852)	0.92528 (0.570)	1.3326 (0.777)	0.76573 (0.444)

$$\text{Specif. 3:} \quad \begin{cases} \ln g_i = \gamma_0 + \gamma_1 \ln Y_{1i}^p + \gamma_2 \ln F_i + \gamma_3 \ln M_i + \varepsilon_i \\ \ln b_i = \beta_0 + \beta_1 \ln Y_{2i}^p + \beta_2 \ln W_i^c + \beta_3 \ln g_i + u_i \qquad \text{if } b_i^* > 0 \end{cases}$$

TABLE 5A: Estimation Results for Specification 4

$b_i =$ Inter-vivos	$Y_1^p = Y_{68-72}^p$ $Y_2^p = Y_{79-88}^p$	$Y_1^p = Y_{68-77}^p$ $Y_2^p = Y_{79-88}^p$	$Y_1^p = Y_{68-72}^p$ $Y_2^p = Y_{74-88}^p$	$Y_1^p = Y_{68-77}^p$ $Y_2^p = Y_{74-88}^p$
γ_0	−1.86073 (−1.819)	−1.88157 (−1.712)	0.05226 (0.049)	−1.63555 (−1.474)
γ_1	0.46971 (3.886)	0.44373 (3.310)	0.23062 (1.851)	0.40967 (3.017)
γ_2	0.69966 (5.695)	0.67840 (5.560)	0.75782 (6.271)	0.70422 (5.646)
γ_3	0.07471 (0.735)	0.09984 (1.015)	0.113918 (1.350)	0.10643 (1.063)
λ_0	−1.56776 (−1.226)	−0.56546 (−0.414)	−0.62184 (−0.460)	−2.57039 (−1.698)
λ_1	0.16306 (1.078)	0.01565 (0.100)	0.02803 (0.526)	0.25808 (1.492)
λ_2	−0.30206 (−3.460)	−0.28921 (−3.260)	−0.31058 (−3.531)	−0.30643 (−3.514)
λ_3	0.28588 (2.088)	0.41427 (2.769)	0.25234 (1.725)	0.27797 (1.774)
β_0	4.06533 (1.947)	5.33400 (2.576)	5.31310 (2.392)	3.03962 (1.212)
β_1	0.20577 (0.940)	0.02422 (0.106)	0.05188 (0.210)	0.30274 (1.149)
β_2	−0.47466 (−2.767)	−0.48368 (−2.957)	−0.53301 (−3.309)	−0.48569 (−2.936)
β_3	0.31403 (1.299)	0.46615 (1.681)	0.38510 (1.441)	0.28745 (1.073)

$$\text{Specif. 4:} \quad \begin{cases} \ln g_i = \gamma_0 + \gamma_1 \ln Y_{1i}^p + \gamma_2 \ln F + \gamma_3 \ln M + \varepsilon_i \\ d_i = \lambda_0 + \lambda_1 \ln Y_{2i}^p + \lambda_2 \ln W_i^c + \lambda_3 \ln g_i + \xi_i \\ \ln b_i = \beta_0 + \beta_1 \ln Y_{2i}^p + \beta_2 \ln W_i^c + \beta_3 \ln g_i + u_i & \text{if } d_i > 0 \end{cases}$$

TABLE 5B: Estimation Results for Specification 4

b_i = Bequests	$Y_1^p = Y_{68-72}^p$ $Y_2^p = Y_{79-88}^p$	$Y_1^p = Y_{68-77}^p$ $Y_2^p = Y_{79-88}^p$	$Y_1^p = Y_{68-72}^p$ $Y_2^p = Y_{74-88}^p$	$Y_1^p = Y_{68-77}^p$ $Y_2^p = Y_{74-88}^p$
γ_0	−2.12968 (−2.140)	−1.63874 (−1.515)	−1.73941 (−1.723)	−1.44106 (−1.326)
γ_1	0.49457 (4.2203)	0.41171 (3.116)	0.44370 (3.724)	0.38425 (2.890)
γ_2	0.66661 (5.557)	0.72060 (5.766)	0.68641 (5.644)	0.72650 (5.785)
γ_3	0.03741 (0.359)	0.08185 (0.795)	0.04603 (0.439)	0.09764 (0.945)
λ_0	−2.75385 (−2.127)	−2.04979 (−1.504)	−1.57527 (−1.086)	−2.98811 (−1.939)
λ_1	0.25341 (1.629)	0.17595 (1.112)	0.11219 (0.6541)	0.27657 (1.557)
λ_2	−0.05970 (−0.691)	−0.05889 (−0.672)	−0.05207 (−0.606)	−0.05622 (−0.649)
λ_3	0.05477 (0.397)	0.05341 (0.374)	0.10204 (0.694)	0.05802 (0.376)
β_0	7.24393 (2.557)	5.04500 (1.712)	3.81593 (1.195)	4.64140 (1.412)
β_1	0.40287 (1.187)	0.61687 (1.791)	0.78708 (2.061)	0.63215 (1.662)
β_2	−0.03969 (−0.219)	−0.01898 (−0.104)	−0.03235 (−0.178)	−0.00013 (−0.007)
β_3	0.57186 (1.999)	0.51699 (1.726)	0.41696 (1.323)	0.51407 (1.613)

$$\text{Specif. 4:} \quad \begin{cases} \ln g_i = \gamma_0 + \gamma_1 \ln Y_{1i}^p + \gamma_2 \ln F + \gamma_3 \ln M + \varepsilon_i \\ d_i = \lambda_0 + \lambda_1 \ln Y_{2i}^p + \lambda_2 \ln W_i^c + \lambda_3 \ln g_i + \xi_i \\ \ln b_i = \beta_0 + \beta_1 \ln Y_{2i}^p + \beta_2 \ln W_i^c + \beta_3 \ln g_i + u_i & \text{if } d_i > 0 \end{cases}$$

TABLE 6: Estimation Results for Earnings Equation

	$Y_1^p = Y_{68-72}^p$	$Y_1^p = Y_{68-77}^p$
γ_0	1.1165 (2.894)	1.325 (3.343)
γ_1	0.5587 (4.127)	0.4364 (3.301)
γ_2	0.5998 (4.897)	0.8248 (5.678)
γ_3	0.1023 (1.118)	0.1235 (1.113)
θ_0	9.9276 (4.972)	10.678 (4.167)
θ_1	0.2876 (4.135)	0.3452 (4.235)

$$\begin{cases} \ln g_i = \gamma_0 + \gamma_1 \ln Y_{1i}^p + \gamma_2 \ln F_i + \gamma_3 \ln M_i + \varepsilon_i \\ \ln W_i^c = \theta_0 + \theta_1 \ln g_i + \omega_i \end{cases}$$

TABLE 7A: Testing Equality of Income Distribution Functions

Model 1	Test-Statistic	$c_{0.95}$	P–Value
Inter-vivos			
$Y_2^p = Y_{74-88}^p$	0.07178	0.0834	0.18
$Y_2^p = Y_{79-88}^p$	0.06318	0.0886	0.21
Bequests			
$Y_2^p = Y_{74-88}^p$	0.09217	0.1148	0.16
$Y_2^p = Y_{79-88}^p$	0.09324	0.1123	0.15
Model 2	Test-Statistic	$c_{0.95}$	P-Value
Inter-vivos			
$Y_2^p = Y_{74-88}^p$	0.05983	0.0768	0.22
$Y_2^p = Y_{79-88}^p$	0.06371	0.0764	0.19
Bequests			
$Y_2^p = Y_{74-88}^p$	0.1086	0.1191	0.12
$Y_2^p = Y_{79-88}^p$	0.1004	0.1198	0.17

TABLE 7B: Testing Equality of Income Distribution Functions

Model 3	Test-Statistic	$c_{0.95}$	P-Value
Inter-vivos			
$Y_1^p = Y_{68-72}^p, Y_2^p = Y_{74-88}^p$	0.066891	0.0723	0.11
$Y_1^p = Y_{68-72}^p, Y_2^p = Y_{79-88}^p$	0.065894	0.0725	0.14
$Y_1^p = Y_{68-77}^p, Y_2^p = Y_{74-88}^p$	0.069873	0.0726	0.09
$Y_1^p = Y_{68-77}^p, Y_2^p = Y_{79-88}^p$	0.067772	0.0728	0.12
Bequests			
$Y_1^p = Y_{68-72}^p, Y_2^p = Y_{74-88}^p$	0.10345	0.1156	0.08
$Y_1^p = Y_{68-72}^p, Y_2^p = Y_{79-88}^p$	0.11034	0.1167	0.06
$Y_1^p = Y_{68-77}^p, Y_2^p = Y_{74-88}^p$	0.09238	0.1198	0.11
$Y_1^p = Y_{68-77}^p, Y_2^p = Y_{79-88}^p$	0.09432	0.1234	0.15
Model 4	Test-Statistic	$c_{0.95}$	P-Value
Inter-vivos			
$Y_1^p = Y_{68-72}^p, Y_2^p = Y_{74-88}^p$	0.080982	0.0987	0.14
$Y_1^p = Y_{68-72}^p, Y_2^p = Y_{79-88}^p$	0.078894	0.0976	0.15
$Y_1^p = Y_{68-77}^p, Y_2^p = Y_{74-88}^p$	0.077621	0.0945	0.14
$Y_1^p = Y_{68-77}^p, Y_2^p = Y_{79-88}^p$	0.072972	0.0988	0.17
Bequests			
$Y_1^p = Y_{68-72}^p, Y_2^p = Y_{74-88}^p$	0.13248	0.1325	0.05
$Y_1^p = Y_{68-72}^p, Y_2^p = Y_{79-88}^p$	0.13787	0.1326	0.03
$Y_1^p = Y_{68-77}^p, Y_2^p = Y_{74-88}^p$	0.13023	0.1328	0.06
$Y_1^p = Y_{68-77}^p, Y_2^p = Y_{79-88}^p$	0.13194	0.1319	0.05

FIGURES

FIGURE 1: Estimated Density Functions
(Income ≡ Labour Income + Inter-Vivos Transfers)

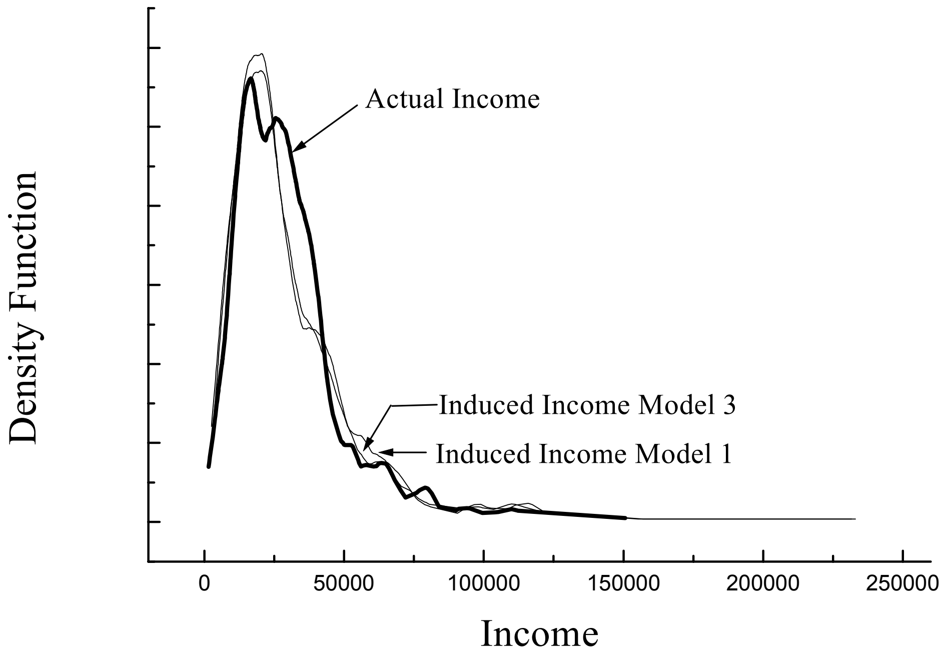

FIGURE 2: Estimated Density Functions
(Income $\equiv$ Labour Income + Bequests)