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Parental altruism under imperfectinformation: theory and evidence

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Abstract

Understanding if altruism motivates intergenerational monetary transfers is crucial to assess the effectiveness of public policies that redistribute income across generations. Previous works have rejected the altruism hypothesis. This paper presents an altruism model that incorporates effort of the child and introduces imperfect information of parents about the labor market opportunities of children. Calibrations of the model show that the response of transfers to the income of the child is similar to the estimates of previous researchers. I also find evidence supporting a prediction of the model: parental transfers are especially responsive to income variations of children who are very attached to the labor market.

JEL Classification: D19, D64, D82, J14, H20.

Keywords: Altruism, imperfect information, intervivos transfers.

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1 Introduction

The altruism model of the family posits that the utility of an individual (for example, a parent) depends on the utility of other family members (for example, an adult child), and that this interdependence shapes intergenerational transfers of money and services. Richer parents, if altruistic towards their adult children, are more likely to give transfers to poorer children. In fact, Becker (1974) and Barro's (1974) altruism models imply that an exogenous redistribution of the income of a dynasty linked by altruism and providing monetary help will be neutralized by private intergenerational transfers. Assessing empirically if altruism is the force behind economic links is then crucial for understanding the effectiveness of programs like Social Security, that redistribute income between generations. This paper assesses if the altruism model of the family can be reconciled with the empirical evidence on intergenerational transfers in the US.

Several authors have tested Becker's hypothesis with data from the US. Their results generally confirm that, while the response of transfers to the income of the parent and the child have the predicted sign, the responses are almost an order of magnitude less than what is needed to support the hypothesis that transfers neutralize redistributions of income between generations. While the altruism model of family links predicts that, among parents giving transfers, a dollar increase in the income of the parent coupled with a dollar decrease of the income of the child results in a rise of the intergenerational transfer of one dollar, empirical estimates show that transfers increase by less than 15 cents.[1]

Alternative researchers have modified the altruistic model of the family to account for that finding. McGarry (2000) assumes that altruistic parents are uncertain about the future earnings of their children and use current earnings as a signal of permanent earnings. Pollak (1988) argues that transfers from altruistic parents are tied to specific assets, and do not respond to the income variations of the child. Cox (1987) argues that altruistic parents

[1] See for instance, Altonji et al. (1997) and McGarry and Schoeni (1995) who use matched data on parents and children and find that redistributing a dollar of income from the child to the parent rises transfers by less than 15 cents. Cox (1987) and Cox and Jakubson (1995) use datasets on receivers of help only, and find that parental transfers respond positively to the income of the child. Their results imply that redistributing a dollar of income from the child to the parent rises parental transfers only by 1 cent. Arrondel and Laferrère (2001) use data for France, and also find a positive relationship between transfers and income of the child. See Laitner (1997) or Arrondel and Masson (2002) for reviews of the literature.

use transfers to buy services from their children. These explanations overturn Becker's prediction, but these papers do not to quantify whether the modifications proposed generate responses of transfers to income of parents and children that match the empirical findings.

The present work assesses whether adding two key modifications to the basic altruism model improves the concordance between the model and the data. I build on a model of Kotlikoff and Razin (1988), that follows the literature on optimal taxation (see for example Besley and Coate, 1995 and the references therein). This model endogenizes the effort of children and relaxes the assumption that the parent has perfect information about the labor market opportunities of the child. Endogenizing labor supply decisions of recipients of help is realistic, given the empirical evidence that young adults modify their labor market decisions because of parental help.[2] In the model in this paper, parents observe the income of their (egoistic) children, but observe neither the labor market opportunities nor the effort of their children. The rationale for this assumption is that parents visit their children, and can infer their income from their consumption habits, but it is hard for parents to observe whether children have the option of working in a lucrative job that requires extended hours. In this setting, parents face a trade-off when deciding about the optimal amount of help to give to their descendents. On one hand, they would like to compensate the income variations of their children. On the other, the monetary help may distort the effort decisions of their children. I show that parents solve this trade-off by providing transfers that do not respond much to income.

While previous researchers have modeled the effects of imperfect information about labor market opportunities on the size of parental transfers, I am not aware of work that attempts to match the empirical facts about transfers or to make an empirical test of the theory.[3] This paper makes two contributions to the literature on transfers. The first contribution is to assess the quantitative impact of imperfect information on the response of parental

[2] Card and Lemieux (2000) document that younger generations in US and Canada have reacted to adverse labor market conditions by staying longer at their parent's house. Holtz-Eakin et al. (1993) also present evidence that the receipt of an inheritance disincentivates labor market participation.

[3] See, for example, Kotlikoff and Razin (1988), Fernandes (2002), Cremer and Pestieau (1996) or Nishiyama and Smetters (2002). The model in this paper generalizes the model in Kotlikoff and Razin (1988), who investigate a special case in which the child can only have two types of wages. Nishiyama and Smetters (2002) use a similar setup, but they restrict themselves to a class of transfers that are linear in the income of the parent and the child. The present work does not restrict the shape of the transfer function.

transfers of money to income to the parent and child. I do this assessment by simulating a computable version of the altruistic model under imperfect information. My simulation results suggest that imperfect information greatly reduces the optimal responses of parental transfers to earnings of the parent and the child.

The second contribution is to extend the model so that it yields testable empirical predictions. I show analytically that, under certain circumstances, if altruistic parents act according to my model, parental transfers are more responsive to the earnings of children with lower labor supply elasticities. In other cases, simulations are used to illustrate the same result. I then develop an empirically testable hypothesis by referring to the well-documented fact that labor supply elasticities differ across the various members of a married child's household. I test whether or not parental transfers are more responsive to a fall in the labor earnings of the member of the child's household with a lower labor supply elasticity - the primary earner. This test is empirically distinguishable from alternative theories of altruism under imperfect information. Finally, I present empirical evidence from two samples drawn from the Panel Study of Income Dynamics. While not all the predictions of the theory are accepted, evidence is found that the probability of receiving a transfer responds more to permanent earnings of the primary earner than to those of the secondary earner in the household of a married child.

The paper is organized as follows. Section 2 describes the model. Section 3 provides a benchmark case in which the parent has perfect information about the labor market opportunities of the child. Section 4 solves the model with imperfect information. Section 5 provides simulation results. Section 6 discusses the empirical strategy and the data used. Section 7 presents the results of the empirical tests and the paper concludes with Section 8.

2 The model

This section describes the households of the parent and child and provides the modeling assumptions. Two households interact in this model. The first one is the household of a single parent who cares about the utility of the child. The second household is that of the child, and is composed of two members: a primary and a secondary earner. Assumptions 1, 2 and 3 describe the preferences of the members of these two households. Assumptions 4 and 5 describe the information of the parent about the labor market opportunities and effort of the child.

The household of the child maximizes the joint utility function of the two members. Their utility depends on the consumption of a common good (c^c), the hours of leisure of the primary earner (l_p^c) and the hours of leisure of the secondary earner (l_s^c). For each member of the household of the child, leisure is defined as the difference between time available ($\overline{l}_s^c$ for the secondary earner, $\overline{l}_p^c$ for the primary earner) and hours of work (h_p^c for the primary earner, h_s^c for the secondary earner).[4,5]

Assumption 1 (preferences in the household of the child): The joint utility of the household of the child is:

$$U^c(c^c, h_p^c, h_s^c) = v(c^c) + \gamma_s(\overline{l}_s^c - h_s^c) + \gamma_p(\overline{l}_p^c - h_p^c) \tag{1}$$

where $v(), \gamma_s()$, and $\gamma_p()$ are increasing, strictly concave and differentiable functions. $\gamma_s'''()$ is assumed to be positive.[6]

Assumption 2 (labor supply elasticities): The labor supply of the primary earner is perfectly inelastic with respect to own wage. The (uncompensated) elasticity of the labor supply of the secondary earner with respect to own wage is positive.

There is abundant evidence that the elasticity of hours worked with respect to own wage is higher for married females (secondary earners) than for married males (primary earners).[7] The assumption of a zero elasticity of labor supply for the primary earner simplifies considerably the theoretical setup of the problem. It has been used in previous empirical studies of consumption insurance -see Attanasio and Davis (1996).

The budget constraint of the household of the child is the following:

$$c^c \leq w_p^c \overline{h}_p^c + w_s^c h_s^c + t$$

[4] Throughout the paper, it is assumed that the household of the child is unitary. In Section 7.1, I discuss whether this assumption may be driving the empirical results.

[5] The following notation is used. The superscript p (c) over a variable denotes that it corresponds to the parent (child). Subscripts will only be used for the household of the child. The subscript p denotes primary earner, and the subscript s denotes secondary earner (in the household of the child).

[6] The latter is a technical assumption needed to guarantee a convex constraint set in the solution to the problem of the parent. See appendix 2.

[7] See the evidence cited in Blundell and MaCurdy (1999). Characterizing husbands as primary earners, as opposed to wives may seem anachronistic. Nevertheless, almost all husbands in my sample have higher permanent incomes than their wives.

Income of the primary earner is the product of the wage w_p^c, and the (fixed) number of hours worked by the primary earner ($\overline{h}_p^c$). Income of the secondary earner is the product of the wage w_s^c and the number of hours worked (h_s^c). Consumption is less than or equal to the sum of the income earned by the two earners, parental transfers (t). The following notation will be used:

$$y_s^c = w_s^c h_s^c \qquad y_{exo}^c = w_p^c \overline{h}_p^c$$

Total earned income of the household is the sum of income earned by the secondary and primary earners. The first component is affected by effort decisions, and is sensitive to the wage of the secondary earner, in the sense that a change in the labor market opportunities of that earner also changes the optimal level of hours of market work. The second component is assumed to be strictly exogenous.

Assumption 3 (altruistic parent): The preferences of the parent are defined over own consumption and the utility of the household of the child and can be represented by the function:

$$U^p = c^p + \eta U^c = c^p + \eta\{v(c^c) + \gamma_p(\overline{l}_p^c - h_p^c) + \gamma_s(\overline{l}_s^c - h_s^c)\} \tag{2}$$

where c^p stands for consumption of the parent. Namely, c^p is the difference between income of the parent (y^p) and the money given to the child through monetary transfers t. η is a parameter measuring the degree of altruism of the parent.[8]

Assumption 4 (variables that the parent does not observe): The parent does not have information about the wage realizations nor about the effort decisions of any of the members of the household.

Ex ante, the parent knows that the wage of the secondary earner is drawn from a discrete distribution with n wages ($0 < w_{s,1}^c < ... < w_{s,n}^c$). Each wage $w_{s,i}^c$ is drawn with probability $\pi_{s,i}^c$ for the secondary earner.

Assumption 5 (variables that the parent does observe): The parent observes the income earned by each member of the household: namely, the product of the wage and the number of hours worked. The parent is able to distinguish between the income earned by the primary and secondary earner.

[8] In the simulations, I relax the assumption of risk neutrality of the parent.

Assumption 4 formalizes the notion that it is difficult for parents to observe the marginal rate of pay of an extra hour of work of their children. Parents, in general, may not know whether or not their children search for overtime work. It is also difficult for parents to observe whether or not the child has the opportunity of working in less pleasant but more lucrative occupations. On the other hand, it is possible for parents to observe the earnings of the persons within a family. Parents visit their children, observe the home they live in, whether they have a car, and their consumption habits. Hence, they can form an assessment of what is the total income earned in the household of the child. Assumption 5 goes further, and states that the parent can observe the earnings of each member. The idea is that parents know the education and occupation of each of the members of the household of the child. Up to some observational error, parents can infer the earnings of each of the members.[9]

An additional note is in order. I assumed that the primary earner always desires to work the same number of hours. I also assume that the parent is not aware of the wage of the primary earner, but observes the income earned (assumption 5), and knows what are the preferences of the primary earner for work. Hence, the parent is able to infer the origin of any income variation of the primary earner. Thus, that component can be treated as observable.

3 The case with perfect information

This section solves the problem for the case in which the parent has perfect information about the wages and choices of each one of the two members of the household of the child. The parent decides over transfers and over the labor choices of the two members of the household of the child. The parent does not need to worry about the disincentives created by parental help, as the wage of each member is perfectly observed. Nevertheless, the parent cannot enforce a plan that involves negative transfers from the household of the child. The parent maximizes the expected utility function over all the possible wages of the secondary earner.

[9] The model can accomodate alternative information setups. For example, one may argue that parents can observe the wage of the child, as well as the number of hours worked, but not the preferences for leisure of the children. Consider the utility of the child $U^c = U^c(c^c, \frac{h^c}{w^c})$ One can reinterpret w^c as the (unobservable) preference of the child for leisure. Children with higher w^c find it less costly in terms of utility to achieve a number of hoursl h^c. The results of the model would still hold.

$$\max_{\{(t_i, y^c_{s,i})_{i=1}^{i=n}\}} U^p = \sum_{i=1}^{i=n} \pi^c_{s,i}[y^p - t_i + \eta U^c_i(c^c_i, \frac{y^c_{s,i}}{w^c_{s,i}},\ y^c_{exo})] \tag{3}$$

$$s.t. \quad t_i \geq 0 \qquad \forall i = 1, ..., n$$

$$s.t. \quad c^c_i = y^c_{s,i} + \ y^c_{exo} + t_i \qquad \forall i = 1, ..., n$$

where $U^c_i = v(\ y^c_{exo} + y^c_{s,i} + t_i) + \gamma_s(\bar{l}^c_s - \frac{y^c_{s,i}}{w^c_{s,i}})$.[10] The number of hours worked by the secondary earner is replaced by the ratio of the labor earnings and wage of the secondary earner. Also, the wage of the primary earner is normalized to one. In (3), $\pi^c_{s,i}$ is the probability of occurrence of the wage $w^c_{s,i}$, y^p denotes parental resources, t_i the amount of parental monetary transfers, U^c_i is the level of utility of the child, η is the altruism parameter, c^c_i denotes the consumption of the child, $w^c_{s,i}$ is a particular realization of the wage of the secondary earner, $y^c_{s,i}$ is the earnings of the secondary earner in the household of the child, and y^c_{exo} is the earnings of the primary earner in the household of the child. The parent solves (3) for each level of y^c_{exo}. The subscript i indexes the different wages that the child could earn. The first order conditions of this problem are:

$$\frac{\partial U^p}{\partial y^c_{s,i}} = v'(y^c_{s,i} + \ y^c_{exo} + t_i) - \gamma'_s(\bar{l}^c_s - \frac{y^c_{s,i}}{w^c_{s,i}})\frac{1}{w^c_{s,i}} \leq 0 \qquad \forall i = 1, ..., n \tag{4}$$

$$\frac{\partial U^p}{\partial t_i} = -1 + \eta v'(y^c_{s,i} + y^c_{exo} + t_i) \leq 0 \qquad \forall i = 1, ..., n \tag{5}$$

For positive hours of work, equation (4) equates the marginal disutility of an additional hour of work of the secondary earner in the household of the child, weighted by the wage, to the marginal utility that the child derives from an additional unit of consumption. Combining

[10] Given that wages are observable, it is not strictly necessary to express the objective function of the parent in terms of expectations. I do this to permit comparability with the problem solved in the next section. Also, to save space, I omitted the constraint that the labor income of the secondary earner is non-negative

equations (4) and (5) one can prove that the income earned by the secondary earner is increasing with the own wage when transfers are positive.

Equation (5) states that, if parental transfers are positive, the parent equates the (constant) marginal utility of own consumption with the marginal utility derived from one unit of extra consumption of the child. Given the shape of the utility function of the child, equation (5) implies that for all wages of the secondary earner that cause a positive transfer, the consumption in the household of the child is a constant. That is, a dollar increase in the income of the child diminishes parental transfers on a dollar for dollar basis, no matter whether these variations occur because of an increase in the income of the primary or the secondary earner.[11]

4 Second best: The case with imperfect information

Under imperfect information, the parent faces constraints on the amount of transfers given to the child. For example, if the parent guaranteed the child with the optimal schedule under perfect information, and the child privately observed a sufficiently low wage of the secondary earner, the best option for the child would be to pretend that the wage was the lowest one, exert zero effort and get parental transfers. That outcome is not incentive-compatible. The game between the parent and the child belongs to the class of principal-agent models, where the parent acts as an altruistic principal making a contract with a selfish agent.

$$\max_{\{t_i, y^c_{s,i}\}} \sum_{i=1}^{i=n} \pi^c_{s,i}\{y^p - t_i + \eta U^c_i(c^c, \frac{y^c_{s,i}}{w^c_{s,i}},\ y^c_{exo})\} \tag{6}$$

$$s.t. \quad v(\ y^c_{exo} + y^c_{s,i} + t_i) + \gamma_s(\bar{l}^c_s - \frac{y^c_{s,i}}{w^c_{s,i}}) \ \geq \ v(\ y^c_{exo} + y^c_{s,j} + t_j) + \gamma_s(\bar{l}^c_s - \frac{y^c_{s,j}}{w^c_{s,i}}) \qquad \forall i, j \quad i \neq j \tag{IC}$$

[11] The prediction of constant consumption for children who receive transfers is an extreme case of the offsetting of exogenous redistribution of income predicted by the altruism model. Let $y^c (y^p)$ denote the income of the child (parent.) The prediction of Becker's model (that does not include effort of the child) is that $\frac{\partial t}{\partial y^p} - \frac{\partial t}{\partial y^c} = 1$. With linear utility in consumption of the parent, this equality still holds, but in a more restrictive form: $\frac{\partial t}{\partial y^c} = -1$, $\frac{\partial t}{\partial y^p} = 0$.

$$s.t. \quad t_i \geq 0 \quad \forall i = 1...n$$

where $U_i^c = v(\ y_{exo}^c + y_{s,i}^c + t_i) + \gamma_s(\bar{l}_s^c - \frac{y_{s,i}^c}{w_{s,i}^c})$. (IC) stands for incentive compatibility constraints. They embody the restriction that the child must be prevented from lying about the observed wage. The solution of this problem assigns to each wage a transfer and an income level, just as in the benchmark case with perfect information. I characterize the solution of the problem in the next proposition.

Proposition 1 *The solution of to the problem* $\{(c_i^{c,*}, y_{s,i}^{c,*})_{i=1}^{i=n}\}$ *presents the following characteristics:*

[1] consumption and earnings of the secondary earner are increasing in the wage, up to a finite number of bunching points.

The consumption-earnings schedule contains three regimes.

[2] If there exists a wage w_r *for which,* $c_r^{c,*} = \bar{c}, \quad y_{s,r}^{c,*} = 0$, *then, for all wages below* w_r, $c_i^{c,*} = \bar{c}$, *and* $\ y_{s,i}^{c,*} = 0$

[3] There is an intermediate range of wages for which the child receives zero transfers and is indifferent between the chosen bundle and the one associated to the lower wage.

[4] If there exists a wage w_i *for which* $c_i^{c,*} = y_{s,i}^{c,*} + y_{exo}^c$, *for wages higher than this, transfers are also zero.*

The proof of the proposition is detailed in Appendix 1. For a more precise characterization of the schedule, in the next subsection, I present two propositions characterizing how parents respond to variations in the two components of the total income in the household of the child. First, I characterize the response of transfers to income of the secondary earner. Because the grid of wages is discrete, a derivative of transfers with respect to income earned by the secondary earner is not well defined. The problem is addressed using a concept from the literature on optimal taxation: the "implicit marginal tax." (see Besley and Coate, 1995)

$$IMT(y_{s,i}^c) = 1 - \frac{\partial U^c / \partial y_{s,i}^c}{\partial U^c / \partial c_i^c} = 1 - \frac{\frac{1}{w_s^c}\gamma'(\bar{l}_s^c - \frac{y_{s,i}^c}{w_{s,i}^c})}{v'(c_i^c)}$$

which is, one minus the marginal rate of substitution between consumption and earnings evaluated at each point of the solution. The slope of the transfer schedule is the IMT multiplied by minus one.[12]

Proposition 2 *For all wages for which a positive transfer is observed, the implicit marginal tax on effort income (income of the secondary earner) is a (positive) number strictly smaller than one.*

This proposition is proven in the appendix 1. That is, despite the fact that consumption and income are increasing in the wage, parental transfers will decrease with the wage of the child. Parental transfers are weakly redistributive, in the sense that parents give more to the child if the income of the child is lower. Proposition 2 is an important result, showing that it is possible to have an altruism model in which parents do not compensate children for income variations, if the assumption of perfect information is relaxed.

Proposition 3 *If the transfer scheme is such that, in equilibrium, the child receives a transfer for every wage, a variation in income that does not involve an effort response is perfectly compensated by the parent.*

$$\frac{\partial t_i^*}{\partial \ y_{exo}^c} = -1 \qquad if \quad t_i^* > 0 \quad \forall w_{s,i}^c$$

Hence, if in equilibrium transfers are positive for all wages, the reaction of transfers to exogenous income is greater in absolute value than the response to effort income (where the latter is driven by unobservable wage differences that prompt an effort response).

Corollary 4 *If the transfer scheme is such that, in equilibrium, the child receives a transfer for a subset of wages, a variation in income that does NOT involve an effort response is NOT necessarily perfectly compensated by the parent.*

[12] The rationale of the definition is the following. Assume for a moment that the distribution of wages is continuous. Assume also that a differentiable scheme $t(y^c)$ exists, and that this scheme maximizes the utility of the parent. The child facing this schedule chooses y^c to maximize $v[y^c + t(y_s^c)] + \gamma_s[\bar{l}^c - \frac{y_s^c}{w_s^c}]$. Solving the first order condition of this problem and rearranging, one obtains $t'(y_s^c) = \frac{\gamma_s'[\bar{l}^c - \frac{y_s^c}{w_s^c}]\frac{1}{w_s^c}}{v'[y_s^c + t(y_s^c)]} - 1 = -IMT(y_s^c)$. In the simulations in the next section I confirm that as the wage distribution is populated with more wages and becomes closer to a continuum, the "implicit marginal tax" converges to the actual slope of the transfer function.

The rationale behind corollary 4 is that there is a binding incentive compatibility constraint between the last wage realization for which the child receives a transfers and the first wage realization for which the child does not receive. Assume that the parent provides a transfer to the child only if the wage of the secondary earner is w_v or lower. Consider the case that the child observes a wage w_{v+1}. If the incentive compatibility constraint is binding, the child is indifferent between reporting w_v to the parent and receiving transfers and reporting w_{v+1} and non receiving transfers. Call this utility value U_{v+1}. Imagine now that the exogenous component of income falls by a dollar, and that the parent does not find it optimal to extend transfers to the child if the wage is w_{v+1}. Following an exogenous income change, the utility of the child with wage w_{v+1} falls by $v'(c^*_{v+1})$ Assume that the parent chose to compensate perfectly the exogenous income change for the range of wages that receive transfers (including w_v). Then the child with wage w_v would no longer be indifferent between reporting w_{v+1}, attaining the utility level $U_{v+1} - v'(c^*_{v+1})$, and reporting w_v and keeping the utility level U_{v+1}. In other words, if the parent does not find it optimal to give a transfer to the child with wage w_{v+1} after the exogenous income change, insuring exogenous income changes for the states of nature in which child receive transfers violates the IC constraint between wages w_{v+1} and w_v.[13] In order to give support to the hypothesis that transfers react more to variations in the income of the primary earner, section 5 presents evidence from simulations, confirming the results for the preferences posed.

5 Simulations

This section solves the altruism model of the family numerically to obtain further insights about the effects of imperfect information on the schedule of transfers and earnings. Simulations play a key role in this work. First, the qualitative results in the previous subsection do not provide information about the magnitudes of transfer responses to the various components of income. The numerical computations allow for an explicit comparison between the predictions of the altruism model of the family and the findings of previous researchers. Second, numerical simulations permit me to establish whether or not the response of trans-

[13] Note that these considerations do not hold if transfers are operative in all states of the world, regardless of the wage of the child. Also, these considerations do not hold if the participation constraints were not included in the program (the usual case in the optimal taxation literature). Kotlikoff and Razin (1988) show a similar result in a simple two-wage framework.

fers to income components is bigger for exogenous income components than the response to labor income components for all cases. Such heterogeneity in the responsiveness of parental transfers to income provide the basis for further empirical tests of the model. Subsection 5.1 presents numerical computations of the response of the transfer amount to the income of the primary and secondary earners holding constant the income of the primary earner. Subsection 5.2 presents numerical computations of the response of the probability of receiving transfers and the transfer amount to the income of the primary and secondary earners allowing for heterogeneity in the income of both members of the household.

5.1 Simulations of the transfer amount keeping $\mathbf{y}_{exo}$ constant

Following much of the literature on labor supply and consumption, the following utility function is posed for the child:

$$U^c(c^c, \frac{y_s^c}{w_s^c}) = \frac{(c^c)^{1-\phi_c}}{1-\phi_c} + \kappa \frac{(\overline{l_s} - \frac{y_s^c}{w_s^c})^{1-\rho_s}}{1-\rho_s} \tag{7}$$

and, for the parent $U^p = c^p + \eta U^c$. Simulations of the model require estimates of the parameters of the utility function, the shape of the wage distribution that the child faces ex-ante, and some estimate of the earnings of the primary earner. Parameters of the utility function are chosen in the following manner. ϕ_c is the degree of risk aversion of the child. A higher value of ϕ_c is associated to a more concave utility function (with respect to consumption). An estimate of 2 is used, following Rangazas (1998), who also calibrates parental transfers in the US. ρ_s and κ are chosen to generate an uncompensated labor supply elasticity of married women (in the absence of transfers) that falls within the range of empirical estimates of Mroz (1987) and, approximately, the average permanent income of married spouses in the PSID sample used in the empirical analysis, \$19,000 (it is \$18,586 in Table 3). The parameter η is picked so that the simulated average transfer matches the unconditional mean of transfers in the 1988 Supplemental Transfers file, 380 dollars per household (including values of zero, and not using weights)

The wage distribution of the spouse was obtained from the cross-sectional personal average wage distribution of married females in the 1968-1993 waves of the Panel Study of Income Dynamics. The wage of a wife is defined as the ratio of labor earnings over hours of work reported. The mean wage of a white married secondary earner with 30 years of age and no kids is predicted by means of a log regression of wages on demographics and year dummies. The mean residual for each individual over the years that the individual contributed an observation is then added to the mean predicted value. The 10th percentile, mean and 90th percentile of the resulting distribution of the wages are 4.83, 9.83, and 15.87 (1993 dollars). In order to get estimates of the probability of a given wage, the density of the distribution is estimated using a kernel.[14]

Given that the set of simulations in Table 1 keep constant the income of the primary earner, I estimate y^c_{exo},the average level of permanent income of the primary earner, as follows. I regressed labor earnings of primary earners on a set of demographics and year dummies. This regression yields the prediction of mean earnings of a white primary earner at age 30 without children. The mean value of the prediction is 27,000 dollars (valued in 1993 dollars).

The baseline specification takes ϕ_c as 2, ρ_s as 2.2 and κ as 0.93. These parameters generate an uncompensated labor supply elasticity of the secondary earner of 0.44, 0.09 and 0 at the 10th percentile, mean and 90th percentile of the wage distribution. The uncompensated static labor supply elasticity evaluated at the mean wage in Mroz's sample is 0.13

Table 1 reports the simulated average response of the amount of transfers to variations in income of both earners for the two information regimes: perfect and imperfect information. The average is taken for wage realizations for which transfers are positive. In both information regimes, the response of parental transfers to income variations is negative, but the magnitude of the response is very different in each case. While under perfect information a dollar increase in the income of the secondary earner is associated to a dollar decrease in parental transfers (row 9, Model I), the same dollar increase under imperfect information decreases parental transfers by only 11 cents (row 4, Model I). The mean response of parental transfers to income of the primary earner is 18 cents in absolute value (row 5, Model I). Private information reduces in absolute value the response of parental transfers to income to a fifth (for primary earner) and a tenth (for the secondary earner) of the perfect information

[14] First, I estimated 500 points of the distribution of individual wages and computed the kernel density for each wage. For the simulations, I used 250 equispaced wage points between the minimum wage of \$1.2 and the maximum of \$20. The probability of each grid point was approximated by interpolating the values of the density function of the original 500 points. Specific details about the simulation procedure are contained in Appendix 2.

benchmark. I offer an explanation of the lowering of the derivative of transfers with respect to permanent income of the primary earner in the imperfect information regime in Section 4. The second result to note is that, under imperfect information, the average response of parental transfers to income variations of the secondary earner is smaller in absolute value than the response of parental transfers to the income of the primary earner. Pointwise, parental transfers are also more responsive to the income of the primary earner than to the income of the secondary earner (not shown).

Table 1 presents a second specification where ρ_s is 4 κ is 10 and η is 16.3. These parameters are chosen so that simulated average transfer and income of the secondary earner match the empirical counterparts, and the uncompensated static labor supply elasticity is .20 at the 10th percentile of the wage, .05 at the median wage and -.05 at the 90th percentile of the wage distribution. Drawing an analogy from the results of the optimal taxation theory, parental transfers should be especially responsive to income of a secondary earner with a low static labor supply elasticity, because this secondary earner is very attached to the labor market. The simulations in Table 1 confirm this intuition. The average response of parental transfer to income of the secondary earner is higher in absolute terms than in the baseline case: a dollar increase in the permanent income of the wife decreases parental transfers by 14 cents (row 4, Model II). An increase in the income of the primary earner diminishes parental transfers by 23 cents (row 5, Model II).

The simulations above assume that the utility of the parent is linear in own consumption. To assess if this assumption is driving the results in Table 1, a final set of simulations is ran (Models III and IV). Parental preferences take the following form: $U^p = \frac{(c^p)^{1-\phi_p}}{1-\phi_p} + \eta U^c$. A value of 2 is chosen for ϕ_p, consistent with the choice for ϕ_c. Models III and IV in Table 1 present the results of these simulations. The results are very similar to the specifications in Models I and II.

5.2 Simulations including heterogeneity in $\mathbf{y}_{exo}$

This subsection introduces heterogeneity in the altruism parameter of the parent and on the income of the primary earner. The introduction of heterogeneity permits the estimation of the effect of an increase in the income of the primary and secondary earners on the probability of receiving a transfer. Also, I can analyze the response of the transfer amount to income of both earners using standard specifications in the literature on transfers, like the Tobit model.

I generate a random sample of 523 households of children drawn from the PSID sample described in Section 6.1.1, each with a different realization of the wage of the secondary earner, w_s^c and earnings of the primary earner, y_{exo}^c. The mean (standard deviation) of y_{exo}^c is 27,000 dollars (10,222). The corresponding numbers for the wages of the secondary earner w_s^c are 9.95 (4.16). In the first specification I assigned to each household a random parameter of parental altruism η, drawn from a Normal distribution with an average of 15.9. 25% of households receive transfers. I experimented with several values for the variance of η, and report results for a variance of 3.[15]

Each household is assumed to have the same preferences used in the previous subsection, and faces the same ex-ante distribution of the wage of the secondary earner (the distribution of wages described in the previous subsection). The output of these computations is a sample of children in which the i-th observation is a transfer amount $t_i(w_i, y_{i,exo}^c, \eta_i)$, and the earnings choice of the secondary earner $y_{i,s}^c(w_i, y_{i,exo}^c, \eta_i)$. I examine the response of the probability of receiving a transfer to the earnings of the husband and wife using the following Probit.

$$P(t_i > 0 | y_{exo,i}^c, y_{s,i}^c) = \Phi(\delta_0 + \delta_1 y_{exo,i}^c + \delta_2 y_{s,i}^c)$$

where Φ is the cumulative normal distribution, t_i is the amount of parental transfers received by the child, and $y_{exo,i}^c$ and $y_{s,i}^c$ reflect the earnings of the husband and wife in the household of the child. The results of the simulations are shown in Table 2.

Rows 1 and 2 in the first panel of Table 2 report the coefficient on the Probit of earnings of the primary and secondary earner in a sample generated under the assumption that the parent has perfect information about w_s^c. For all specifications, the coefficients of both earnings components are almost identical.

Rows 3 and 4 in the first panel of Table 2 present the coefficients of the same Probit specification on a sample generated assuming that the parent does not have full information

[15] Variation in η is needed in order to identify the effects of earnings on the probability of receiving a transfer. As shown in Section 5, the probability of receiving a transfer is one if earnings fall below the cutoff value of earnings. Hence, without variation in the altruism parameter η, the earnings of the secondary earner would be a perfect predictor of receiving a transfer. In a previous draft, I present additional results with other values of $Var(\eta)$. The qualitative results (available upon request) are not affected by the variance of η.

on the wage of the secondary earner. In this case, the probability of receiving a transfer does depend on which member of the household loses the dollar. An increase in the earnings of the primary earner has a bigger impact on the probability of transfer receipt than the same increase in the earnings of the secondary earner. These results are in line with those found in the previous subsection: under imperfect information parental transfers are more responsive to the earnings of children who are more attached to the labor market.

To put the results in perspective, the second panel in Table 2 presents the predicted probability of receiving a transfer at various income levels. For example, for Specification 1, the estimate in row 6 in panel 2 reports that, evaluated at the sample means, the probability of receiving a transfer is .14. A household in which the secondary earner earns $4,000 less than the average has a probability of receiving of .34 (specification 1, panel 2, row 8). Conversely, if the primary earner earns $4,000 less than the average, the probability that the household receives a transfer is .41 (specification 1, panel 2, row 5).

Finally, Panel III include the effects of earnings on the transfer amount, using a Tobit model. The estimates in row 11, Model 1 implies that, among children receiving transfers, an increase of a dollar in the earnings of the secondary earner diminishes the transfer amount by 21 cents. Conversely, a dollar increase in the earnings of the primary earner diminishes the transfer amount by 29 cents. The presence of heterogeneity increases the magnitude of the response of transfers to income with respect to the experiments in the previous subsection, but the main results still hold.[16]

5.3 Results from the simulations

I draw three conclusions from the simulations. First, imperfect information reduces substantially the sensitivity of the amount of parental transfers to the income of the parent and child, and helps reconciling the predictions of the altruism model of the family with the data. Second, among children receiving transfers, imperfect information causes the *amount* of parental transfers to be more responsive to the income of the primary earner than to the income of the secondary earner. The third, the *probability* of receiving a transfer is more

[16]I also calculated the effect of income of the child on the transfer amount using alternative limited dependent variable estimators, like the A-I estimator (described in Section 6). The average response of the transfer amount to a dollar increase in the income of the primary and secondary earners were very similar to the Tobit coefficients

responsive to the income of the primary earner than to the income of the secondary earner. I test the last two hypothesis in the next section.

5.3.1 An alternative theory of imperfect information

McGarry (2000) proposes an alternative explanation to the low response of parental transfers to the income of children. In her model, children are liquidity constrained, and parents use the current income as a signal of the child's future permanent income, that they not observe. Under these assumptions, a drop in current income of the child makes parents anticipate lower permanent income. Hence, parents react to this drop by increasing both savings and current transfers. The increase in parental savings causes the derivative of current transfers with respect to current income to be below the perfect information benchmark. These considerations do not hold if changes of current income of the child convey no information about future permanent income.

There are two reasons because of which the empirical test in the current work is empirically distinguishable from McGarry's. First, the test in the present work uses measures of permanent income.[17] Uncertainty about future permanent income can produce a low derivative only for the derivative of transfers with respect to current income. Second, even examining the derivative of transfers with respect to current income of the husband and wife, the predictions of the present work are likely to differ from McGarry's. Given the patterns of participation in the labor market, changes in current income of the husband are likely to be stronger predictors of future permanent income of the household than the income of the secondary earner (for example, because the labor market participation of secondary earners responds more to shocks than the primary earner's). Under that assumption, uncertainty about future permanent income predicts that current parental transfers should be *less* responsive to current income of the primary earner.

6 The empirical strategy and samples

In the empirical implementation, I examine whether data drawn from the PSID supports the pattern of simulation results described in section 5. First, I examine whether a dollar increase

[17] The measure of permanent income is described in Section 6.1.2. It is an average of present, past and future values of labor earnings, adjusted for age and household composition. The average number of income observations per individual is 14, so measurement error is not likely to be a substantial problem.

in the earnings of the primary earner has a bigger impact on the probability of receiving a transfer than the a dollar increase in the earnings of the secondary earner. Second, I test whether a dollar increase in the income of the primary earner in the household of the child leads to a larger reduction in the parental transfer amount than a dollar increase in the income of the secondary earner in the same household. Instead of doing structural estimation, I have chosen to run reduced-form regression models of transfers on income of the child. I can then match the moments reported in the simulations in Tables 1 and 2. In Table 2, I report the coefficients of Probit and Tobit models. Also, reduced-form estimation of the effect of income on transfers allows comparability with other estimates in the literature.

I use limited dependent variable models to compare the slopes of the transfer function with respect to income of the primary and secondary earners in the household of the child. In the data, the primary earner is identified with the husband in a married household, and the secondary earner with the wife. The model estimated is the following:

$$T_i = \max\{\beta_0 - \beta_h Y^c_{h,i} - \beta_f Y^c_{f,i} + \beta_p Y^p_i + \delta X_i + U_i, 0\} \tag{8}$$

The dependent variable (T_i) is the amount of transfers received by the household of the child, indexed by i. $Y^c_{h,i}$ are a measure of permanent labor earnings of the husband in the household of the child, and $Y^c_{f,i}$ labor earnings of the wife in the household of the child. Given that the model described in section 4 is static, both parental transfers and income of the child are lifetime decisions. Therefore, I construct lifetime earnings variables for $Y^c_{f,i}$ and $Y^c_{h,i}$. Y^p_i denotes permanent income of the parent.[18] X_i includes variables that control for the determinants of the needs of the members of the household of the child such as the total number of children in the household of the child -grandsons and granddaughters of the parent- and the specific number of children in age brackets. X_i also includes variables that affect the willingness of the parent to provide a transfer, including whether parents are divorced or widow/er, and interactions with marital status.[19] The coefficients of interest are

[18] Note that all income measures are permanent, to be consistent with the model in Section 2. Permanent income does not vary over time, so I cannot use individual fixed-effect models, even in the sample with repeated observations on the same individual.

[19] The set of demographics includes contains the following variables: a polynomial of second order in the age of the husband and wife in the household of the child, dummies indicating whether the parents of the husband and wife are widow or a widower, and interactions with marital status, dummies for divorced

β_h and β_f , the degree to which the transfer from the parent decreases with income of each of the earners. The empirical test that I make is whether or not $|\beta_h| \geq |\beta_f|$.

A standard specification, like the Tobit, constrains unobservable variables summarized by U_i to enter the transfer equation in a separable fashion. Nevertheless, transfers may depend on income and unobservable taste parameters in a non-separable way. Hence, the coefficients of the Tobit specification may be biased. This problem motivates the second estimation strategy, which is based on a semiparametric estimator developed by Altonji and Ichimura (1998). I term this the A-I estimator. Unlike the Tobit specification, that estimator reports the mean slope of the transfer schedule, but allows for heterogeneity in these slopes.[20,21]

6.1 The data

The main sample is taken from the 1988 Transfer Supplement of the Panel Study of Income Dynamics. Given its long panel structure, the PSID contains reliable data on lifetime resources of individuals. In 1988, the PSID included detailed information on monetary transfers received from parents. In 1988, in addition to the transfer supplement respondents were

parents, and interactions with the marital status and a dummy for nonwhite child. I also include the total number of children (grandchildren of the parent) living in the household of the child. Finally, the number of children of the child between 1 and 2 and the number of children of the child between 3 and 5 years of age are included.

[20]The A-I estimator provides an estimate of $E\{\frac{\partial T_i(Y_i,U_i)}{\partial Y_i}|Y_i, T(Y_i,U_i) > 0\}$. It based on the following relationship.$E\{\frac{\partial T_i(Y_i,U_i)}{\partial Y_i}|Y_i, T(Y_i,U_i) > 0\} = \frac{\partial E\{T_i|Y_i,T(Y_i,U_i)>0\}}{\partial Y_i} + E\{T_i|Y_i,T(Y_i,U_i) > 0\}\frac{\partial P\{T_i>0|Y_i\}}{\partial Y_i}/P\{T_i > 0|Y_i\}$

I implement it by replacing the expressions on the right hand side with estimates obtained using a global polynomial approximation to the regression function (the first part of the right hand side in the expression above) and the conditional probability (the second part.) Standard errors are calculated using the delta method.Altonji et al (1997) and Altonji and Ichimura (1998) provide details.

[21]Comparing the transfer-income selection of different households can be problematic, as there is heterogeneity in the degree of parental altruism. Holding education constant, more generous parents are likely to give higher transfers and allow the secondary earner to earn less income, hence biasing downward the coefficient on income of the secondary earner in a censored regression model. The presence of heterogeneity in parental altruism is then likely to bias the coefficient on the income of the secondary earner against the predictions of the altruistic model of the family under imperfect information.

asked questions about their parents and their spouse's. Questions include education, age, marital status, and current income. Altonji et al (1997) use the subsample of the respondents to the 1988 Transfer Supplement who were present in the initial 1968 interview and who could be matched to their parents.[22,23] The use of the extended sample in the present work requires imputing some characteristics of the parents (see footnote 26 below). To assess the robustness of the results, In Section 7.0.6, I also experiment with an alternative PSID sample using matched parents and children and a yearly question about help received from relatives.

6.1.1 Data on parental transfers.

The 1988 Transfer Supplement File contains information on the amount received and on the person who gave the transfer. The question asked is: "During 1987, did (you/your family living there) receive any loans, gifts or support worth $100 or more from your parents? About how much were those loans, gifts or support worth altogether in 1987?" The question is asked first about the husband's parents and then about the wife's parents. I aggregate transfers from both sets of parents. I implicitly assume that all parents coordinate when deciding about giving transfers to their children.

The main sample consists of 2,022 households with information on earnings and transfers received. The unit of observation is a married respondent to the 1988 survey living in a household in which the head is between 21 and 55 years of age. Table 3 shows the (unweighted) summary statistics of the sample. 23% of all married households report transfers from at least one set of parents. The mean transfer (among those who receive, and aggregating transfers reported by the head and wife) is 2,986 dollars (in 1993). The mean age of the children is 35 years (for husbands) and 33 (for wives). Nonwhites are overrepresented in the sample.[24]

[22] The matched sample of parents and children in the 1988 Transfer Supplement File contained around 300 households of married children, that are needed for the analysis in the paper. Given the small sample size, I decided to use an extended sample.

[23] Among Altonji et al.'s (1997) findings, it is worth mentioning that reported transfers do not seem to be related to the purchase of a house by the child. Altonji et al. (1997) also report that very few children are students, so reported transfers are not likely to be associated to payments like college tuition.

[24] Given the structure of the PSID and the choice of households of children, there are 23 observations of individuals whose children are also included in the sample. I reran the analysis excluding these cases,

6.1.2 Data on the permanent income of the child

The measure of permanent income of the child is a time-average of past, current, and future income adjusted for demographic variables and time. I used the panel data on all individuals from the PSID who were either a head or a wife in a particular year. The following income generating process is assumed:

$$\log Y_{it} = \gamma_0 + Z_{it}\gamma_0 + v_i + e_{it} \tag{9}$$

Y_{it} are labor earnings of the member in the household of the child in a given year. Z_{it} contains a set of demographic variables. v_i is a permanent individual effect, uncorrelated with the demographic variables, and e_{it} denotes transitory variation in income. The parameters γ_0 and γ_1 are estimated by (gender specific) OLS regressions, using all the individuals in the PSID who were ever heads or wives between the ages of 18 and 60 (and only years in which they were heads or wives).[25] Also, only years in which labor earnings were above 400 dollars are included. The individual specific component v_i is estimated as the mean of the residuals for each person. This component is added to the predicted income for a person of age 40, married, and without children, and the variables are normed so that $Z_{it}\gamma_1$ is 0 for such a person. Consequently, $\widehat{Y}_i^c = \exp(\gamma_0 + v_i)$

A caveat with this measure of lifetime resources is that secondary earners tend to participate in the labor market less frequently than primary earners do. Hence, including only the years in which wives earn more than 400 dollars is likely to overestimate their true lifetime resources. To correct for this, lifetime resources of the individuals are weighted by the proportion of years they contributed to the regression. That is, $Y_i^c = \frac{\#(years \quad Y_{it}>400)}{\#(years \quad observed)}\widehat{Y}_i^c$. The 10th percentile, median and 90th percentile of the resulting distribution of permanent earnings of the husband are 14,926, 33,271 and 57,147, respectively (dollars of 1993). For wives, the corresponding numbers are 6,264, 16,225 and 34,187.[26]

without much effect on the results.

[25] The Z_{it} contains a fourth order polynomial in age centered at the age of 40, a dummy for non married, number of children and year specific dummies. For females, dummies indicating head of household and head of household with children are also added.

[26] The main sample has no direct information on parental permanent income. I create a measure of this variable by exploiting the special structure of the PSID. A subsample of respondents in the 1988 survey were born inside PSID households. I match the records of persons who were sons/daughters in the 1968

7 Results

This section analyzes the effects of permanent income of each member in the household of the child on both the amount of the transfer received and on the probability of receiving a transfer. I provide evidence based on Probit, Tobit, and A-I estimators. In what follows, I censor transfers above 10,000 dollars and give them a value of 10,000. The main reason to censor the data is to reduce the influence of outliers on the estimates. However, in the sample period transfers above 10,000 dollars could be subject to taxes, and the prediction of Becker (1974) will not hold for them.[27]

7.0.3 Probit analysis with the 1988 Transfer Supplement Sample

This section presents the results of a Probit specification, testing if the probability of receiving a transfers reacts more to a dollar decrease in the earnings of the primary earner than to a dollar decrease in the earnings of the secondary earner.

The Probit models I and II in Table 4 include the receipt of a transfer as the dependent variable. Standard errors are corrected for the fact that regressors are generated and for the fact that respondents may come from the same 1968 household (see Cox and Jakubson, 1995). The reported estimates in Table 4 are Probit coefficients. In all specifications, the sign of the earnings of the husband is negative. The coefficient of the earnings of the wife is also negative, and the magnitude is approximately half than that of the husband. The coefficients in the Probit model I imply that an increase of 1,000 dollars of the income of the husband decreases the probability of receiving a transfer by .0025 (the standard error is .0007). An increase of 1,000 dollars of the income of the wife decreases the probability of receiving a transfer by .0016 (the standard error is .0009). These results accord with

PSID sample to the records of their parents. I then construct measures of the lifetime resources of the parents of these respondents following Altonji et al (1997). For the rest of respondents in the 1988 survey, I impute parental income by means of predicted values of regressions of parental lifetime resources on the set of parental variables available in the 1988 survey. In Section 7.0.6, I experiment with a matched sample of parents and children.

[27] Individual transfers of less than 10,000 dollars to a given individual are not subject to taxes in the US, while these above $10,000 are included in the donor's gift tax base. Once the donor accumulates $600,000 dollars of taxable gifts (above $10,000), gifts are taxed. Married couples can give 20,000 a year up to a 1.2 million limit, assuming a careful estate management. More details in Poterba (2001).

the predictions of the altruistic model of the family under imperfect information. Including education of the child and quadratic terms in earnings rises the absolute value of impact of earnings on the probability, for both members of the household of the child.

7.0.4 Tobit specification with the 1988 Transfer Supplement Sample

The Tobit model I in Table 4 shows that parental transfers rise by 2.2 cents in response to a dollar reduction in the earnings of the head. Transfers rise by 1 cent in response to a dollar decrease in the income of the secondary earner.[28] This result accords with the results from the simulations in section 4, although the coefficients are imprecise. The difference in slopes is robust to the inclusion of education of the parent and child (Tobit model II in Table 4). A dollar decrease in the permanent earnings of the head results in an increase in transfers that ranges of 3.6 cents (the standard deviation is 0.9 cents). Conversely, a dollar decrease of the permanent earnings of the wife results in an increase of transfers of 2.4 cents (the standard deviation is 1.5 cents).

7.0.5 A-I estimator with the 1988 Transfer Supplement Sample

Table 5 presents the results from the estimator developed by Altonji and Ichimura (1997). This estimator has the advantage of allowing for heterogeneity in the preferences of the parents and the child, as well as nonseparability between the error terms and the explanatory variables. The parameter reported is the derivative of transfers with respect to permanent earnings of the husband and wife for the subsample of children who report transfers, evaluated at sample means. To estimate the form of the truncated regression, a global polynomial procedure was used. It contains the income of the parent, a third order polynomial in labor income earned by the wife in the household of the child, and third order polynomial in labor income earned by the head, and interactions between first order and second order terms of the polynomials. The same set of demographics as in the former specifications is included.

Evaluated at mean earnings, an extra dollar of permanent income of the husband results in a decrease of parental transfers of 2 cents. The average reaction of transfers to earnings of the wife varies across specifications. In model I, that excludes education controls, it is 3 cents. Once the education of the members of the household of the child is included (models II and III in Table 5), the average slope of the income of the wife rises to 5 cents. These results

[28] The reported standard errors in the Tobit specification do not account for correlation within the family nor for the fact that parental permanent earnings are generated.

contradict the prediction of the model of altruism under imperfect information regarding the response of the transfer amount to the earnings of the members of the household.

7.0.6 Experiments using the 1976-1993 Waves of the PSID

I also present evidence from a matched sample of parents and children using the 1976 through 1993 waves of the PSID. The sample size is bigger than in the previous case, and information both on the permanent income of parents and children is available. Every year, respondents of the PSID are asked "Did you receive last year any help from relatives? What was the amount?" I include only continuously married children who were born before 1971.[29] The sample contains 18,170 observations on 1,819 children matched to 1,126 original 1968 households. Table A.1 shows the descriptive statistics of this sample.

Models I and II in Table 6 present the results from a Probit model of transfers on permanent income of the head and wife. The specifications include similar covariates to the specifications above, and the actual permanent income of the parent. As predicted by the altruism model of the family, the sign of earnings of the head is negative and precisely estimated. Also, the coefficient of the earnings of the wife is negative, and the magnitude is statistically significantly lower than that of the head. The magnitude of the coefficients is bigger than the corresponding estimate using the 1988 Transfer Supplement file, and the precision is also higher.

Model 3 in Table 6 shows the coefficients of a Tobit specification. In the Tobit specification, the coefficient of permanent income of the husband in Model I implies that of parental transfers rise by 10 cents (standard deviation: 0.8 cents) in response to a dollar reduction in the earnings of the head. The coefficient of permanent income of the wife in Model I implies that the transfer amount rises by 5 cents in response to a dollar decrease in the income of the secondary earner (the standard deviation is 0.8 cents). This result accords with the results from the simulations in section 5. I also ran the A-I estimator on this sample (results not

[29] These individuals are followed as they established their own household. This information is matched to the information of their parents using the interview number in 1968. Observations are dropped if both parents are dead at the time of the survey, or if the only parent located in 1968 had either died or left the sample. Only households of the child in which the head was over 21 were considered. Following Altonji et al (1992), the first year observation of the household of the child is dropped. The age of the parent was restricted to be at least 38.

shown).[30] The estimator is evaluated at the mean of permanent earnings of the head and wife for the subsample of children who report a transfer. The results imply that a dollar reduction in the earnings of the primary earner causes an increase in transfers of 9 cents. Conversely, a dollar decrease in the earnings of the secondary earner causes an increase of transfers of 7 cents. This specification accords to the predictions of the model.[31]

7.1 Discussion of empirical findings

The empirical analysis supports one of the predictions of the altruism model under imperfect information: the probability of receiving is higher if the primary earner of the household of the child loses a dollar than if the secondary earner does. The result holds for two measures of transfers in the PSID. Another prediction of this model is that among households who receive transfers, an additional dollar of the primary earner diminish transfers more than an additional dollar of the secondary earner. That result is not consistent across specifications.

A possible explanation for this failure of the theory is that the test is not well defined, because parents care more about the utility of their own offspring than about the utility of their in-law's. Even in the absence of private information, this fact could create heterogeneous responses to earnings components if children households are not unitary (see, for example, Chiappori, 1992). I explored this possibility examining the response of the transfer amount to the earnings of the offspring donor, controlling by the sum of earnings of both members of the recipient household. If parents are only altruistic toward their own offspring, their transfers should be more responsive to the earnings of the offspring. The results of the A-I estimator (not shown) imply that, a dollar increase in the resources of the household of the child diminish transfers by 2 cents (the standard deviation is 1.2 cents). Holding constant the total resources of the child, a loss of a dollar in the income of the offspring of the donor increases the transfer amount by 0.4 cents (the standard deviation is 1.4 cents).

[30] To estimate the form of the truncated regression, a global polynomial procedure was used. It contains the income of the parent, a third order polynomial in labor income earned by the wife in the household of the child, and third order polynomial in labor income earned by the head. The same set of demographics as in the Tobit and Probit specifications is included.

[31] Still, the results from the A-I estimator on this sample are not conclusive. When I estimate other moments, such as the average response of parental transfers to income of the husband wive, there were specifications for which the reaction to the income of the wife was not smaller in absolute value than the reaction to the income of the husband.

It is not obvious from these results that the differential degree of altruism toward in-laws is driving the results from the A-I estimator.[32]

8 Conclusions

Can imperfect information about labor market opportunities account for the discrepancy between the predictions of the altruism model of the family and the empirical evidence on intervivos transfers? The computations reported in this work imply that among households of children who are receiving monetary help, the response of parental transfers to a dollar decrease in labor income is below 30 cents. Previous researchers have reported empirical estimates of the response of transfers to a dollar decrease of the income of the child, and this magnitude is around 15 cents. The model of altruism under imperfect information is also consistent with new evidence from the PSID: I find that the household of a married child is more likely to receive a transfer if the primary earner loses a dollar than if the secondary earner does. Nevertheless, other predictions are not matched.

What does this model say about the effect of a program that taxes a dollar of the income of the child to give it to the parent? A tax would lie out of the control of the child, and would be observable to the parent. The model presented in this paper predicts then that while parental transfers will not necessarily neutralize this program, they will rise in response to it. Also, the increase of parental transfers following this exogenous redistribution will be higher than the increase estimated by Altonji et al. (1997) or Cox (1987), who identify the effect on parental transfers of income variations of the child associated to endogenous effort choices. The effectiveness of public programs that redistribute income between generations remains then an open question for empirical research.

9 Appendix 1: Proofs of the propositions

(not intended for publication) Proposition 1 is proved using lemmata 5 through 11. The following

[32] Another possibility for explaining the results using the A-I estimator is an alternative theory of transfer motives in which parents compensating the income variations of secondary earners because they are more likely to take care of them. Nevertheless, exchange behavior is not clearly supported by the PSID data (Altonji et al., 2000). Finally, it is worth noting that the A-I results are sensitive to the choice of the order of the polynomial used to approximate the transfer function.

notation is used. $\widehat{U}^c(w_j, y^c_{exo})$ is the utility level of the household of child if the secondary earner has a wage w_j in the absence of parental transfers. The utility function is rescaled to make $\gamma_p(\overline{l}^c_p - y^c_{exo})$ equal zero. A hat ($\hat{}$) over a variable denotes that it forms part of the solution to the problem that the child would solve without parental transfers. An asterisk (*) over a variable denotes that forms part of the solution to the problem with imperfect information. I drop the superscript c in the income and consumption variables of the child. The subscript s in the wage, probability and income is also dropped, once the primary earner is ignored. The problem of the parent under imperfect information is the following

$$\max_{\{(c_i,y_i)_{i=1}^{i=n}\}} \sum_{i=1}^{i=n} \pi_i\{y^p - c_i + y_i + \eta U^c_i(c_i, \frac{y_i}{w_i}, y_{exo})\} \tag{10}$$

$$s.t. \quad v(c_i) + \gamma_s(\overline{l}^c_s - \frac{y_i}{w_i}) \geq v(c_j) + \gamma_s(\overline{l}^c_s - \frac{y_j}{w_i}) \quad i \neq j \quad \forall i, j = 1...n \tag{IC}$$

$$s.t. \quad U^c_i(c_i, \frac{y_i}{w_i}, y_{exo}) \geq \widehat{U}^c_i(w_i, y_{exo}) \quad \forall i = 1...n \tag{PC}$$

$$s.t. \quad c_i - y_{exo} - y_i \geq 0 \quad \forall i = 1...n \tag{PT}$$

where $U^c_i = v(c_i) + \gamma_s(\overline{l}^c_s - \frac{y_i}{w_i})$. IC denotes the "incentive compatibility" constraint, PC denotes the "participation constraint" and PT denotes "positive transfer". Besley and Coate (1995) prove that, for the preferences posed, one needs only to worry about the informational constraints between adjacent wages. First I define those special informational constraints in detail.

Definition 1 *The constraint $v(c^*_i) + \gamma_s(\overline{l}^c_s - \frac{y^*_i}{w_i}) \geq v(c^*_{i-1}) + \gamma_s(\overline{l}^c_s - \frac{y^*_{i-1}}{w_i})$ will be defined as the downward adjacent incentive compatibility constraint (DAIC) associated to wage w_i*

Definition 2 *The constraint $v(c^*_i) + \gamma_s(\overline{l}^c_s - \frac{y^*_i}{w_i}) \geq v(c^*_{i+1}) + \gamma_s(\overline{l}^c_s - \frac{y^*_{i+1}}{w_i})$ will be defined as the upward adjacent incentive compatibility constraint (UAIC) associated to wage w_i*

Lemma 5 *Let the solution to the problem of the parent under imperfect information $\{(c^*_i, y^*_i)_{i=1}^{i=n}\}$. The PC constraint binds if and only if the PT constraint binds.*

It cannot be the case that, for a given wage, PC does not bind and PT does. The reason is that in the absence of parental transfers it is not possible for the child to attain an utility level that exceeds $\widehat{U}_i^c(w_i, y_{exo})$.Conversely, assume that there exists only a wage w_k for which the PT constraint does not bind and for which the PC does (i.e. $U_k^c(c_k, \frac{y_k}{w_k}, y_{exo}) = \widehat{U}_k^c(w_k, y_{exo})$ Then, the parent may replace (c_k^*, y_k^*) with $(\widehat{c}_k, \widehat{y}_k)$ leaving the rest of the plan unaffected. This change does not alter the utility of the child, and increases the consumption to the parent, since the transfer was strictly positive before, and now is zero. Furthermore, that change cannot affect none of the IC. Assume it affected the IC associated to wage w_i. In such a case, the following chain of inequalities must hold

$$
\begin{aligned}
(11) \qquad \widehat{U}^c(w_i, y_{exo}^c) &\leq v(c_i^*) + \gamma_s(\bar{l}_s^c - \frac{y_i^*}{w_i}) < v(\widehat{c}_k) + \gamma_s(\bar{l}_s^c - \frac{\widehat{y}_k}{w_i}) \\
&\leq v(\widehat{c}_i) + \gamma_s(\bar{l}_s^c - \frac{\widehat{y}_i}{w_i}) = \widehat{U}^c(w_i, y_{exo}^c)
\end{aligned}
$$

The first weak inequality arises from the fact that (c_i^*, y_i^*) is part of the solution, and then, must satisfy PC. The second inequality is by assumption: IC does not hold after the change. The third equality is implied by the fact that $(\widehat{c}_i, \widehat{y}_i)$ solves the problem of the child in the absence of transfers. The set of inequalities entails a contradiction. Hence, in the solution of the problem, it cannnot be the case that PT does not bind and PC does.

Lemma 6 *Any allocation $\{(c_i, y_i)_{i=1}^{i=n}\}$ satisfying the informational constraints implies that consumption and income are nondecreasing in the wage. Furthermore, if $y_i \neq y_{i+1}$ then $y_i < y_{i+1}$*

Proof. Let any pair of wages w_i and w_{i+1} Combining the DAIC associated to wage w_i and the UAIC associated to wage w_{i+1}, it is possible to obtain $\int_{y_i}^{y_{i+1}} \gamma_s'(\bar{l}_s^c - \frac{x}{w_i})\frac{1}{w_i}dx \geq \int_{y_i}^{y_{i+1}} \gamma_s'(\bar{l}_s^c - \frac{x}{w_{i+1}})\frac{1}{w_{i+1}}dx$. Using the facts that the marginal utility of leisure is higher for a person with a lower wage, it can be shown that $y_{i+1} \geq y_i$ If income is nondecreasing in the wage in equilibrium, consumption must also be nondecreasing in the wage.

Corollary 7 *Let the solution of the problem, $\{(c_i^*, y_i^*)_{i=1}^{i=n}\}$. Let two bundles of consumption and income associated to wages w_i and w_{i+1}be (c_i^*, y_i^*) and (c_{i+1}^*, y_{i+1}^*), where $(c_i^*, y_i^*) \neq (c_{i+1}^*, y_{i+1}^*)$. It cannot be the case that the UAIC associated to wage w_i and the DAIC associated to wage w_{i+1} bind at the same time.*

The proof of this corollary is straightforward replacing the weak inequalities in the proof of lemma 6 by equalities.

Lemma 8 *Let the solution of the problem under imperfect information,* $\{(c_i^*, y_i^*)_{i=1}^{i=n}\}$*. If there exists a wage* w_r *such that* $y_r = 0$ *then, for every wage* w_i *such that* $w_i < w_r$*,* $y_i^* = 0$ *and* $c_i^* = c_r^*$

Proof: from lemma 6.

Lemma 9 *Let* $\{(c_i^*, y_i^*)_{i=1}^{i=n}\}$ *be the solution to the problem of the parent under imperfect information. For all* $j \in (1, ..., n)$ *such that* $c_j^* > y_j^* > 0$ *(i.e. for all wages such that the child receives positive transfers), and* $(c_j^*, y_j^*) \neq (c_{j-1}^*, y_{j-1}^*)$ *the UAIC associated to wage* w_{j-1} *does not bind.*

Proof: Assume that there is a range of $(w_{n_0}, ..., w_{n_1})$ such that the UAIC for each wage binds. Assume also that UAIC associated to w_{n_0-1} does not bind, nor does the one associated to w_{n_1+1} (maybe because $n_0 = 1$ and $n_1 = n$). By assumption, there exist at least two combinations of consumption and income that correspond to adjacent wages w_k and $w_{k+1}$and that are such that $(c_k^*, y_k^*) \neq (c_{k+1}^*, y_{k+1}^*)$. By corollary 7, the DAIC associated to wage w_{k+1} does not bind, and, by lemma 6 $v'(c_{n_1}^*) \leq v'(c_{n_1-1}^*) \leq ... \leq v'(c_{n_0}^*)$. The previous set of inequalities follows from (1) the consumption level of any sequence that satisfies the adjacent incentive constraints is nondecreasing in the wage, and (2) the utility level is strictly concave in consumption. Also, at least one of the inequalities holds with strict inequality. Consider the following redistribution of consumption within the set of bundles $\{(c_i^*, y_i^*)_{i=n_0}^{i=n_1}\}$ Assume that there are m wages that share the same combination $(c_{n_1}^*, y_{n_1}^*)$ (m can be one). Define $\{(c_i^0, y_i^*)_{i=n_0}^{i=n_1}\}$ as follows. $c_j^0 = c_j^* - \sum_{i=n_1-m}^{n_1} \pi_i \varepsilon \quad j = n_1 - m, ..., n_1$, and $c_k^0 = c_k^* + \frac{\sum_{i=n_1-m}^{n_1} \pi_i}{\sum_{i=n_0}^{i=n_1-m-1} \pi_i} \varepsilon = c_k^* + \varepsilon_1 \quad k = n_0, ..., n_1 - m - 1$

This plan redistributes consumption from the wage types $w_{n_1}...w_{n_1-m}$ to the wage types $w_{n_0}, ...w_{n_1-m-1}$, leaving the expected expenditure of the parent unaffected. It does not violate the AIC constraints, for an ε small enough. The DAIC of wage n_0 is relaxed. The UAIC between n_1 and $n_1 + 1$ will not bind for small enough ε. Finally, due to strict concavity of v, increasing the consumption level of each wage type $w_{n_0}, ...w_{n_1-m-1}$ by the same amount ε_1 will not violate the UAIC between any two adjacent wages.[33] It also improves the utility of the parent. The change in

[33] In equilibrium, before the modification, the UAIC between any pair of adjacent wages in the interval $[w_{n_0}, w_{n_0+1}, ..., w_{n_1}]$ was binding in equilibrium. i.e.:

$$v(c_i^*) + \gamma(\bar{l}_s^c - \frac{y_i^*}{w_i}) = v(c_{i+1}^*) + \gamma(\bar{l}_s^c - \frac{y_{i+1}^*}{w_i})$$

I will show that increasing c_i^* and c_{i+1}^* by the same amount does not violate the UAIC. Trivially, if $(c_i^*, y_i^*) = (c_{i+1}^*, y_{i+1}^*)$ the new plan will not violate the UAIC associated to w_i. Assume that two adjacent bundles are different and that the UAIC was violated after the change. Then: $v(c_i^* + \epsilon) +$

the utility of the parent is the following

$$
\begin{aligned}
&\sum_{i=n_1-m}^{n_1} \pi_i[1-v'(c^*_{n_1})]\varepsilon - \{\sum_{i=n_0}^{n_1-m-1} \pi_i[1-v'(c^*_i)]\}\varepsilon_1 \quad \geq \\
&\sum_{i=n_1-m}^{n_1} \pi_i[1-v'(c^*_{n_1})]\varepsilon - \{\sum_{i=n_0}^{n_1-m-1} \pi_i\}[1-v'(c^*_{n_1-m-1})]\varepsilon_1 \quad = \\
&\sum_{i=n_1-m}^{n_1} \pi_i[1-v'(c^*_{n_1})]\varepsilon - \sum_{i=n_1-m}^{n_1} \pi_i[1-v'(c^*_{n_1-m-1})]\varepsilon \quad > \quad 0
\end{aligned} \tag{12}
$$

The first inequality uses the fact that marginal utility of consumption is lower for higher wages. The second equality substitutes in the definition of ε_1. The increase is positive, and we get to a contradiction. Hence, in the solution, the UAIC does not bind for any interval.

Lemma 10 *Let* $\{(c^*_i, y^*_i)_{i=1}^{i=n}\}$ *be the solution of the problem of the parent under imperfect information. Then, if* $c^*_i > y^*_i + y_{exo}$*, and* $(c^*_i, y^*_i) \neq (c^*_{i-1}, y^*_{i-1})$ *then the DAIC associated to* w_i *must bind*

Proof. Assume not. From lemma 9, the UAIC associated to wage w_{i-1} does not bind. If the DAIC is not binding, the marginal utilities associated with higher wages are strictly lower than those of the lower wages. One can then redistribute income in the same manner than in the proof of lemma 9.

Lemma 11 *Let the solution to the problem* $\{(c^*_i, y^*_i)_{i=1}^{i=n}\}$*. If there exists some* $v \in (1, ..., n)$ *such that* $c^*_v = y^*_v + y_{exo}$*, then, for all* $k > v$*,*

$$c^*_k = y^*_k + y_{exo} \quad \textit{and} \quad y^*_k = \widehat{y}_k$$

Proof: Assume that $c^*_v = y^*_v + y_{exo}$ and $c^*_{v+1} > y^*_{v+1} + y_{exo}$. Then, by lemma 10, the DAIC constraint associated to wage w_{v+1} must bind. Using the IC's, one can get the following chain of inequalities.$\widehat{U}^c(w_{v+1}, y_{exo}) \leq v(c^*_{v+1}) + \gamma_s(\overline{l}^c_s - \frac{y^*_{v+1}}{w_{v+1}}) = v(\widehat{c}_v) + \gamma_s(\overline{l}^c_s - \frac{\widehat{y}_v}{w_{v+1}}) < v(\widehat{c}_{v+1}) + \gamma_s(\overline{l}^c_s - \frac{\widehat{y}_{v+1}}{w_{v+1}}) = \widehat{U}^c(w_{v+1}, y_{exo})$. The first inequality comes from the fact that the utility for a given wage is, at least, the level without transfers (lemma 5). The second equality makes use of the property that the DAIC must bind, if transfers are positive. The strict inequality comes from

---

$\gamma(\overline{l}^c_s - \frac{y^*_i}{w_i}) < v(c^*_{i+1} + \epsilon) + \gamma(\overline{l}^c_s - \frac{y^*_{i+1}}{w_i})$

Combining the two expresions, they imply that $v(c^*_i + \epsilon) - v(c^*_i) < v(c^*_{i+1} + \epsilon) - v(c^*_{i+1})$. Dividing by ϵ and taking limits, the last equality implies that the $v'' \geq 0$, which is not consistent with the strict concavity of $v(c)$

revealed preference. The chain of inequalities results in a contradiction, hence, $c^*_{v+1} = y^*_{v+1} + y_{exo}$. Utility maximization implies that $y^*_v = \widehat{y}_v$.

The next step is to prove propositions 2, 3 and Corollary 4 in Section 4. First, to simplify the notation, I assume that r=1. Next, define $U^c_i = v(c^c_i) + \gamma_s(\bar{l}^c_s - \frac{y_i}{w_i}) \quad \forall i = 1...n$. The DAIC can then be rewritten as $U^c_j = U^c_{j-1} - \gamma_s(\bar{l}^c_s - \frac{y_{j-1}}{w_{j-1}}) + \gamma_s(\bar{l}^c_s - \frac{y_{j-1}}{w_j})$. Finally, I introduce the change of variable $c_i = f(U^c_i, y_i)$. Using the results in proposition 1, and the new notation, the problem is now the following:

$$\max_{\{U^c_1,(y_j)^{j=n}_{j=1}\}} \quad \sum_{i=1}^{i=v-1} \pi_i\{y^p - c(U^c_i, y_i) + y_i + \eta U^c_i\}$$

$$s.t. \quad \widehat{U}^c_v \geq U^c_1 + \sum_{i=1}^{i=v-1} \{-\gamma_s(\bar{l}^c_s - \frac{y_i}{w_i}) + \gamma_s(\bar{l}^c_s - \frac{y_i}{w_{i+1}})\}$$

and subject to the PT constraints. After rearranging, and dropping the income of the parent y^p, the Lagrangian of this problem (ℓ) becomes

$$\ell = \eta U^c_1 \sum_{i=1}^{i=v-1} \pi_i + \sum_{i=1}^{i=v-1} (\pi_i y_i) - \sum_{i=1}^{i=v-1} (\pi_i c(U^c_i, y_i)) + \eta \sum_{i=2}^{i=v-1} (\pi_i [\sum_{i=1}^{i=v-1} (-\gamma_s(\bar{l}_s - \frac{y_i}{w_i}) + \gamma(\bar{l}^c_s - \frac{y_i}{w_{i+1}}))]) -$$
$$-\lambda[U^c_1 + \sum_{i=1}^{i=v-1} (-\gamma_s(\bar{l}^c_s - \frac{y_i}{w_i}) + \gamma_s(\bar{l}^c_s - \frac{y_i}{w_{i+1}})) - \widehat{U}^c_v]$$

The first order conditions of the problem are the following.

$$\text{(13)} \qquad \frac{\partial \ell}{\partial U^c_1} = \sum_{i=1}^{i=v-1} \pi_i[\eta - \frac{1}{v'(c_i)}] - \lambda = 0$$

$$\frac{\partial \ell}{\partial y_i} = \pi_i(1 - \frac{\partial c}{\partial y_i}) - \{\lambda + \sum_{j=i+1}^{j=v-1} \pi_j[\frac{1}{v'(c_j)} - \eta]\}[\gamma'(\bar{l}^c_s - \frac{y_i}{w_{i+1}})\frac{1}{w_{i+1}} - \gamma'(\bar{l}^c_s - \frac{y_i}{w_i})\frac{1}{w_i}] = 0$$
$$\text{(14)} \ \forall i = 1, ..., v-2$$

$$\text{(15)} \qquad \pi_{v-1}(1 - \frac{\partial c}{\partial y_{v-1}}) - \lambda[\gamma'(\bar{l}^c_s - \frac{y_{v-1}}{w_v})\frac{1}{w_v} - \gamma'(\bar{l}^c_s - \frac{y_{v-1}}{w_{v-1}})\frac{1}{w_{v-1}}] = 0$$

Lemma 12 *(proposition 2 in the text) The implicit marginal tax on effort income is a number between zero and one.*

From the first order conditions 13,14 and 15 and the fact that consumption is nondecreasing with the wage.

Lemma 13 *(proposition 3 in the text) If the solution is such that, in equilibrium, the child receives a parental transfer regardless of the wage, an increase in y_{exo} of one dollar reduces t_i by a dollar for every i=1,..,v-1*

Proof: In such a case, there is no wage for which the child receives no transfers and λ equals zero. v-1 can be replaced by n in all the first order conditions 13, 14 and 15. We can observe that the amount of transfers and y_{exo} appear together in all expressions. This implies that if y_{exo} decreases by one dollar, then the transfer increase by one dollar for any given wage.

10 Appendix 2: Numerical solution

The optimal transfer scheme under perfect information is calculated from the first order conditions in Section 3, for the wage distribution and the parameter values of the utility function described in Section 5. The transfer scheme under imperfect information is derived using the results in Section 4. First, the optimal allocation without transfers $\{(\widehat{y}_i)_{i=1}^{i=n}\}$ is computed. Using proposition 1, it is known that, for wages of the secondary earner above the cut-off value w_v, the optimal transfer is zero, and the optimal income level is that without transfers. Hence, the transfer scheme $\{(c_i, y_i(w_i))_{i=v}^{i=n}\}$ for wages above a given w_v is set to $\{(\widehat{y}_i + y_{exo}, \widehat{y}_i)_{i=v}^{i=n}\}$.The following problem is solved, for a given w_v:

$$\max_{\{U_1,(y_i)_{i=1}^{i=v}\}} \sum_{i=1}^{i=v-1} \pi_i\{\frac{(y^p - c(U_i, y_i) + y_i + y_{exo})^{1-\phi_p}}{1-\phi_p} + \eta U_i^c\}$$

(16)
$$s.t. \quad \widehat{U}_v = U_{v-1} - \frac{(\overline{l}_s^c - \frac{y_{v-1}}{w_{v-1}})^{1-\rho_s}}{1-\rho_s} + \frac{(\overline{l}_s^c - \frac{y_{v-1}}{w_v})^{1-\rho_s}}{1-\rho_s}$$

(17)
$$s.t. \quad y_{i+1} \geq y_i \quad U_i \geq \widehat{U}_i \, \forall i = 1...v-1$$

where $U_i = U_{i-1} - \frac{(\bar{l}_s^c - \frac{y_{i-1}}{w_{i-1}})^{1-\rho_s}}{1-\rho_s} + \frac{(\bar{l}_s^c - \frac{y_{i-1}}{w_i})^{1-\rho_s}}{1-\rho_s}$. It can be shown that the objective function is concave in its arguments. Also, $\gamma'''() > 0$ is a sufficient condition for constraints (16)-(17) to form a convex set. The problem is solved for several cut-off wages, starting with the wage cut-off under perfect information. The solution is the $\{U_1, (y_i)_{i=1}^{i=v}\}$ combination that solves the former problem and the smallest wage cut-off w_v for which the Lagrange multiplier associated to the IC constraint is smaller than the derivative of the utility of the parent with respect to $\widehat{U}_v$. The derivative of transfers with respect to y_{exo} is obtained by solving the problem again substituting y_{exo} with $y_{exo}+\epsilon$. Denote the resulting schedule $\{U_1^\epsilon, (y_i^\epsilon)_{i=1}^{i=v}\}$. The derivative of parental transfers with respect to income of the primary earner are obtained as follows: $\frac{t_i - t_i^\epsilon}{y - y^\epsilon}$. The average derivative reported in Table 1 is $\sum_{i=1}^{i=v-1} \pi_i (\frac{t_i - t_i^\epsilon}{y_i - y_i^\epsilon})$.For the case of a risk averse parent, I could not get analytical results regarding which IC constraints bind. Hence, I solved the same objective function as above, with the same set of constraints but, instead of using the inequality (17), I used the set of constraints $U_j \geq U_{j-1} - \frac{(\bar{l}_s^c - \frac{y_{j-1}}{w_{j-1}})^{1-\rho_s}}{1-\rho_s} + \frac{(\bar{l}_s^c - \frac{y_{j-1}}{w_j})^{1-\rho_s}}{1-\rho_s} \quad \forall j = 1, ..., v$

Table 1 Simulated effects of permanent earnings on the transfer amount.

	Model I	Model II	Model III	Model IV
	$\phi_c = 2 \quad \kappa = .93$ $\rho_s = 2.2 \quad \eta = 15.9$	$\phi_c = 2 \quad \kappa = 10$ $\rho_s = 4 \quad \eta = 16.3$	$\phi_c = \phi_p = 2 \quad \kappa = .93$ $\rho_s = 2.2 \quad \eta = .52$	$\phi_c = \phi_p = 2 \quad \kappa = 10$ $\rho_s = 4 \quad \eta = .53$
Working hours elasticity	.09	.05	.09	.05
Imperfect information				
1. Mean transfer	380	380	375	380
2. Income of wife	19,100	20,170	18,710	20,180
3. $\frac{\partial t}{\partial y_p}$	0	0	.19	.18
4. Mean $\frac{\partial t}{\partial y_s}$ if $t > 0$	-.11	-.14	-.12	-.14
5. Mean $\frac{\partial t}{\partial y_{exo}}$ if $t > 0$	-.18	-.23	-.19	-.22
Imperfect information				
6. Mean transfer	1,423	1,079	788	683
7. Income of wife	19,240	20,370	18,850	20,430
8. $\frac{\partial t}{\partial y_p}$	0	0	.53	.48
9. $\frac{\partial t}{\partial y_s}$	-1	-1	.57	.57
10. $\frac{\partial t}{\partial y_{exo}}$	-1	-1	.47	.52
Actual data				
11. Mean transfer	378			
12. $\frac{\partial t}{\partial y_p}$	(0.05,0.10)			
13. $\frac{\partial t}{\partial y_c}$	(-0.10,0.00)			

The utility function of the child used in the simulations is $U_c = \frac{c^{1-\phi_c}}{1-\phi_c} + \kappa \frac{(\bar{l}_s - y_s/w)^{1-\rho_s}}{1-\rho_s}$. The utility of the parent is $U_p = \frac{c^{1-\phi_p}}{1-\phi_p}$ For all specifications, $\bar{l}_s^c$ is set at 6 (corresponding to a time endowment of 6,000 hours a year). The income of the primary earner is fixed at 2.7, corresponding to 27,000 dollars a year (the average earnings at age 30 of PSID married males). The average response $\frac{\partial t}{\partial y_s}$ is obtained from the simulated solution using the discrete approximation $\frac{t_i(w_i, y^c_{exo}) - t_{i-1}(w_i, y^c_{exo})}{y_i(w_i, y^c_{exo}) - y_{i-1}(w_i, y^c_{exo})}$.

The mean transfer corresponds to the unconditional mean in the 1988 PSID Transfer Supplement. The empirical estimates of the response of transfers to earnings of parents and children are taken from Altonji et al. (1997), Cox and Jakubson (1995), and McGarry (1995).

Table 2 Simulated effects of earnings on transfers, including heterogeneity.

Parameters in all specifications: $V(\eta)=3, \phi_c=2, \phi_p=0$	Specification I $\rho_s=2.2, \kappa=.93, E(\eta)=15.9$	Specification II $\rho_s=4, \kappa=10, E(\eta)=13$
Panel I. Probit coefficients, Perfect information		
1. Income, primary earner	-.30	-.30
	(.02)	(.03)
2. Income, secondary earner	-.32	-.30
	(.01)	(.04)
Imperfect information		
3. Income, primary earner	-.20	-.23
	(.02)	(.02)
4. Income, secondary earner	-.15	-.17
	(.01)	(.01)
Panel II. Probability of transfer, imperfect information		
5. $Y_h=\overline{Y}_h-4, Y_f=\overline{Y}_f$	.41	.28
6. $Y_h=\overline{Y}_h, Y_f=\overline{Y}_f$	.14	.07
7. $Y_h=\overline{Y}_h+4, Y_f=\overline{Y}_f$	.028	.01
8. $Y_h=\overline{Y}_h, Y_f=\overline{Y}_f-4$	.34	.22
9. $Y_h=\overline{Y}_h, Y_f=\overline{Y}_f$	.14	.07
10. $Y_h=\overline{Y}_h, Y_f=\overline{Y}_f+4$	.04	.016
Panel III: Tobit coefficients, imperfect information		
11. Income, primary earner	-.29	-.33
	(.02)	(.03)
12. Income, secondary earner	-.21	-.23
	(.01)	(.025)

$\overline{Y}_h$ is \$27,000, and $\overline{Y}_f$ is \$21,000. Magnitudes are in 1993 dollars. $\overline{Y}_f - 4$ represents income of the secondary earner minus 4,000 dollars (a third of the standard deviation of the distribution of permanent income of secondary earners, see Table 3). $\overline{Y}_h - 4$ represents income of the primary earner minus 4,000 dollars (a third of the standard deviation of the observed distribution of permanent income of secondary earners in the PSID, see Table 3)

Table 3 Descriptive statistics of selected variables, 1988 Supplement.

Variable	Total sample (N=2,022)	If No Transfer (N=1,476)	If Transfer (N=546)
Child received money	0.23	0	1
Amount received (from all parents)	807	0	2,986
Age of the husband	35.11	35.81	33.25
	(7.14)	(7.19)	(6.67)
Age of the wife	32.96	33.59	31.24
	(6.75)	(6.73)	(6.49)
Child's permanent income -husband	35,288	35,269	35,338
	(17,967)	(17,551)	(19,062)
Child's permanent income -wife	18,586	18,459	18,930
	(11,590)	(11,520)	(11,780)
Years of schooling -husband	12.96	12.81	13.36
	(2.59)	(2.60)	(2.53)
Years of schooling -wife	12.83	12.68	13.25
	(2.48)	(2.43)	(2.57)
Child's race other than white	0.22	0.24	0.17
Age of father -husband	62.50	62.89	61.57
	(9.05)	(9.01)	(9.08)
Age of father- wife	61.25	61.68	60.22
	(8.76)	(8.69)	(8.86)
Permanent income -husband's parents	57,573	55,785	62,399
	(24,197)	(22,661)	(27,372)
Permanent income -wife's parents	58,824	56,339	65,533
	(25,528)	(23,473)	(29,382)
Years of school-husband's father	10.89	10.67	11.42
	(3.35)	(3.31)	(3.388)
Years of school-husband's mother	11.09	10.75	11.587
	(3.36)	(3.34)	(2.797)
Years of school -wife's father	11.11	10.75	11.89
	(2.87)	(3.35)	(3.28)
Years of school -wife's mother	11.07	10.80	11.77
	(2.94)	(2.96)	(2.78)
Divorced parents -husband	0.12	0.12	0.13
Divorced parents -wife	0.11	0.10	0.14
Parent is a widow -husband	0.29	0.31	0.23
Parent is a widow -wife	0.25	0.27	0.17

Standard deviations in parentheses. Monetary variables measured in dollars of 1993.

Table 4 Reaction of transfers to permanent income, 1988 Supplement.

	Probit Model		Tobit Model	
Regressors	Model I	Model II	Model I	Model II
Perm. income -child husband	-.007	-.010	-.022	-.036
	(.002)	(.0024)	(.008)	(.009)
Perm. income -child wife	-.003	-.006	-.010	-.024
	(.003)	(.0037)	(.012)	(.015)
Perm income sq. -child husband	excluded	8e-5	excluded	.0002
		(4e-5)		(.0002)
Perm income sq. -child wife	excluded	.0001	excluded	.0003
		(.001)		(.0005)
Perm income sq, husband's parents	.006	.005	.036	.025
	(.002)	(.002)	(.006)	(.007)
Perm income sq, wife's parents	.009	.007	.036	.025
	(.004)	(.003)	(.006)	(.006)
Years schooling - child husband	excluded	.023	excluded	.137
		(.018)		(.072)
Years schooling - child wife	excluded	.042	excluded	.220
		(.019)		(.081)
Years schooling missing - husband	excluded	-.342	excluded	-.208
		(.389)		(1.924)
Years schooling missing - child wife	excluded	.2730	excluded	.894
		(.358)		(1.406)
Years schooling, father of husband	excluded	-.015	excluded	-.134
		(.014)		(.057)
Years schooling, mother of husband	excluded	-.001	excluded	-.019
		(.014)		(.059)
Education, father of wife	excluded	.017	excluded	.077
		(.013)		(.056)
Education, mother of wife	excluded	.005	excluded	.027
		(.015)		(.060)
Age husband -child		-.062		-.290
		(.036)		(.154)
Age husband, sq. -child		-7e-4		-.300
		(-7e-4)		(.154)
Age wife -child		.094		.330
		(.041)		(.181)
Age wife sq -child		.002		.008
		(7e-4)		(.003)

Table 4 Reaction of transfers to permanent income, 1988 Supplement. (cont)

	Probit model		Tobit model	
Regressors	Model I	Model II	Model I	Model II
Father of husband widower		.194		.849
		(.170)		(.678)
Mother of husband is a widow		.044		.188
		(.098)		(.409)
Father of wife is a widower		.084		.466
		(.255)		(.679)
Mother of wife is a widow		-.202		-.609
		(.099)		(.414)
Father of husband widower, rem.		-.10		-.573
		(.247)		(.989)
Mother of husband widow, rem.		-.144		-.493
		(.241)		(.719)
Father of wife widower, rem.		-.411		-1.824
		(.255)		(1.01)
Mother of wife widow, rem.		.231		.426
		(.170)		(.752)
Parents of husband divorced		.105		.504
		(.161)		(.659)
Parents of wife divorced		.200		.356
		(.156)		(.649)
# Children, child hh.		-.053		-.308
		(.037)		(.159)
# Children 1-2, child hh		.072		.370
		(.070)		(.283)
Child nonwhite		-.088		-.725
		(.093)		(.384)
Constant		-1.823		-6.048
		(.598)		(2.675)
Observations (positive)			2,022 (546)	

The dependent variable in the Probit specification takes value 1 if the child reported a transfer, 0 otherwise. Estimates are Probit coefficients. In the Tobit model, the dependent variable is the transfer amount (thousands of 1993 $). Standard errors (in parentheses) account for correlation across observations involving siblings and generated regressors -Probit specification. Unless otherwise stated, all models include the same set of controls, shown for Model II.

Table 5: Reaction of transfers to permanent income, 1988 Supplement

Household-based sample Dependent variable: transfer amount. Estimation method: A-I estimator.			
Derivative evaluated at sample means			
Regressor	Model I	Model II	Model III
Perm. income - child husband	-.023	-.027	-.032
	(.013)	(.013)	(.013)
Perm income - child wife	-.035	-.048	-.048
	(.022)	(.022)	(.023)
Other controls			
Years schooling - child husband	excluded	included	included
Years schooling -child wife	excluded	included	included
Years schooling -parents.	excluded	excluded	included
Observations		546	

Standard errors (in parentheses.) allow for arbitrary correlation between observations belonging to the same dynasty, and are obtained using the delta method. Transfers above 10,000 dollars (in 1993 dollars) are censored and set at 10,000. All models include the same regressors included in Table 4. The sample mean of permanent earnings of the primary earner is \$35,288. The corresponding number for the secondary earner is \$18,586

Table 6: Reaction of transfers to permanent income, 1976-1993 sample.

Continuously married children.				
	Estimation Method: Probit		Estimation method: Tobit	
Regressors	Model I	Model II	Model I	Model II
Perm. income -child husband	-.020	-.023	-.10	-.11
	(.001)	(.002)	(.008)	(.008)
Perm. income sq -child husband	excluded	.0002	excluded	.009
		(4e-6)		(.002)
Perm. income -child wife	-.007	-.010	-.05	-.05
	(.001)	(.003)	(.008)	(.01)
Perm. income sq. -child wife	excluded	.0001	excluded	.006
		(7e-5)		(.003)
Perm. income - parent	.004	.002	.011	.011
	(.0003)	(.0006)	(.003)	(.003)
Age head -child		-.021		-.099
		(.012)		(.047)
Age head, sq. -child		.004		.019
		(.001)		(.005)
Age wife -child		-.016		-.05
		(.01)		(.05)
Age wife sq -child		.002		-.008
		(.01)		(.005)
Years schooling - child head	excluded	.022	excluded	.11
		(.015)		(.05)
Years schooling - child wife	excluded	.05	excluded	.31
		(.018)		(.06)
Father widower		.014		.90
		(.14)		(.71)
Mother widow		.18		.82
		(.11)		(.42)
Father widower, rem.		.09		.37
		(.20)		(1.00)
Mother widow, rem.		-.5		-2.54
		(.27)		(1.39)
Parents divorced		-.03		-.11
		(.09)		(.46)
Parents divorced, fath rem		-.24		-1.05
		(.13)		(.64)

Table 6 Reaction of transfers to permanent income, 1976-1993 sample (cont.)

Continuously married children.				
	Estimation method: Probit		Estimation method: Tobit	
Regressors	Model I	Model II	Model I	Model II
Parents divorced. moth rem		.39		1.59
		(.12)		(.63)
Child nonwhite		.17		.55
		(.05)		(.24)
Child female		.16		.17
		(.04)		(.18)
Inverse number of siblings		.32		1.94
		(.15)		(.77)
No father		.30		1.32
		(.07)		(.39)
Years of schooling, father		.01	excluded	.05
		(.005)		(.03)
Years of schooling, mother		.03	excluded	.17
		(0.007)		(.04)
# Children, child hh.		.04		.14
		(.02)		(.12)
# Children 1-2, child hh		.06		.35
		(.03)		(.17)
# Children 3-5, child hh		-.013		-.04
		(.038)		(.19)
Constant		-2.87		-14.67
		(.11)		(.73)
Observations (uncensored)		18,170 (763)		

Sample of 1,819 children matched to 1,126 original 1968 original households. Each match of parent and child contributes one observation per PSID wave. Only continuously married children above 21 years of age are kept. Earnings of the child and parent are the deviations from the sample means. Standard errors (in parentheses) in the Probit specification allow for arbitrary correlation between observations belonging to the same dynasty. In the Tobit specification, they are not corrected. All models also include the education of the parent (in years), dummies for race, and indicators of the number of children in the household of the child (not included). A data appendix is available upon request.

Table A.1 Descriptive statistics of selected variables, 1976-1993 sample

Variable	Total sample (N=18,170)	If No Transfer (N=17,407)	If Transfer (N=763)
Child received money	.04	0	1
Amount received	827	0	1,970
Age of the husband	31.93	32.02	29.74
	(5.98)	(5.98)	(5.71)
Age of the wife	29.82	29.91	27.74
	(5.59)	(5.58)	(5.35)
Child's perm. income -husband	32,917	33,242	25,496
	(15,568)	(15,576)	(13,397)
Child's perm. income -wife	15,760	15,880	13,020
	(13,340)	(13,380)	(12,053)
Years of schooling -husband child	13.37	13.37	13.38
	(2.15)	(2.15)	(2.23)
Years of schooling -wife child	13.17	13.17	13.30
	(2.03)	(2.03)	(2.17)
Child's race other than white	.25	.25	.23
Age of father	59.03	59.12	57.14
	(8.06)	(8.04)	(8.23)
Parent's income	56,514	56,340	60,468
	(34,450)	(34,280)	(39,463)
Father's years of schooling	8.08	10.00	10.84
	(5.76)	(4.55)	(4.74)
Mother's years of schooling	11.07	10.93	11.69
	(3.24)	(3.23)	(3.43)
Divorced parents	.09	.09	0.10
Mother is a widow	.11	.11	.09
Father is widower	.03	.03	.03

Sample of 1,819 children matched to 1,126 original 1968 original households. Each match of parent and child contributes one observation per PSID wave. Only continuously married children above 21 years of age are kept. Standard deviations in parentheses. Monetary variables measured in dollars of 1993. Education measured in years of schooling. A data appendix is available upon request.

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