Motives for investment in human capital of children: evidence from Indonesian Family Life Survey Data*

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Abstract

Two alternative models of parental investments in children's human capital are considered and tested empirically using the Indonesian Family Life Survey (IFLS). The pure loan model and the reciprocity with two-sided altruism model yield different predictions about the effect of children's education level and number of children on intergenerational transfers. Using these predictions, a specification test is carried out to differentiate these two models with the data. The evidence favors the second model of reciprocity with two-sided altruism.

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1 Introduction

The main purpose of this paper is to examine the motive for investment in human capital of children by parents. The main difference between patterns of intergenerational transfers and investment in human capital of children in developed and most of the developing countries is that while in all countries parents invest substantial resources in the human capital of children, in less developed countries we observe substantial resource transfers from children to parents but such transfers are much less observed in developed countries. These patterns of transfers are sometimes used to postulate the hypothesis that in less developed countries, parents' investment in their children is more like lending to children since children cannot borrow from the private capital market to finance their education, whereas in developed countries, parents' investment in their children is mainly due to parents' altruism towards their children.

In the literature on intergenerational transfers, there are mainly two strands regarding the motivation for such transfers: parental altruism and exchange. Becker (1974) introduced a model of resource transfers from parents to children in which parents are altruistic towards their children but children are not; transfers in his model are motivated by parental altruism. A strong implication of his model is that if parents transfer positive amount of resources to their children, publicly provided intergenerational transfers programs are neutralized in the sense that private consumption decisions exact offset public transfers, in effect neutralizing them. Behrman, Pollak and Taubman (1982) gave an alternative model of altruistic transfers in which parents make transfers to children to offset their children's earnings inequality rather than for investment purpose. Empirical studies based on U.S. data offer mixed evidence on altruistic transfers within the family. McGarry and Schoeni (1995) found that parents give more to less well off children and elderly

parents, suggesting that such transfers are not motivated by exchange motives. In the extended family altruism models (Altonji et al (1992)), Hayashi (1995)) found that the distribution of resources within the family affects the distribution of food consumption, rejecting the hypothesis that the extended family is altruistically linked.

Among the alternative models of exchange motives for transfers, one set of models view transfers of resources from parents to children as exchange of money for non-market services received from their children. For instance, Bernheim, Shleifer and Summers (1982) view bequest as strategic exchange for children's services such as visits. In another study, Cox and Ranks (1992) found that money transfers are correlated with services received, and interpreted this as evidence of exchange based quid-pro-quo in intra-family transfer behavior. Another variant of exchange motive treats inter-vivo intergenerational transfers from parents to children as forms of loans to help liquidity-constrained children early in the life cycle in returns for children's services in later periods. Cox (1987, 1990) found evidence for such motivation.

The motive for parental investment in children's education and its relationship to old-age transfers from children to old parents have not drawn much attention in the human capital literature. Among the few theoretical models of parental investment in children's education, Becker, Murphy and Tamura (1990) extended the Becker and Lewis (1978) quality-quantity model of parental human capital investment to an overlapping generations growth model in which human capital investment in children is motivated by parental altruism; such transfers, however, could not be linked to transfers from children given that agents lived for one period. In another overlapping generations growth model (Raut (1990)), parental investment in their children's human capital is motivated by the rate of transfers that they anticipate receiving from children during old-age; however, the rate of transfers that the children make to their old parents is determined outside the model by social norm or other mechanisms. The literature on the empirical testing of the motive for parental investment in their children's human capital and its relationship to the

transfers from children during parents' old-age is as sparse as the theoretical literature. Lillard and Willis (1996) found evidence for the hypothesis that transfers from parents to children for their education are paid back in parents' old age, thus ensuring parents' old age security.

In this paper, we will examine the motive underlying intergenerational transfers theoretically and then empirically using the Indonesian Family Life Survey (IFLS) data set. In section 2, we consider two models of parental human capital investment and transfers from children during parent's old-age. In both models, two-sided altruism plays a significant role. In the first model, parents act as principal and children as agent; parents determine the terms of schooling loans to their children including how much their children should give back during the parent's old-age. Children are passive, but they are not worse-off with the terms of the loan. This approach presumes that there are some family or social norms that enforce such inter-generational contract. Our second model of transfers is based on reciprocity in the sense that it gives autonomy to each agent regarding how much they like to transfer to the other (not based on coercion as in the pure loan model). The amount of parental human capital investment during children's young age and the amount that children transfer to their old parents during the children's adult age, are both determined simultaneously in Nash equilibrium. We then derive testable restrictions and study the nature of optimal parental human capital investment in their children and old-age transfers from their children when they grow up. The testable restrictions allow us to test which model is consistent with the data that we use. After describing the data and variables of our study in section 3, we carry out the econometric testing and report other empirical results in section 4. Section 5 concludes the paper.

2 Basic Model

We provide two simplified models of parental investment in their children's education and old-age transfers that they may receive later from their adult children.

The main distinguishing feature of these two models is that in one model, parental educational investment and the old-age transfers from children are an implicit pure loan contract, the terms of which are designed by parents, and children are passive in the setting of the terms; this is modeled in a principal-agent framework; in the second model, while parents decide how much to invest in children's human capital, they cannot force children to transfer what parents deem reasonable; children voluntarily decide the amount to be transferred to their old parents. Parents anticipate children's reciprocity and accordingly, decide the amount of human capital investment for their children. This will be analyzed in the Nash equilibrium framework. We now describe these models.

We consider the following overlapping generations set-up. While in family decisions, husband and wife may have different opinions, we will assume them to be identical for our purpose, and formulate family decisions problems for a representative parent; we treat the representative household head to be female for expositional ease. Assume that our female household head is now adult, she has a given number of children who will be adults in the next period and make family decisions in the next period. We assume again that her children make identical decisions, and we will refer to the representative child as the son for our expositional ease.

The mother lives for two periods: adulthood (period 1) and old-age (period 2); she earns incomes E_{p1} and E_{p2} respectively in period 1 and period 2. Let T_1 be the amount of human capital investment the mother makes on each of her n identical children in period 1. Human capital investment here means only schooling investment. Let T_2 be the amount of resource transfers she receives from each child in period 2. When she is adult, her child is young, he goes to school, the amount of schooling depends on how much he can spend on his education. Let us assume that he invests whatever amount his parent gives him for education and he consumes all of his endowment E_{k1}. In period 2, he is adult, and his earnings E_{k2} depends on the amount of schooling investment, T_1 and his innate ability or talent level τ, we denote this dependence by $E_{k2}(T_1, \tau)$. Let us denote by c_{it}, the consumption of

agent i in period t, $i = p, k$ and $t = 1, 2$. We assume that the parent cares about her child's well-being and the child cares for his parent's well-being. We incorporate these two sided altruism by assuming the following utility functions:

$$\text{parent's utility function:} \quad u(c_{p1}) + \beta\, U\left(c_{p2}, v^p\left(c_{k2}\right)\right) \tag{1}$$

$$\text{child's utility function:} \quad V\left(c_{k2}, u^k\left(c_{p2}\right)\right) \tag{2}$$

v^p represents the parent's perception of her child's utility from his consumption c_{k2}, in period 2, similarly u^k represents the child's perception of the parent's utility when the parent consumes c_{p2} in her old-age. Our notational convention is that the felicity index represented by the lower or upper U refers to parent and the lower or upper V refers to child.

The felicity index U in the parent's utility function may depend on the number of children, n; similarly how much children care about their parents as represented in the son's utility function V, may also depend on how many siblings, n, he has; we take n to be a parameter of U, and V; we explicitly recognize its presence when we use a specific utility function and derive the econometric specifications. Let us assume for now that parents are not liquidity constrained but their young children in period 1 are.

Let us denote by s the amount of assets (financial and physical) that the mother decides to save for old-age. The budget constraints of the mother are:

$$\begin{aligned} c_{p1} + nT_1 + s &= E_{p1} \\ c_{p2} &= (1+r)s + nT_2 + E_{p2} \end{aligned} \tag{3}$$

When the saving s is unrestricted in sign, which is equivalent to assuming that the parent faces perfect capital markets and is not liquidity constrained, the above two constraints collapse into the usual inter-temporal budget constraint:

$$\text{parent's budget constraint:} \quad c_{p1} + \frac{c_{p2}}{1+r} = E_{p1} + \frac{E_{p2}}{1+r} + \frac{nT_2}{1+r} - nT_1 \equiv \mathcal{Y}(T_1, T_2) \text{ say} \tag{4}$$

The above budget constraint of the parent reflects the fact that the parent is not liquidity constrained.

$$\text{A child's budget constraint is:} \quad c_{k2} = E_{k2}(T_1, \tau) - T_2 \tag{5}$$

We present our first model in the next subsection.

2.1 Parental educational expenditures and old-age transfers as pure loan

Under this scenario, we assume that the parent is the principal and the child is the agent. The parent decides s, T_1 and T_2:

$$\max_{T_1, T_2 \geq 0, s} u(c_{p1}) + \beta U\left(c_{p2}, v^p\left(c_{k2}\right)\right)$$

subject to the budget constraints Eqs. (3)-(5), and the following participation constraint of her son:

$$V\left(E_{k2}(T_1, \tau) - T_2, u^k\left(c_{p2}\right)\right) \geq V\left(E_{k2}(0, \tau), u^k\left(c_{p2}^o\right)\right) \tag{6}$$

where c_{p2}^o denotes the amount of consumption that the parent would optimally choose for her second period consumption if she did not transfer any amount of educational loan to her child.

The above constraint (6) means that the parent decides her educational loan contract (T_1, T_2) for her son in such a way that the educational loan contract is acceptable to him.

There are a few notable features to this model of transfers:

- The educational loan contract (T_1, T_2) should be thought of as an implicit contract. There is nothing in the model that tells us if her son is going to honor the contract, when the time comes for him to pay T_2. However, there are several ways in which this contract is enforced, such as by social norms, or through the reputation effect which comes into effect when it will be his turn to receive transfers from his own children. But we do not address these issues in this paper.

- In this simplified version of the principal agent framework, the child has no choice but to go through the schooling even though it may not improve his utility compared to the utility level that he can attain by not going to school (i.e., if the constraint (6) is binding). However, since the parent's utility depends on the child's utility, it is possible that the constraint (6) is not binding, or that $T_1 - T_2/(1+r) > 0$, in which case the parent gets a lower rate of return from investment in her children's education as compared to investment in capital markets. In this case, each child would have higher schooling level than the level that he would obtain if he was able to borrow from the capital market at the competitive interest rate r.

We assume that the participation constraint Eq. (6) is not binding. Later we come back to its significance and justification. The first order conditions with respect to c_{p1} and c_{p2}, after some rearrangements, or equivalently with respect to to s, lead to

$$u'\left(c_{p1)}\right) = \beta\left[1+r\right] \cdot \frac{\partial U}{\partial c_{p2}} \tag{7}$$

and the first order conditions with respect to T_1 and T_2 are respectively given by

$$n \cdot u'\left(c_{p1)}\right) = \beta \cdot \frac{\partial U}{\partial v^p} \cdot \frac{dv^p}{dc_{k2}} \cdot \frac{\partial E_{k2}}{\partial T_1} \tag{8}$$

and

$$n \cdot \frac{\partial U}{\partial c_{p2}} = \frac{\partial U}{\partial v^p} \cdot \frac{dv^p}{dc_{k2}} \tag{9}$$

Eqs. (8) and (9) imply

$$n \cdot u'\left(c_{p1}\right) = \beta n \cdot \frac{\partial U}{\partial c_{p2}} \cdot \frac{\partial E_{k2}}{\partial T_1}$$

Substituting Eq. (7) in the above, we have

$$\frac{\partial E_{k2}(T_1, \tau)}{\partial T_1} = 1 + r \tag{10}$$

Eq. (10) alone determines the amount that the parent will invest in each of her child's education. Eq. (10) tells us that the parent will invest in each of her child's

education up to the point when the marginal increase in the earnings of the child for one more dollar equals the market interest rate. From Eq. (10) it is clear that the amount of investment depends on two factors, the market interest rate, and the unobserved ability parameter of the child. The higher is the market interest rate or the higher is the talent level of the child, the higher will be the investment in his schooling. Furthermore, notice that the amount of investment in each of her child's education does not depend on the number of children she has. This is of course what we expect if parents treat investment in schooling of children as a loan.

An implication of Eq. (10) is that if parents are not liquidity constrained (or capital markets are perfect for parents but children are not allowed to borrow from the capital market to finance their human capital investment), the level of schooling or parental investment on education of children T_1 will depend only on the market interest rate, and the ability of the child and nothing else. However, in less developed countries, generally even parents are liquidity constrained, and poorer mothers may have higher cost of raising money to invest on their children's education. Thus, variables measuring the mother's socio-economic background and ease of borrowing such as mother's wage income, E_{p1}, level of her human capital, and her asset holdings will significantly affect T_1. Representing these family background variables by Z, and the unobserved ability of her child and all other factors that affect her decision T_1 by ϵ_1 we specify the following regression equation:

$$\ln T_1 = \beta_0 + \beta_1 Z + \epsilon_1 \tag{11}$$

After estimating this equation, if we find *excess sensitivity* of the parameter estimates of the regressors in Z,, we conclude that parents are liquidity constrained.

It is not possible to get an explicit solution for T_2 in general. We use the following specification of the utility function to derive optimal T_2:

$$\begin{array}{lll} U\left(c_{p2}, v^p\left(c_{k2}\right)\right) = u\left(c_{p2}\right) + \gamma^p v^p\left(c_{k2}\right) & \ldots & \text{(A1)} \\ v^p\left(c_{k2}\right) = u\left(c_{k2}\right) & \ldots & \text{(A2)} \\ u\left(c\right) = \alpha \ln c. & \ldots & \text{(A3)} \end{array} \tag{12}$$

We further assume that $\alpha+\alpha\beta+\alpha\beta\gamma^p = 1$, and $0 < \alpha, \beta$, and $\gamma^p \geq 0$. We also

assume that γ^p is an increasing function of n, the number of her children. When $\gamma^p = 0$, parents are not altruistic towards their children. The assumption (A1) means that U is separable, the assumption (A2) means that the mother values her son's consumption in her own way, and the assumption (A3) specifies the utility function to be Cobb-Douglas.

We maintain the assumption that parents are not liquidity constrained. Under assumptions (A1)-(A3), Eq. (9) yields:

$$\frac{c_{k2}}{c_{p2}} = \frac{\gamma^p}{n}. \tag{13}$$

From the Cobb-Douglas utility function, we know that $c_{p2} = \alpha\beta(1+r)\mathcal{Y}(T_1, T_2)$; substituting this, and the expression for c_{k2} from Eq. (5) in Eq. (13), and after simplifications, we have the following explicit solution for T_2:

$$T_2 = \left[\frac{1}{1+\alpha\beta\gamma^p}\right] E_{k2}\,(.) + \left[\frac{(1+r)\alpha\beta\gamma^p}{1+\alpha\beta\gamma^p}\right] T_1 - \left[\frac{(1+r)\alpha\beta\gamma^p}{[1+\alpha\beta\gamma^p]\cdot n}\right] \cdot \left[E_{p1} + \frac{E_{p2}}{1+r}\right] + \epsilon_2 \tag{14}$$

The ϵ term in the above specification represents errors due to the approximation of utility functions, and variation in the taste parameters, and assuming that ϵ is random across children and households, we then have the following censored regression model[1] for the optimal transfers:

$$\begin{aligned} \text{if } \epsilon_2 &> -\left[\alpha_1 E_{k2} + \alpha_2 T_1 + \alpha_3 E_{p1} + \alpha_4 E_{p2}\right], \\ T_2 &= \alpha_1 E_{k2} + \alpha_2 T_1 + \alpha_3 E_{p1} + \alpha_4 E_{p2} + \epsilon_{\,2} \\ T_2 &= 0 \quad \text{otherwise} \end{aligned} \tag{15}$$

Econometric implication and testing of the altruism hypothesis are as follows: If we find α_3 and α_4 to be negative, this will imply that parents are altruistic towards children and T_2 will be smaller for more well-off parents.

[1]There are many empirical studies which apply ordinary least squares estimation procedure to a variant of the above equation. But it is well-known that such estimates are biased and inconsistent and thus may lead to wrong inference. We will see such sensitive inference when we present our empirical results.

As mentioned earlier, γ^p may be an increasing function of the number of children the mother has. In that case, we would expect that mothers with larger number of children will receive lower transfer from each child, given all other variables constant. We will check this in our empirical investigation, by including the number of adult siblings in the above transfer equation of her son.

These results are derived under the assumption that the participation constraint is not binding. Whether or not it is binding depends on the degree of children's altruism towards parents. For instance, suppose that parents care very little for their children, and children care very little for their parents, then an optimal T_2 above might turn out to yield lower utility for children than the reservation utility that they could obtain without any educational investment from their parents. In that case, the participation constraint will provide an upper limit T_2^* and the above regression equation will be censored from above as well. We, however, presume that parents care for their children so much so that her choice of (T_1, T_2) will give her son higher than his reservation utility level. We assume this without statistically testing its validity. Under this assumption, the mother would never find an optimal T_2 which goes beyond this upper limit.

In this model, children are passive and to some extent powerless in the determination of the transfers levels. To see this, suppose that children care about their parent's old age consumption very much, and would like to transfer more than the above, but that higher transfer will not be acceptable to parents, and it will result in a war of back and forth inter-vivo transfers between parents and children. We will not get into these theoretical issues here and assume away these possibilities.

Notice that since parents make their transfer decisions prior to their children's transfer decisions, a Stackleberg framework with subgame perfect equilibrium to characterize behaviors may seem more appropriate. More specifically, investment in children's schooling decisions are first made by parents leaving the decision T_2 to be made by children later; children's transfers decision, T_2 will vary with (or to use a game theoretic term, react to) parents' decision T_1, and the old-age income of the parents, $(1 + r)s + E_{p2}$; this kind of responses from children are

known as reaction functions. While parents cannot directly tell their children how much to transfer to them, they can manipulate the situation by, say, investing a large part of their income on their children's human capital and thus left with little income in old-age, and children will then transfer more to them. For more details on this, see Raut (1997). We do not consider these kinds of manipulated reciprocity in children's transfers in this paper, we leave these for empirical investigation to another occasion.

Notice that the implicit contracts (T_1, T_2) in the pure loan framework are enforced by some mechanism in the family (either with social norm or by some other mechanism) but the model itself cannot tell us anything about the mechanism itself. It is possible that children do care for parents' old-age consumption or well-being, and thus the old-age transfers that the parents are observed to receive from their children may be the result of their children's voluntary decisions. We model this in the next subsection.

2.2 Parental educational expenditures and old-age transfers as reciprocity with two-sided altruism

In the previous model we assumed that the mother decides the amount of old-age transfer that she deems reasonable, and children did not have anything to say. We now consider a model of parental human capital investment, where the mother decides how much to invest on her children, but it is up to her children to determine how much they like to transfer to their parents during parents' old-age. We model this as a Nash equilibrium [2] as follows:

The mother takes her son's transfer decision $T_2 \geq 0$ as given and solves the following

$$\max_{T_1 \geq 0, s} u(c_{p1}) + \beta U\left(c_{p2}, v^p\left(c_{k2}\right)\right)$$

The budget constraints are as before, i.e., Eqs. (4) and (5).

[2] For a similar model based on two-sided altruism, and for a discussion of problems associated with various equilibrium concepts, see Raut (1997) and Nerlove and Raut (1997, section 3.5).

Her representative son takes his mother's decisions s, and $T_1 \geq 0$ as given and decides the amount T_2 that he would like to transfer to his mother by solving the following optimization problem.

$$\max_{T_2 \geq 0} V\left(c_{k2}, U^k\left(c_{p2}\right)\right)$$

subject to the budget constraints Eq. (5) and the second line of Eq. (3) . The first order conditions with respect to s and T_1 for the mother's problem are exactly same as Eqs. (7) and (8) in the previous model. However, in place of Eq. (9) of the previous model, we have the following first order condition of the representative son's optimization problem:

$$\frac{\partial V}{\partial c_{k2}} = n \cdot \frac{\partial V}{\partial u^k} \cdot \frac{du^k\left(c_{p2}\right)}{dc_{p2}} \tag{16}$$

Unlike the previous model, we do not get a closed form solution for T_1 in general. We make the following assumptions that U and V are separable (B1 and B2 below) and that the actual felicity index of consumption of an agent coincides with the perceived felicity index of another agent who is affected by this consumption (B3 and B4 below). More specifically, we assume that

$$\begin{array}{lll} U\left(c_{p2}, v^p\left(c_{k2}\right)\right) = u\left(c_{p2}\right) + \gamma^p v^p\left(c_{k2}\right) & \ldots & \text{(B1)} \\ V\left(c_{k2}, u^k\left(c_{p2}\right)\right) = v\left(c_{k2}\right) + \gamma^k u^k\left(c_{p2}\right) & \ldots & \text{(B2)} \\ u^k\left(c_{p2}\right) = u\left(c_{p2}\right) & \ldots & \text{(B3)} \\ v^p\left(c_{k2}\right) = v\left(c_{k2}\right) & \ldots & \text{(B4)} \end{array} \tag{17}$$

Under these assumptions, we have $\frac{\partial V}{\partial c_{k2}} = \frac{dv}{dc_{k2}} = \frac{dv^p}{dc_{k2}}$, $\frac{\partial V}{\partial u^k} = \gamma^k$ and $\frac{du^k}{dc_{p2}} = \frac{du}{dc_{p2}} = \frac{\partial U}{\partial c_{p2}}$. Substituting these in Eq. (16) we have

$$\frac{dv^p}{dc_{k2}} = n \cdot \gamma^k \cdot \frac{\partial U}{\partial c_{p2}}$$

Noting that $\frac{\partial U}{\partial v^p} = \gamma^p$, and substituting the above in Eqs. (7) and (8), we find T_1 to be a solution to the following equation:

$$E'_{k2}\left(T_1, \tau\right) = \frac{1+r}{\gamma^k \gamma^p} \tag{18}$$

Unlike the previous model, we note that the optimal schooling investment level T_1 may depend on the degree of two-sided altruism. The interesting feature is that if one of the two altruism parameters is zero, the mother does not invest in her son's schooling. However, if γ^k is decreasing and γ^p is increasing in n, then although we cannot assert whether the $\gamma^k.\gamma^p$ is increasing or decreasing in n, but we can check if the level of investment T_1 depends at all on n. Apart from Z in our econometric specification of Eq. (11), we also include n. This provides a basis for a statistical test to choose between two models: if the estimated coefficient of n in Eq. (11) turns out to be statistically significant, we reject the pure loan model in favor of the model of reciprocity described here.

Given s, T_1, we can solve for T_2 from Eq. (16) alone, which under the assumptions in Eq. (17) and (A2) of Eq. (12) yields the following:

$$\begin{array}{l} \text{if} \quad \frac{\gamma^k}{1+\gamma^k} E_{k2}\left(T_1\right) - \left(\frac{1}{n\cdot[1+\gamma^k]}\right)\left[(1+r)\, s + E_{p2}\right] + \epsilon_2 \geq 0 \\ \text{then,} \\ T_2 = \frac{\gamma^k}{1+\gamma^k} E_{k2}\left(T_1\right) - \left(\frac{1}{n\cdot[1+\gamma^k]}\right)\left[(1+r)\, s + E_{p2}\right] + \epsilon_2 \\ T_2 = 0, \text{ otherwise} \end{array} \tag{19}$$

where, ϵ_2 denotes the approximation errors as in the previous model.

Comparing Eqs. (14) and (19), we find interesting properties of T_2 under these two models. While the transfer T_2 under the pure loan model depends only on the mother's degree of altruism towards her son, in this reciprocity model, it depends only on her son's degree of altruism towards her. More importantly, notice that while we can treat the square bracket term in the above to be more or less comparable to the last square bracketed term in Eq. (14), we find that Eq. (14) involves an extra regressor: T_1. The reason for this is quite simple, but it can help us to statistically choose between two models of human capital investment and old-age transfers. Under the pure loan model, given the parent's income, and the son's income, the son must transfer higher T_2 amount if T_1 is higher, i.e., if his mother lent him higher amount of human capital. Whereas in the model of this section, after controlling for son's earnings (which depends on T_1), T_1 has no independent effect. We can use this to statistically test between two models.

3 The data

3.1 The IFLS

The Indonesian Family Life Survey is a multi-purpose household survey conducted in 1993 by Rand and Lembaga Demografi, the Demographic Institute at the University of Indonesia. It was designed to study fertility behavior, infant and child health outcomes, migration and employment patterns, and health and socio-economic functioning of the older population. Its sample of around 7200 households is drawn from 13 provinces out of a total of 27 provinces in Indonesia and covers around 83% of the country's population.

The distinctive feature of the household survey is that it contains extensive information not only on household demographic characteristics, health, and life events, it also contains extensive information on economic activities of the households such as food and certain non-food expenditures, and household production activities and assets holdings. Selected household members were asked about their current and retrospective wages and employment patterns, marriage and pregnancy history, migration history, health conditions and usage of health facilities, and transfer activities toward non resident parents, children and siblings. A Community Facility Survey of availability and quality of infrastructure, health and school facilities used by household respondents is conducted in parallel with the household survey and can thus be directly linked to the household questionnaire.

The household survey sample was stratified on provinces and randomly selected within provinces. The sample frame used by the IFLS was based on the one used by the 1993 SUSENAS, a socioeconomic survey of 60,000 households conducted by the Indonesian Central Bureau of Statistics. In the smaller provinces, urban households were oversampled to facilitate rural-urban and Javanese-non Javanese comparisons. The questionnaire designed was modeled after the Malaysian Family Life Surveys, the Indonesian Resources Mobilization Study and the Indonesian Demographic and Health Surveys. Three sections of the questionnaire collected information at the household level, and the remaining three at the indi-

vidual level from adult respondents, ever married women and, by proxy, young children.

Within the household, detailed information is collected on the household head and the head's spouse, two randomly selected children of the head and spouse aged less than 14, a "senior" member of the household aged 50 or more and his/her spouse randomly selected from the remaining members, and for a randomly selected 25% of the households, an individual of age 15 to 49 and his/her spouse are selected from remaining members. Thus information is most complete for household heads and their spouses, and for the purpose of this paper, we will focus on transfer activities of the head and head's spouse only.

We now present summary statistics for the households that we are studying in this paper.

3.2 Characteristics of respondent households

We are primarily interested in the head and the head's spouse and their transfers to their parents. Hence, the summary statistics are only presented for the respondent's households and their non coresident parents. We present these summary statistics in tables 1 and 2. As indicated by table 1, the average annual household total incomes is 8,447,674 Rupiahs or around US$4,048. A large part of total average household incomes is due to wage incomes which amounted to 8,100,147 Rupiahs, with the remaining part of household incomes coming from farm and non farm businesses. However, as table 1 indicates, a relatively large proportion of households, 38%, own a farm business, while only 27% of households own a non farm business.

The earnings data were collected only for those household members who worked outside their own farm or business. In order to impute earnings for these household members we assume that the production function for their farm and non-farm business is Cobb-Douglas, i.e., per worker farm and non-farm business income is given by $y = f(k) = k^{\sigma}$, $0 < \sigma < 1$, where k is the capital per worker. We take earnings of a worker to be the marginal product of labor, i.e., $w = (1 - \sigma)f(k)$.

Most studies found σ to be around $1/3$. Under these assumptions, we computed the earnings of an individual working in his/her own farm or business as $2/3$ times the household non-wage income per worker. We tried other values of σ around $1/3$, the qualitative results did not change. We denote the earnings variable by INC_EQ in what follows.

Table 1: Descriptive Statistics of Income and Assets

Variable	Label	N	Mean
HHEMPINC	total hh incomes from employment	7220	8100146.85
HHFASV	household total farm asset values	7180	2324845.89
HHNFASV	household total non farm asset values	7180	1167245.10
OWN_BUSS	Owns a non farm business	7220	0.27
OWN_FARM	Owns a farm	7220	0.381
OWN_HSE	Owns a house	7220	0.098
TFINC	household total farm income (operating+rental	7180	129139.89
TNFINC	total non farm incomes (operating+rental	7180	174072.70
TOT_INC	Total household incomes	7180	8447674.46

Table 2: Descriptive Statistics of variables

Variable	Description	N	Mean	Std Dev
AGE	Age of person	33032	26.273	19.435
FEMALE	Female gender or not	33106	0.513	0.500
GRADE	Number of schooling years	32888	4.687	4.447
INC_EQ	Average adult hh member earnings	21456	2826948.300	28023034.310
PAGE	Parent's age	19993	61.864	14.164
PGEN_DUM	Parent's gender dummy	27391	0.474	0.499
PGRADE	Parent's educational level	18852	2.248	3.823
TF2P	Money transfer to parent	3221	241339.030	2110593.400
MTFRP	Money transfer from parents	1197	196519.630	1249310.580
POWN_BU	Parent's business ownership (Yes or no)	10346	0.177	0.382
POWN_HS	Parent's house ownership (Yes or no)	10390	0.893	0.309
POWN_FR	Parent's farm ownership (Yes or no)	10348	0.554	0.497
PWORKN	Parent's working status (Yes or no)	27391	0.193	0.394

Table 2 shows individual characteristics of household members. The average

age of the population in the sample of respondents interviewed is 26 years with an average number of schooling of 4.7 years. Compared to the older generations parents of the respondents, the current generation has attained higher levels of education. There are slightly more women living in the households interviewed in the survey, at 51% of the sample population as compared to 49% of the population being male. The average income of an adult household member stands at 2,826,948 Rupiahs or around US$1,355.

3.3 Characteristics of respondents' parents

As indicated by table 2, on average, the non coresident parent is 62 years of age with 47% of the non coresident parents being female, as compared to the current generation population at 51% being female. The older generation has an average of 2.25 years of schooling , less than the current generation which has an average of 4.69 years of schooling. Slightly more than half, 55% of the older generation had a farm business and 17% of them owning a non farm business. This reflects a rapid trend in commercialization of the household economy away from farming. Only 20% of the non coresident parents report to be still working.

The average money transfer given to parents amounted to 241,339 Rupiahs or around US$116, which is more than the average transfer from parents, amounted to 196,520 Rupiahs or around US$94. In addition, the frequency of upward transfers (from respondents to parents) is almost 3 times that of downward transfers (from respondents to their children).

We will now turn to the empirical findings from our econometric analysis.

4 Empirical results

4.1 Earnings function and returns to education

We estimated an earnings function similar to Mincer's (1974) earnings function. The specification in column (a) is exactly the same as Mincer's original specification and our parameter estimates are interestingly almost identical to those of

Mincer (see Willis (1986) for a concise presentation of Mincer's estimates). The estimates in column (a) of table 3 show that average of log-earnings of an adult (LINC_EQ) is highly correlated with own educational attainment (GRADE). The return to education as measured by the increase in incomes from an additional school year is 9.4%, controlling for asset ownership (OWN_HSE, OWN_BUSS, OWN_FARM), gender (FEMALE), and age.

Table 3: Parents investment in children's schooling, T_1

Regressors	**(a)**	**(b)**
INTERCEP	11.4455 (196.854)	11.5626 (182.105)
FEMALE	0.0945 (5.014)	0.0877 (4.641)
OWN_HSE	0.3758 (12.231)	0.3721 (12.114)
OWN_FARM	−0.4064 (−20.645)	−0.4035 (−20.500)
OWN_BUSS	0.3417 (16.187)	0.3462 (16.393)
GRADE	0.0938 (40.068)	0.0658 (10.052)
GRADE2	 ()	0.0018 (4.578)
AGE	0.0481 (17.549)	0.0459 (16.529)
AGE2	−0.0005 (−15.959)	−0.0005 (−15.520)
R^2	0.1467	0.1476
Number of obs.	21,165	21,165

Note: t-statistics are in parentheses.

The life cycle effect, as seen through the effect of the age variable, has the predicted effect: earnings rise first with age to a certain point after which it declines. The gender effect on incomes is, surprisingly, positive and significant. We do not have an explanation for this finding, but this deserves further analysis at a later date.

Column (b) in table 3 shows very similar findings, with the additional result that the return to education is an increasing function of own educational level squared, GRADE2.

4.2 Parental investment in children's education, T_1

Direct school expenditures incurred by parents would have been the appropriate measure of educational transfers but they were not recorded consistently in the survey, and hence we use the educational attainment of children (CGRADE) as a measure of T_1, the parental investments in children's education. The estimates are as follows:

$$\begin{array}{lllllll} \text{CGRADE} = & \text{-0.610} & -0.571 & * \text{ GRADE} & -0.887 & * \text{ CGEND} & \\ & (0.96) & (28.06) & & (6.58) & & \\ & +0.500 & * \text{ LN\_Y} & +0.096 & * \text{ NO\_CHILD} & R^2 = .248 & \\ & (9.93) & & (2.74) & & n = 3459 & \end{array}$$

The above estimates show that children's educational attainment is positively correlated with their parents' educational attainment (GRADE) and incomes (LN_Y). The direct effect of income is evidence of the existence of liquidity constraints and their effect on educational investments in children, once the parent's education level has been controlled for. Notice that the effect of the dummy variable CGEND (which is 1 if female and 0 otherwise) is significantly negative, i.e., female children's educational attainment is significantly less than that of their male counterparts but by only less than one school year.

Notice that the greater the number of children (NO_CHILD), the higher is the educational level of children. Eq. 18 suggests that the effect of this variable can be positive or negative, due to γ varying according to the number of children. Since the effect of NO_CHLD is statistically highly significant, our test between two models, once again, rejects the pure loan motive in favor of the two-sided altruistic motive for parental investment in children's education, and children's transfer of resources to their old-parents.

4.3 Transfers from children to parents

We estimated variants of T_2 in Eq. (19) using ordinary least squares procedure and censored regression techniques (i.e., Tobit regression) as suggested by our theoretical model. In one variant, we use $\ln T_2$, and in the other one, we use T_2. The ordinary least square estimates of the above two variants are shown in the first two columns, and the estimates from Tobit analysis of only the second variant are shown in the third column of table 4.

From the first column in table 4, the first OLS equation of log transfer to parents shows that the higher the education level of the child (GRADE), after controlling for children's incomes (LN_Y), the higher the transfer amount to parents. This result has been interpreted as evidence for the loan repayment hypothesis (Lillard and Willis (1996)). However, as we will show, this result is sensitive to the specification of the equation to be tested. The negative coefficient of parents income is consistent with either reciprocity with two-sided altruism or the pure loan repayment model. House ownership by parents (POWN_HSE) raises transfers from children, while farm ownership by parents (POWN_FR) reduces such transfers. Female children transfer less to their parents than male children. The higher the parents' age (PAGE), the higher the transfer amount, as it is expected that the older the parents, the more assistance they may need. The higher the educational level of parents (PGRADE), the higher the transfer amount; this result could be due to the effect of the parent's high permanent income on previous period educational investments.

In the actual transfer OLS equation in second column in table 4, the effect of respondent children's educational level (GRADE) becomes insignificant, as well as the effect of other variables.

In the Tobit equation in the third column in table 4, all variables which were significant in the first column of table 4, retain their significance except for house ownership by parents (POWN_HS) and educational level of respondent children (GRADE). The fact that GRADE is no longer significant together with the fact that parents' estimated incomes (PLN_Y) retains its negative coefficient lend support,

Table 4: Transfers to old parents, T_2

Regressors	**OLS:** $\ln T_2$	**OLS:** T_2	**Tobit:** T_2
INTERCEP	5.1742	935.1896	1707.933
	(1.961)	(0.998)	(0.728)
POWN_BU	0.0850	16.6341	−6.022
	(0.934)	(0.514)	(−0.074)
POWN_HS	0.2727	−19.5766	61.867
	(2.547)	(−0.515)	(0.672)
POWN_FR	−0.4313	−59.1756	−286.976
	(−4.623)	(−1.785)	(−3.480)
FEMALE	−0.2783	−33.0439	−200.921
	(−5.605)	(−1.873)	(−4.672)
GRADE	0.0332	1.7556	1.924
	(5.327)	(0.792)	(0.360)
PGRADE	0.0626	7.6074	35.533
	(3.461)	(1.182)	(2.224)
P_LN_Y	−0.5434	−70.5860	−303.253
	(−2.788)	(−1.020)	(1.760)
AGE	−0.0026	0.1000	−2.470
	(−0.756)	(0.079)	(−0.817)
PAGE	0.0129	−1.1569	9.370
	(3.025)	(−0.760)	(2.348)
LN_Y	0.1505	9.1779	72.184
	(8.164)	(1.401)	(4.444)
NO_CHILD	0.0403	6.5653	30.359
	(1.334)	(0.610)	(1.238)
NO_SIBS	−0.0151	−1.7446	−13.451
	(−1.473)	(−0.479)	(−1.520)
R^2	0.065	0.0036	λ= 1152.840
			(57.640)
Number of obs.	5,581	5,581	5,581

Note: t-statistics are in parenthesis.

once again, to the reciprocity with two-sided altruism model of parental educational investment and children's old-age support against the pure loan model.

5 Conclusion

In this paper, we have considered two models of parental investment in children's human capital and transfers of resources from children to parents when they grow older. The first model treats parental investment in children's education as a type of loan and the terms of repayment are decided by parents. While two sided altruism plays some role in the determination of the implicit loan contract, but it is not the driving force in the determination of such transfers. In the second model, parents decide how much they like to invest in their children, and children decide how much they like to pay back when they grow-up. Here the two-way transfers are determined by reciprocity with two-sided altruism. We have derived testable restrictions that can distinguish between two models, and we have also compared the nature of these two transfers under the two models using the Indonesian Family Life Survey Data. Our study favors the reciprocity with two-sided altruism model over the pure loan model.

The findings that parents' old age income is negatively correlated with respondent children's income, and that the child's educational level is insignificant in the estimated model of transfers from children to parent, lend support to the reciprocity two-sided altruism model for these transfers, while casting doubt on the repayment hypothesis.

In addition, we find that the number of children is a significant determinant of the level of human capital investment that parents make for each child, which lends additional support to the reciprocity two-sided altruism model, since this variable does not matter for the education of a child under the pure loan model. As generally expected, we also find evidence that parents are liquidity constrained in making human capital investment levels for their children. This suggests that there is a role for public policy to improve efficiency in the allocation of human capital

investments.

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