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Reciprocity with Two-sided Altruism in Intergenerational Transfers: Evidence from Indonesian Family Life Survey Data[1]

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1 Introduction

The main purpose of this chapter is to examine the motive for investment by parents in the human capital of children. The difference between patterns of intergenerational transfers and investment in the human capital of children in developed countries on the one hand, and those of most of the developing countries on the other, 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 transfer are sometimes used to postulate the hypothesis that in less-developed countries, parental 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, parental investment in their children is mainly due to parental altruism towards their children.

In the literature on intergenerational transfers, there are two main strands reviewing 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 the 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 transfer programmes are neutralized, in the sense that private consumption decisions exactly offset public transfers. Behrman *et al.* (1982) formulate an

alternative model of altruistic transfers in which parents make transfers to children to offset their children's earnings inequality rather than for investment purposes. Empirical studies based on US 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) and 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 linked altruistically.

Among the alternative models of exchange motives for transfers, one set of models view transfer of resources from parents to children as exchange of money for non-market services received from their children. For example, Bernheim *et al.* (1985) view bequests as strategic exchange for children's services, such as visits during old age. In another study, Cox and Rank (1992) found that money transfers are correlated with services received, and interpreted this as evidence of quid pro quo exchange in intrafamily transfer behaviour. Another variant of the exchange motive treats *inter vivos* intergenerational transfers from parents to children as a form of loan to help liquidity-constrained children early in the life-cycle in return for children's services in later periods. Cox (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 *et al.* (1990) extended the 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 live 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 transfer 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 norms 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 also relatively sparse. Lillard and Willis (1996) found that transfers from children to parents are positively correlated with the children's education level, and interpreted this as evidence that parental educational investment in children is paid back in the parents' old age, thus ensuring the parents' old-age security.

In this chapter we examine empirically the motives underlying intergenerational transfers, using the Indonesian Family Life Survey (IFLS) data set. In Section 2, we consider two models of parental human capital investment and transfer from children during the parent's old age. We derive

testable restrictions imposed by each model on the equations for optimal parental human capital investment in their children, and for old-age transfers from their children when they grow up. These restrictions allow us to test which model is consistent with the data. After describing the data and variables of our study in Section 3, we carry out the econometric testing and report the empirical results in Section 4. Section 5 concludes the chapter.

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. In the second model, while parents decide how much to invest in their children's human capital, they cannot force the children to transfer what the parents deem reasonable; children voluntarily decide the amount to be transferred to their old parents; parents anticipate children's reciprocity and, accordingly, decide on the amount of human capital investment loan for their children. We now describe these models in more detail.

We consider an overlapping generations setup. While in family decisions, husband and wife may have different opinions, we shall assume them to be identical in family decisions and 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 adult and make their 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 expositional ease.

The mother lives for two periods: adulthood (Period 1) and old-age (Period 2); she earns incomes E_{p2} and E_{p2} respectively in Periods 1 and 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, and the amount of schooling depends on how much he can spend on his education. Let us assume that he invests whatever amount T_1 his parent gives him for education and consumes all his endowment E_{k1}. In Period 2, during adulthood, his earnings E_{k2} depend on the amount of schooling investment, T_1 and his innate ability or talent level, τ; we denote this relationship as the function $E_{k2}(T_1, \tau)$. 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 this two-sided altruism in the utility functions of parent and child as follows:

$$\text{Parent's utility function: } u(c_{p1}) + \beta U(c_{p2}, v(c_{k2})); \text{ and} \tag{17.1}$$

$$\text{Child's utility function: } V(c_{k2}, u(c_{p2})). \tag{17.2}$$

Our notational convention is that the felicity index represented by the lower or upper case U refers to the parent, and the lower or upper case V refers to the 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 taken n to be a parameter of U, and V we recognize its presence explicitly when we use a specific utility function and derive the econometric specifications.

We use the following specification of the utility functions whenever it is not possible to derive optimal solutions for the general utility functions:

$$\begin{aligned} &\text{(A1)} \quad U(c_{p2}, v^p(c_{k2})) = u(c_{P2}) + \gamma^p v(c_{k2}) \\ &\text{(A2)} \quad V(c_{k2}, u^k(c_{p2})) = v(c_{k2}) + \gamma^k u(c_{p2}) \\ &\text{(A3)} \quad u(c) = v(c) = \alpha \ln c. \end{aligned} \tag{17.3}$$

We further assume that $\alpha + \alpha\beta + \alpha\beta\gamma^p = 1$, and $0 < \alpha$, β, and γ^p, $\gamma^k \geq 0$. We presume γ^p to be an increasing function of n, the number of children. When $\gamma^p = 0$, parents are not altruistic towards their children. Assumption (A1) means that U is separable; Assumption (A2) means that V is separable; and Assumption (A3) specifies that the mother and each of her children have a common Cobb–Douglas felicity index.

Let us assume for now that parents are not liquidity constrained but their young children are in Period 1. 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:

$$\begin{aligned} c_{p1} + nT_1 + s &= E_{p1} \\ c_{p2} &= (1 + r)s + nT_2 + E_{p2}. \end{aligned} \tag{17.4}$$

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 intertemporal budget constraint:

$$c_{p1} + \frac{c_{p2}}{1+r} = E_{p1} + \frac{E_{p2}}{1+r} + \frac{nT_2}{1+r} - nT_1 \equiv \gamma(T_1, T_2), \text{ say.} \tag{17.5}$$

The child's budget constraint is:

$$c_{k2} = E_{k2}(T_1, \tau) - T_2. \tag{17.6}$$

[1]We [illegible]

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 T_1, T_2 and s:

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

subject to the budget constraints in Equations (17.4)–(17.6), and the following participation constraint of her son:

$$v(E_{k2}(T_1, \tau) - T_2, u^k(c_{p2})) \geq V(E_{k2}(0, \tau), u(c_{p2}^o)), \tag{17.7}$$

where c_{p2}^o denotes the amount of consumption 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 Equation (17.7) 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. We, however, assume that the participation constraint Equation (17.7) is not binding, and from the first order conditions, we can derive that:

$$\frac{\partial E_{k2}(T_1, \tau)}{\partial T_1} = 1 + r. \tag{17.8}$$

It is not possible to get an explicit solution for T_2 in general. Under the separability and Cobb–Douglas specification in Assumptions (A1) and (A3), and after simplifications of the first-order conditions, we have the following explicit solution for T_2:

$$T_2 = \left[\frac{1}{1+\alpha\beta\gamma^p}\right]E_{k2}(.) + \left[\frac{(1+r)\alpha\beta\gamma^p}{1+\alpha\beta\gamma^p}\right]T_1 - \left[\frac{(1+r)\alpha\beta\gamma^p}{[1+\alpha\beta\gamma^p]\cdot n}\right]\cdot\left[E_{p1} + \frac{E_{p2}}{1+r}\right] + \epsilon_2. \tag{17.9}$$

Equation (17.8) alone determines the amount the parent will invest in each of her children's education. Equation (17.8) tells us that the parent will invest in each of her children's education up to the point when the marginal increase in the earnings of the child for one more dollar of parental transfer equals the market interest rate. From Equation (17.8) 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 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 children'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.

In less-developed countries, however, even parents might be liquidity-constrained, and poorer mothers may have a higher cost of raising money to invest in their children's education. Thus, variables measuring the mother's socioeconomic background and ease of borrowing, such as mother's wage income, E_{p1} the level of her human capital and her asset holdings will significantly restrain the total amount she can borrow; in that case, the investment T_1 in each child is expected to be negatively correlated with the number of children n. Representing these family background variables by Z, and the unobserved ability of her child and all other factors that affect her decision T by ϵ_1, we specify the following regression equation:

$$\ln T_1 = \beta_0 + \beta_1 Z + \epsilon_1. \tag{17.10}$$

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

The ϵ term in the above specification represents error caused by the approximation of utility functions, and variation in the taste parameters. Assuming that ϵ is random across children and households, we then have the following censored regression model[2] for the optimal transfers:

$$T_2 = \begin{cases} \alpha_1 E_{k2} + \alpha_2 T_1 + \alpha_3 E_{p1} + \alpha_4 E_{p2} + \epsilon_2, \\ \quad \text{if } \epsilon_2 > -[\alpha_1 E_{k2} + \alpha_2 T_1 + \alpha_3 E_{p1} + \alpha_4 E_{p2}], \\ 0 \quad \text{otherwise.} \end{cases} \tag{17.11}$$

From Equation (17.9), negative α_3 and α_4 imply positive γ^p. This means that parents are altruistic towards children, and T_2 are smaller for better-off parents.

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

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 she deems reasonable, and in that contract, children are passive recipients of the parent's transfer decisions both ways. That implicit contract (T_1, T_2) is enforced by some mechanism in the family (either based on the social norm or through some other mechanism). However, 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 are the result of their children's voluntary decisions. We now consider a model of parental human capital investment, where the mother decides how much to

invest in her children, but it is up to her children to determine how much they want to transfer to their parent during her old age. We model this as a Nash equilibrium[3] as follows:

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

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

Budget constraints are as in Equations (17.5) and (17.6).

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:

$$\max_{T_2 \geq 0} V(c_{k2}, u(c_{p2})),$$

subject to the budget constraints in Equation (17.6) and the second line of Equation (17.4).

From the first-order conditions and under Assumptions (A1)–(A3), we derive:

$$E'_{k2}(T_1, \tau) = \frac{1+r}{\gamma^k \gamma^p}. \tag{17.12}$$

Given s, T_1, under Assumptions (A2) and (A3), and after simplification, from the first-order condition with respect to T_2, we find the solution for T_2 as follows:

$$T_2 = \begin{cases} \frac{\gamma^k}{1+\gamma^k} E_{k2}(T_1) - \left(\frac{1}{n.[1+\gamma^k]}\right)[(1+r)s + E_{p2}] + \epsilon_2, \\ \quad \text{if } \epsilon_2 > -\left[\frac{\gamma^k}{1+\gamma^k} E_{k2}(T_1) - \left(\frac{1}{n.[1+\gamma^k]}\right)[(1+r)s + E_{p2}]\right], \\ 0 \quad \text{otherwise.} \end{cases} \tag{17.13}$$

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

Unlike the previous model, notice that, here, the optimal schooling investment level T_1 may depend on the degree of two-sided altruism, $\gamma^k \gamma^p$. The interesting feature is that if one of the two altruism parameters is zero, the mother does not invest in her son's schooling; furthermore, notice that even with no liquidity constraint facing her, T_1 will depend on n. It is reasonable to assume that γ^p is increasing and γ^k is non-increasing in n. It follows then that T_1 depends on n. Whether this relationship is positive or negative, depends on $\gamma^k \gamma^p$ increasing or decreasing in n. If $\gamma^k \gamma^p$ is increasing in n (which is indeed the case if, for example, γ_k is constant), then there will be a positive relationship between T_1 and n, as opposed to a negative relationship implied by the mother's liquidity constraint. This provides a statistical test to choose between the two models: if the estimated coefficient of n in Equation (17.10) turns out to be statistically positively significant, we reject the pure loan model in favour of the reciprocity model described here.

Comparing Equations (17.9) and (17.13), we find interesting differences in 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 the 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 Equation (17.3) to be comparable to the last square bracketed term in Equation (17.9), we find that Equation (17.9) involves extra regressor T_1. The reason for this is quite simple: 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, that is, if his mother lent him a higher amount of human capital. However, in the model of this section, after controlling for the son's earnings, which depend on T_1, T_1 has no independent effect on T_2. We can use this result to statistically test between the two models.

3 The data

3.1 The IFLS

The Indonesian Family Life Survey (IFLS) is a multipurpose household survey conducted in 1993 by Rand and Lembaga Demografi, the Demographic Institute at the University of Indonesia. It was designed to study fertility behaviour, infant and child health outcomes, migration and employment patterns, and the health and socio-economic functioning of the older population. Its sample of around 7200 households is drawn from thirteen provinces out of a total of twenty-one provinces in Indonesia, and covers around 83 per cent of the country's population.

The distinctive feature of this household survey is that, not only does it contain extensive information on household demographic characteristics, health, and life events, it also holds extensive information on the economic activities of the households, such as food (and certain non-food) expenditures, household production activities and asset 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 towards non-resident parents, children and siblings. A Community Facility Survey of availability and quality of infrastructure, health and school facilities used by household respondents was conducted in parallel with the household survey and can thus be linked directly to the household questionnaire.

The household survey sample was stratified by 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 design was modelled 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 individual level from adult respondents, ever-married women and, by proxy, young children.

Within the household, detailed information was 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 their spouse randomly selected from the remaining members; and for a randomly-selected 25 per cent of the households, an individual aged 15–49 and their spouse are selected from remaining members. Thus the information is most complete for household heads and their spouses, and for the purpose of this chapter, we shall focus on the transfer activities of the head and head's spouse only. We now present summary statistics for the households considered in this chapter.

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-co-resident parents. We present these summary statistics in Tables 17.1 and 17.2. As indicated by Table 17.1, the average annual household total income is 8 447 674 rupiahs, or around US$4048. A large part of total average household income is from wage income, amounting to 8 100 147 rupiahs, with the remaining part of household income coming from farm and non-farm businesses. However, as Table 17.1 indicates, a relatively large proportion of households, (38 per cent), own a farm business, with only 27 per cent of households owning 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 the

Table 17.1 Descriptive statistics of income and assets

Variable	Label	N	Mean
HHEMPINC	Total household income 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	0.38
OWN_HSE	Owns a house	7220	0.10
TFINC	Household total farm income (operating + rental)	7180	129139.89
TNFINC	Total non-farm income (operating + rental)	7180	174072.70
TOT_INC	Total household income	7180	8447674.46

Table 17.2 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 years' schooling	32888	4.687	4.447
INC_EQ	Average adult household member earnings	21456	2826948.300	28023034.310
PAGE	Parents' age	19993	61.864	14.164
PGEN_DUM	Parents' gender dummy	27391	0.474	0.499
PGRADE	Parents' educational level	18852	2.248	3.823
TF2P	Money transfer to parents	3221	241339.030	2110593.400
MTFRP	Money transfer from parents	1197	196519.630	1249310.580
POWN_BU	Parents' business ownership (Yes or No)	10346	0.177	0.382
POWN_HS	Parents' house ownership (Yes or No)	10390	0.893	0.309
POWN_FR	Parents' farm ownership (Yes or No)	10348	0.554	0.497
PWORKN	Parents' working status (Yes or No)	27391	0.193	0.394

other household members, we assume that the production function for their farm and non-farm business is Cobb – Douglas; 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 the earnings of a worker to be the marginal product of labour; that is $w = (1 - \sigma) f(k)$. Most studies found σ to be around 1/3. Under these assumptions, we compute the earnings of an individual working on their own farm or business as 2/3 times the household non-wage income per worker. We tried other values of σ around 1/3, but the qualitative results did not change. We will denote this earnings variable by INC-EQ in the rest of the chapter.

Table 17.2 shows the individual characteristics of household members. The average age of the population in the sample of respondents interviewed is 26, and the average number years of schooling is 4.7. Compared to the older generation of 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, with 51 per cent of the sample population being female. The average annual income of an adult household member was 2 826 948 rupiahs, or around US$1355.

3.3 Characteristics of respondents' parents

As indicated by Table 17.2, on average, the non-co-resident parent is 62 years of age, with 47 per cent of the non-co-resident parents being female, compared to the current generation population of 51 per cent being female. The older generation had an average of 2.25 years of schooling, less than the current generation, which had an average of 4.69 years of schooling. Slightly more than half (55 per cent) of the older generation had a farm business, while 17 per cent of the older generation own a non-farm business. This reflects a rapid trend in the commercialization of the household economy away from farming. Only 20 per cent of the non-co-resident parents report being 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, which amounted to 196 520 rupiahs, or around US$94. In addition, the frequency of upward transfers (from respondents to parents) is almost three times that of downward transfers (from respondents to their children).

4 Empirical results

4.1 Earnings function and returns to education

We estimated an earnings function similar to Mincer's (1974). The specification in column (a) is the same as Mincer's original specification, and our parameter estimates are strikingly similar to those of Mincer (see Willis, 1986,

Table 17.3 Estimated earnings function

Regressors	(a)	(b)
INTERCEP	11.4455	11.5626
	(196.854)	(182.105)
FEMALE	0.0945	0.0877
	(5.014)	(4.641)
OWN HSE	0.3758	0.3721
	(12.231)	(12.114)
OWN FARM	-0.4064	-0.4035
	(-20.645)	(-20.500)
OWN BUSS	0.3417	0.3462
	(16.187)	(16.393)
GRADE	0.0938	0.0658
	(40.068)	(10.052)
GRADE2		0.0018
		(4.578)
AGE	0.0481	0.0459
	(17.549)	(16.529)
AGE2	-0.0005	-0.0005
	(-15.959)	(-15.520)
R^2	0.1467	0.1476
Number of observations	21 165	21 165

Note: *t*-statistics are in parentheses.

for a concise presentation of Mincer's estimates). The estimates in column (a) of Table 17.3 show that average log-earnings of an adult (LINC_EQ) is highly correlated with their educational attainment (GRADE). The return to education as measured by the increase in incomes from an additional school year is 9.4 per cent, controlling for asset ownership (OWN_HSE, OWN_BUSS, OWN_FARM), gender (FEMALE), and age.

The life-cycle effect, as seen through the effect of the age variable, has the predicted result: earnings rise first with age, up to a certain point, after which they decline. The gender effect on incomes is, surprisingly, positive and significant. This result deserves a closer investigation into the institutional features of labour markets in Indonesia, even though this is not the main focus of this chapter. Column (b) in Table 17.3 shows very similar results, with the additional result that the return to education is an increasing function of 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:

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

The above estimates show that children's educational attainment is positively correlated with their parents' educational attainment (GRADE) and income (LN_Y). The direct effect of income is evidence of the existence of parental liquidity constraint and its 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 – that is, female children's educational attainment is significantly lower 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 the educational level of children. As we mentioned earlier, since the effect of NO_CHILD is statistically positively significant (not *negatively* significant), our test between two models once again rejects the pure-loan motive in favour of the two-sided altruistic motive for parental investment in children's education, and children's transfer of resources to their aged parents.

4.3 Transfers from children to parents

We estimated variants of T_2 in Equation (17.3) using ordinary least squares and censored regression techniques (that is, Tobit regression) as suggested by our theoretical model. In one variant, we use ln T_2, and in the other, 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 the second variant alone are shown in the third column of Table 17.4.

From the first column in Table 17.4, 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 shall 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 do male children. The higher the parents' age (PAGE), the higher the transfer amount, as it is expected that the older the parents, the more

Table 17.4 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	0.626	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	6.563	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	$\lambda = 1152.840$
			(57.640)
Number of obs.	5 581	5 581	5 581

Note: *t*-statistics are in parentheses.

assistance they may need. The higher the educational level of parents (PGRADE), the higher the transfer amount; this result could be because of the effect of the parents' high permanent income on previous period educational investments.

In the actual transfer OLS equation in the second column in Table 17.4, 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 17.4, all variables that were significant in the first column of Table 17.4 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, 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 chapter 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, it is not the driving force in the determination of such transfers. In the second model, parents decide how much they want to invest in their children, and the children decide how much they want 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 have also compared the determinants of these transfers under the two models using the Indonesian Family Life Survey Data. Our study favours 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 incomes, and that children'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. This 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 investments in their children. These findings suggest that there is a role for public policy to improve efficiency in the allocation of human capital investments by parents.

Notes

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2 There are many empirical studies that 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 shall see such sensitive inference when we present our empirical results.

3 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, sect. 3.5).

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