CHILDHOOD EDUCATION AND ADULTHOOD FEEDBACKS IN THE EAST: The Case of Taiwan

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Abstract

In previous research of intergenerational transfers between family members in Western countries, the focus is mostly upon monetary transfers from-parents-to-children. But in Eastern countries imbued with the culture of filial piety, child-to-parents transfers are the general practice. The purpose of this paper is to analyze the behavior of an adult child’s feedback transfers to his parents. Using the survey data of Taiwan, we found that better-educated adults are more “filial” toward their parents, meaning that other important explanatory variables (such as the adult child’s income, areas of living) being controlled, better educated children will provide more income transfers and visits to their parents. (JEL D10, D91)

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I. Introduction

In the past two decades, considerable research has been devoted to the analysis of intergenerational financial transfers between family members. It is now generally accepted that these transfers are related to strategic interactions between family members (Bernheim et al. 1985, Cox 1987, Chakrabarti et al. 1993); can help relax the borrowing constraints faced by youngsters in a society with incomplete capital market (Cox 1990, Cox and Jappelli 1990); will affect the dynamic pattern of income distribution and capital accumulation (Kotlikoff and Summers 1981, 1986, Chu 1991, Lord and Rangazas 1991, Chu and Koo 1995); and will influence the effectiveness of government policies (Barro 1974, Bernheim and Bagwell 1988, Laitner 1991).\footnote{For a comprehensive survey, see Laitner (1997).} While the research focus in most developed countries was upon monetary transfers from-parents-to-the-child, that in developing countries (Behrman 1988, Quisumbing 1994) was quite different. Paying attention to parent-to-child transfers is indeed justifiable in the West. As Ioannides and Kan (1993) showed, in the 1988 US PSID (Panel Study of Income Dynamics) data, 25% of the sample have parents-to-child transfers, and only 4% of the sample have child-to-parents transfers. The definition of “parents” in Ioannides and Kan even include parents-in-law; if the traditional definition of parents were adopted, we should observe a even lower percentage number of child-to-parents transfers.

But in Eastern countries imbued with the culture of filial piety, the situation is significantly different. According to Lo (1988), more than half of the 1,333 elders sampled in Taiwan regularly receive income transfers from their (adult) children. In the survey data of Taiwan adopted by Parish and Willis (1993), 75% of the sample acknowledged regular child-to-parents monetary transfers, while transfers in the other direction is limited to only 17% of those surveyed. The same data set...
also showed that 95% of the children regularly call or visit their parents, much higher than the 63% number in the 1975 LRHS (Longitudinal Retirement History Survey) data cited in Bernheim et al. (1985). All the above evidence shows that child-to-parents transfers are more important than parents-to-child transfers in Taiwan, and this phenomenon motivates our research.

For analysis of the phenomenon of child-to-parents transfers, the existing theories are inappropriate or incompatible. In the literature, there were two competing hypotheses explaining the parents-to-child transfers, namely, the altruism hypothesis and the exchange hypothesis.\(^2\) As Parsons (1984) pointed out, the implicit or explicit assumption behind the previous analysis of parents-to-child transfers is a parental-control model of household resources. Indeed, according to Cox (1987), both the altruism and exchange hypotheses assume that the parents dominate the bargaining, and they only differ in the adult child’s participation constraint. When an adult child’s participation constraint is slack, it implies that the parents leave some additional (relative to what the child can get on his own) benefit to the child, implying that the former are altruistic toward the latter. Whereas when the participation constraint is binding, the parents leave no additional benefit to the adult child, implying that the transfers between them is just for the purpose of exchange. But when inter vivos child-to-parents transfers are prevalent, the model with dominating parents becomes incongruous.

The argument put forward by Bernheim et al. (1985) was different from the altruism and exchange hypotheses; they claimed that parents might use bequeathable assets as a bait to induce the child’s obedience. But their model is more appropriate to explain child-to-parents services and visits, for which the parents can find no substitute, and not income transfers, which the parents with dominating economic influence do not need. Furthermore, according to Lee (1991),

\(^2\)See Cox (1987) for more detailed discussion.
bequest division in Taiwan is very much determined by custom, hence it is unlikely that the parents would use bequeathable assets to induce certain activities from the child. We therefore believe that some other hypotheses are needed to explain the prevalent behavior of child-to-parents transfers in Taiwan.

For this purpose, we propose to combine the (modified) theory of merit goods with that of preference formation, both introduced recently by Gary Becker (1991). By merit goods, Becker meant “traits or behavior of children that parents care about” (p.10). Becker emphasized that the child may choose his optimal merit goods consumption, taking into account the influence of his choice on his parents’ altruism toward him, and hence the transfers he will receive from his parents. Thus in Becker’s analysis, the interaction of merit goods with parental altruism induces the child to increase the consumption of these goods in a manner desired by his parents. In our model, we reverse the direction of altruism and analyze how the parents’ educational investment in the child may change his feelings about his parents, and consequently his filial piety toward them when he grows up. The above theory is also similar to Becker’s preference formation hypothesis (1993 p.399). Becker argued that the parents should be forward-looking, and be able to anticipate the effect of childhood education on the child’s attitude and behavior as adults. Such an argument clearly acknowledges that parental care may have an important role to play in forging the child’s future attitude toward parents, and this is the key idea of preference formation.³

The analysis of the link between childhood experience (education) and adulthood preferences is closely related to the work of psychologists such as Freud, Horney, Fromm and Sullivan.⁴ Normally we expect that a well-treated (by the

³In Cox and Stark (1993), the authors discussed the possibility that the parents might take advantage of the child’s learning potential by making transfers to their own parents when the child is present to observe such transfers. The “demonstration effect” involved can be interpreted as another kind of preference formation.

⁴See e.g., Mullahy (1949) for more detailed analysis.
parents) child to be filial to the parents when he grows up. This is also consistent with the research result of Huang (1980). The basic ideas of this paper are as follows: First, we believe that an adult’s filial piety or altruism towards his parents is, to a large extent, influenced by how he was treated in his childhood.\(^5\) In particular, we believe that the child’s education is an important proxy variable of his childhood experience. Second, an adult’s filial attitude is reflected in his transfer decisions and visits to his parents. With these two ideas in mind, we have set up a regression model to characterize the relationship between the child’s education and his adulthood feedback behaviors to his parents. Our empirical analysis shows that better-educated adults tend to be more “filial” toward their parents, meaning that other things being equal, better-educated adults will provide more transfers and visits to his parents.

The remainder of this paper is arranged as follows. The second section introduces the theoretical model. Section III presents the econometric setting. In section IV we illustrate the empirical results. Concluding remarks are given in the final section.

II. Preference Formation and Child-to-Parents Transfers

1. Parents-child Preference Interaction

Assume an individual’s life is divided into three periods: in the first period (childhood) he is on the receiving end of his parents’ education investment, which is a one-way transfer. In the second period (adulthood), if his parents are alive, there may be two-way transfers (of incomes or visits) between himself and his parents. It is also during this period of time that the young adult may get married,\(^5\) It is in this sense we say that an adult’s preferences are “formed” by his parents. See section II for more detailed explanation.

\(^5\)
have children and decide to invest in the children of his own. Eventually in the third period his parents die, and his children become adults and have two-way transfers with him.

To simplify our analysis, we will concentrate on the two-way transfers between the adult and his parents, and assume that the adult’s interaction with his parents is influenced by his parents when he was young. The total utility function of an adult child is assumed as

\[ U = u(C_c, S) + \theta v(C_p, S) \]

where \( u(\cdot, \cdot) \), \( v(\cdot, \cdot) \) are the private utility functions of the child and the parents respectively.\(^6\) \( C_c \) (\( C_p \)) represents the consumption of the child (parents), \( S \) is the services provided by the child to the parents. Let subscripts of \( u \) and \( v \) denote partial differential of respective variables. Following the assumptions made by Cox (1987), we assume \( u_c, v_c, v_s \) are positive, and \( u_s, u_{cc}, u_{ss}, v_{cc}, v_{ss} \) are negative. In the total utility function, \( \theta > 0 \) denotes the child’s degree of altruism towards the parents. Let \( E \) be the education investment the parents spend on the child. We assume that \( \theta \) is an increasing function of \( E \), denoted \( \theta(E) \), meaning that the child’s altruism toward his parents when he grows up is affected by the education investments his parents made in him.

Since in most cases we observe that the child provides services to his parents, the restriction \( S \geq 0 \) should be imposed.\(^7\) In the meanwhile, the frequency of visits (or other measures of services) cannot exceed certain limit within a particular period. Let \( \bar{S} \) be the the upper limit of \( S \), the restriction \( S \leq \bar{S} \) is also imposed. As to those children who coreside with their parents, we can imagine that the services provided by them attain the maximum. So \( S = \bar{S} \) holds true.

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\(^6\)The definition of private and total utility here is adopted from Bergstrom (1989) pp.1155-6.

\(^7\)In an extended family, parents may take care of the grandchildren for their child, which is a kind of parents-to child service. But as Lee et al. (1994) suggested, child-to-parents services are more common in the society of Taiwan.
for the child who coresides with his parents. Let the net income transfers from the child to the parents be $T$ ($T$ could be positive or negative). If $T > 0$, the monetary transfers flow upwards from the child to the parents. And if $T < 0$, the monetary transfers flow downwards.

As stated earlier, both $T$ and $S$ can be viewed as choice variables of the adult child. The problem the child faces can be written as

$$\max_{T,S,C_c,C_p} U = u(C_c, S) + \theta v(C_p, S)$$

subject to

$$C_c = I_c - T$$

$$C_p = I_p + T$$

$$0 \leq S \leq \bar{S}$$

where $I_c$ and $I_p$ denote the incomes of the child and parents respectively.

The above maximization problem can be rewritten as

$$\max_{T,S} U = u(I_c - T, S) + \theta v(I_p + T, S)$$

subject to

$$0 \leq S \leq \bar{S}$$

If the constraint $0 \leq S \leq \bar{S}$ is ignored temporarily, the first-order conditions corresponding to the above maximization problem are

$$U_T = -u_c + \theta(E)v_c = 0,$$  \hspace{1cm} (3)

$$U_S = u_s + \theta(E)v_s = 0.$$  \hspace{1cm} (4)

It is clear that in equations (3) and (4), the optimal choices $T^*$ and $S^*$ are functions of $E$, $I_p$, $I_c$ and other family-specific variables $X$:

$$T^* = T^*(E, I_c, I_p, X),$$

$$S^* = S^*(E, I_c, I_p, X),$$

$$6$$
where $S^*$ is unbounded.

Since the observed service ($S$) is constrained by $0 \leq S \leq \bar{S}$, the variables $S$ and $S^*$ have the following relationship:

$$S = \begin{cases} 
S^*, & \text{if } 0 < S^* < \bar{S} \\
\bar{S}, & \text{if } S^* \geq \bar{S} \\
0, & \text{if } S^* \leq 0
\end{cases}$$

Assume that $u_{cs} = v_{cs} = 0$, the following comparative statics results could be easily derived from equations (3) and (4):

$$\frac{\partial T^*}{\partial E} > 0, \quad \frac{\partial S^*}{\partial E} > 0,$$
$$\frac{\partial T^*}{\partial I_c} > 0, \quad \frac{\partial S^*}{\partial I_c} = 0,$$
$$\frac{\partial T^*}{\partial I_p} < 0, \quad \frac{\partial S^*}{\partial I_p} = 0. \quad (7)$$

The results $\partial T^*/\partial E > 0$, $\partial S^*/\partial E > 0$ imply better-educated children are willing to provide more income transfers and services to their parents. In other words, better-educated children are more “filial” toward their parents. The signs of $\partial T^*/\partial I_c$ and $\partial T^*/\partial I_p$ show that, the child-to-parents income transfers is an increasing function of the child’s own income, and a decreasing function of the parents’ income. As to the influences of $I_c$ and $I_p$ on services, no significant relationships are found.

The econometric setting in the next section is constructed from equations (5) and (6), and relevant hypotheses are tested based on equation (7). The way the educational investment made by the parents influences the child’s adulthood

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\(^8\text{Cox (1987) assumed } u_{cs} > 0, v_{cs} < 0 \text{ in his theoretical model. However, as pointed out by Silberberg (1978, p.228), the signs of } u_{cs} \text{ and } v_{cs} \text{ are sensitive to monotonic transformations of the utility function. Since the economic contents of assumptions } u_{cs} > 0, v_{cs} < 0 \text{ are not very clear, } u_{cs} = v_{cs} = 0 \text{ sounds to be a reasonable assumption.}\)
feedback behavior constitutes the main focus of the model. This characterizes the hypothesis of preference formation.

2. Two Interpretations of Preference Formation

Before proceeding with the empirical analysis, we would like to explain the context of “preference formation” in more detail. The first (strong) interpretation of preference formation is based on the assumptions that a child’s education investment is his parents’ active choice variable, and that forward-looking parents know the interaction between the child’s education and his future filial attitude. Given these two assumptions, parents may intentionally invest more on “good” child, knowing that this child will be more likely to feedback when adult. The econometric problem with this interpretation is: If the exogenous components of the unobservables associated with children’s filial attitude are (partially) known by parents and education is a choice, then education would be correlated with the random errors associated with equations (5) and (6), and the follow-up econometric analysis would become much more complicated.

The second (weak) interpretation is to assume either that parents are not so forward-looking, or that the child’s education is not really a choice variable of the parents. For instance, a child with good school records may get admission from good universities, and the parents in fact may be willing to support (part of) the university expenses of any child. But the admission of good universities is a result of the child’s effort, not an active choice variable of the parents. With this weak interpretation, the child’s education would not be correlated with the error terms of (5) and (6), and the econometric analysis would be more standard.\footnote{We thank Professors Mark Rosenzweig and Peter Rangazas for this insightful comment.}

3. The Education Practice in Taiwan
In the rest of this paper, we adopt the weak interpretation, which is more consistent with the situation of Taiwan, described below. Notice that even under the weak interpretation, the filial attitude the child feel toward his parent will still be affected by the education investment the child receives. If the possibility of finishing an expensive college education is (partly) due to financial support from the parents, it is certainly likely that the support-receiving child will be “moved”, and will change his filial attitude toward his parents when he becomes an adult.

The reason why the weak interpretation is more consistent with the situation of Taiwan is as follows. In Taiwan, there was 6-year mandatory education before 1968, and starting from 1968, there was 9-year mandatory education. In the past forty years, there were always joint entrance examinations from junior-middle schools to high schools, and from high schools to colleges. Before 1968, there was even joint entrance examination from elementary to junior-middle schools. Furthermore, founding new schools of all levels and colleges were always regulated by the Ministry of Education severely. After 1971, the Ministry even banned the establishment of any new private schools. As a result, in the past there was always excess demand for education, and the student rationing was carried out all by the joint entrance exams. The exam competition was severe but fair, and so far as we know, no one made the “decision” to go to what schools. Those who got high scores in the joint entrance exams could choose first, and the order of their choice was by and large consistent with the existing school ranking. Those who scored lower were forced to enter worse schools. Of course, there were always some percentage of people whose score were too low to enter any school.

Therefore, in Taiwan the role of parents on education investment was quite

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10 In the 1997 high-school joint exam, the best-scored 25% chose public high schools, the second best 15% chose private high schools, and a majority of the rest went to vocation schools. In the college joint exam of the same year, only the best-scored 55% are allowed to enter colleges.
passive in the past forty years: they paid the education expenses corresponding to what their child ended up with. The child might appreciate what his parents did for him, but education was never a choice variable of the parents. What we will do in this paper is to test whether there is a significant relation between what the child received in the past and what he feeds back currently. This is indeed the weak version of our preference formation hypothesis.

III. Econometric Setting

1. Econometric Setting

We propose the following equations for our estimation: for the \(i\)-th observation,

\[
T_i = \eta_{10} + \eta_{11} E_i + \eta_{12} I_{ci} + \eta_{13} I_{pi} + X_i' \eta_1 + \epsilon_{1i} \\
\equiv Z_i' \delta_1 + \epsilon_{1i} \quad (8)
\]

\[
S^*_i = \eta_{20} + \eta_{21} E_i + \eta_{22} I_{ci} + \eta_{23} I_{pi} + X_i' \eta_2 + \epsilon_{2i} \\
\equiv Z_i' \delta_2 + \epsilon_{2i} \quad (9)
\]

\[
S_i = \begin{cases} 
S^*_i, & \text{if } 0 < S^*_i < \bar{S} \\
\bar{S}, & \text{if } S^*_i \geq \bar{S} \\
0, & \text{if } S^*_i \leq 0 
\end{cases} \quad (10)
\]

In (9), \(S^*_i\) is a censored variable, whose relationship with the observed service level \(S_i\) is described in (10) because \(S_i\) is bounded below by zero and bounded above by \(\bar{S}\). Since the monetary transfers can be either parents-to-child \((T_i < 0)\) or child-to-parents \((T_i > 0)\), the variable \(T_i\) is not censored. \(E_i\) is the education investment the parents made in the child, \(I_{ci}\) (\(I_{pi}\)) is the income of the
child (parents), and $X'_i = (X_{1i}, \ldots, X_{Ki})$ include other family-specific explanatory variables to be specified in the next section. Notice that $T_i$, $S^*_i$ and $X'_i$ are all flow variables of the survey period, whereas $E_i$ is a stock variable. When we say that an adult child’s preferences have already been “formed”, we mean that his behavioral pattern of choosing current flow variables is (significantly) affected by the stock variable $E_i$, which was determined long time ago.

In regressions (8) and (9), $\epsilon_{1i}$ and $\epsilon_{2i}$ denote the error terms. To simplify the analysis, we assume $\epsilon_{1i}$ and $\epsilon_{2i}$ are bivariate normally distributed as follows

$$
\begin{pmatrix}
\epsilon_{1i} \\
\epsilon_{2i}
\end{pmatrix} \sim N

\begin{pmatrix}
0 \\
0
\end{pmatrix},

\begin{pmatrix}
\sigma^2_1 & \sigma_1 \sigma_2 \rho \\
\sigma_1 \sigma_2 \rho & \sigma^2_2
\end{pmatrix}
\right)
\end{equation}

(11)

where $\sigma^2_1$ and $\sigma^2_2$ are the variances of $\epsilon_{1i}$ and $\epsilon_{2i}$ respectively, and $\rho$ is the correlation coefficient between $\epsilon_{1i}$ and $\epsilon_{2i}$.

Under these assumptions, the likelihood function corresponding to equations (8)-(10) can be derived. Hence maximum likelihood estimation (MLE) method is employed to estimate the various parameters in the regression model. The exact form the likelihood function is shown in the Appendix.

Based on the comparative statics results in the previous section, we propose the following hypotheses:

$$
H_0 : \eta_{11} = 0, \eta_{21} = 0,
$$

$$
H_1 : \eta_{11} > 0, \eta_{21} > 0,
$$

and see whether the preference formation hypothesis holds.

2. The Data Set

Our data set comes from the 1989 Taiwan Family and Women Survey (TFWS), jointly conducted by scholars of the National Taiwan University and the Univer-
sity of Chicago. This data set has been used by Parish and Willis (1993), Lee et al. (1994) and some other researchers. The survey was attached to the larger *Family Expenditure Survey* (FES) undertaken every year by the Directorate General of Budget Accounting and Statistics. Data collected by FES survey have been widely used in previous research and are known for their high quality.\(^{11}\) The data from the TFWS contains a representative sample of women aged 25-60 years, from which we choose families of currently married women. Although only women were interviewed, the same set of questions was asked about parents and parents-in-law of the interviewees. As pointed out by Lee et al. (1994, p.1016), the division between male and female lines with regard to old-aged support is not severe in the society of Taiwan. So the feedback transfers of the male line (from the husbands to his parents) and the female line (from the wife to her parents) are both taken into account in this research. Thus the observations to be analyzed can be viewed as pairs of child and parents, while the child could be either male or female.

For analytical purpose, we made further restrictions on the sample. We restricted the analysis to the child with years of age over 33 in 1989. The main reason is that the 9-year mandatory education starts from 1968, those who were over the age of 33 in 1989 were stratified into the 6-year mandatory education, while the younger generation benefits from the education reform. By restricting the age of the child, the education investment made by the government can be controlled, and the education investment made by the parent could be isolated more easily. In addition to the restriction imposed on the age of the child, we limit the analysis to those children who had at least one parent living. After the above manipulations, the number of observation remained is 3,562 pairs of child and parents.

\(^{11}\)See e.g. Deaton and Paxon (1993) for more explanations about the FES.
3. Measurement of Variables

Corresponding to equations (8) and (9), the detailed definition of the variables are listed in Table 1. The manipulation of some variables deserves more explanation here. The measure of child-to-parents services ($S$) is the frequency of visits per month. Since $S$ is measured in “days-per-month”, $S$ has a upper limit of 30 and a lower limit of 0. The net income transfers ($T$) is the net value of the child-to-parents transfers minus the parents-to-child transfers.

As to the most important explanatory variable, the education investment received by the child ($E$), three different measures ($E1$-$E3$) are adopted. $E1$ denoted the years of education of the child. $E2$ is a dummy variable, coded “1” if the child received more than 6-year mandatory education, coded “0” if otherwise. The variable $E3$ measures the child’s education relative to his(her) siblings. If the years of education of the child is greater than the average education of his (her) siblings, $E3$ is coded “1”. Otherwise, $E3$ is coded “0”.

The child’s monthly income ($INCC$), the area the child resides ($CITYC$), and the number of kids of the child ($KIDC$) can help to reflect the economic status of the child ($Ic$). The years of education of the parents ($EDUP$), the number of parents alive ($ALIVEP$), the parents’ health conditions ($PHEALTHP$) can be used to measure the the economic status of the parents ($Ic$). Other explanatory variables include the gender of the child ($MALEC$), the number of siblings of the child ($SIBC$), and the distance between the residences of the child and the parents ($DIST1, DIST2$). The distance between the residences of the child and the parents has three categories, of which “the distance between the child and the parents is within 10 minutes to 1 hour” is the omitted category. $DIST1$ and $DIST2$ can be viewed as proxy variables for the opportunity cost of services.

The basic statistics of various variables are shown in Table 2. In Table 2,
we can see that the number of observations with $SIBC \geq 1$ is 3,529. These observations formed the sample to be analyzed when the variable $E3$ is adopted.

V. Empirical Results

The estimation results are shown in Table 3. We left out the results of $\sigma_1$ and $\sigma_2$, which appeared in the covariance matrix but did not seem to carry much economic message. Three separate measures of the child’s education ($E$) were chosen, and the estimation results are listed in Model (1)-(3) respectively. We shall discuss the influences of various variables one by one.

Education of the child ($E1$-$E3$). The t-values listed in Table 3 show that, whatever measure of the education investment we choose, the education investment made by the parents has a significantly positive effect on income transfers and services. We then perform a Wald test on the joint effects of the child’s education on monetary transfers and services:

$$H_0 : \eta_{11} = 0, \eta_{21} = 0,$$

$$H_1 : \eta_{11} > 0, \eta_{21} > 0.$$ 

In view of the various $\chi^2$ statistics at the bottom of Table 3, the null hypotheses are rejected under 1% significance level. The results show that the child’s feedback behaviors, whether measured in income transfers or services, are strongly affected by the education investment made by the parents.

The income of the adult child ($INCC$). We can see from Table 3 that the effect of the family income of the child on income transfers is positive, while the effect of the income of the child on services is positive. The former result is largely consistent with what we expect from the theory and other related researches.\footnote{In Cox and Rank (1992) there was a positive relationship between parents’ (imputed) income and child’s education.}
The result that high-income child tends to provide more monetary transfers and less services implies that, high-income child may use monetary transfers to buy the right of visiting the parents less frequently. These results are similar with those found in Lee et al. (1994).\textsuperscript{13}

\textit{The gender of the child (MALEC).} The results show that sons will provide more income transfers and service than daughters do. Although Lee et al. (1994) found that sons and daughters behave similarly with respect to the support for the aged parents, what found here shows that sons are more relied on by the parents for their old-aged support.

\textit{Distance (DIST1, DIST2).} It can be seen from Table 3, the children who live near their parents (DIST1 = 1) will visit his parents more often. For those children who live far apart from their parents (DIST2 = 1), the frequency of visits is significantly lower. The above results show that the opportunity cost of visits does matter for the children when they decide on visiting parents.

\textit{Living area of child (CITYC) and number of kids of the child (KIDC).} We found that children living in urban area tend to provide more income transfers to their parents. Since the area of living may reflect the economic status, the children who can afford to live in the urban area tend to be more prosperous, thus more income transfers can be provided by them. As to the influences of KIDC, we found that the more children the adult child has, the less income transfers will be provided. This implies that children with more kids may face more severe financial burden, thus will choose a smaller amount of income transfers.

\textit{Education of parents (EDUP), whether both parents alive (ALIVEP), and income and parents-to-child transfers.} In Ioannides and Kan (1993), income (or wealth) was also a positive explanatory variable of inter vivos transfers.\textsuperscript{13}Lee et al. (1994) found that the son’s income has a negative effect on the probability of coresidence, while its effect on the son’s income transfer is positive.
health of parents (PHEALTHP). The EDUP variable shows significantly negative effect on services in Model (1) and (2), and significantly positive effect on income transfers in Model (3). These results are not consistent with what we expect if EDUP is treated as a proxy for the income of parents. A possible explanation for the inconsistency is that EDUP is not a good proxy the parent’s income. To reflect the financial needs of the parents, ALIVEP and PHEALTHP may be two better candidates than EDUP. As the results shown in Table 3, if both parents are alive, or if the health condition of the alive parents is worse, the income transfers from the child will be higher. Which means more needy parents will receive more income transfers. Table 3 also shows that, when the health condition of the alive parents is worse, the child will visit the parents more frequently.

V. Concluding Remarks

In this paper we analyze the feedback transfers and services rendered by the adult child to parents, which is different from the direction of transfers studied in most previous literature. We showed that these transfers and services are significantly influenced by economic-demographic variables of the child and the parents. More importantly, we found that the child’s current transfer behavior is affected by his experience in childhood, in particular his childhood education. This finding is consistent with Becker’s preference formation hypothesis, and also conforms with some sociologists’ belief that education changes people’s filial attitude toward parents.
Appendix: Specification and Assumptions of the Error Terms

From equations (8)-(11), the corresponding likelihood function can be derived as follows:

\[ L = \prod_{S_i \geq S} L_{1i} \prod_{0 < S_i < S} L_{2i} \prod_{S_i \leq 0} L_{3i} \]

with

\[ L_{1i} \equiv \int_{S_i}^{\infty} f(T_i, S_i^*) dS_i^* \]
\[ = f(T_i) \int_{S_i}^{\infty} f(S_i^* | T_i) dS_i^* \]
\[ = \frac{1}{\sigma_1} \phi\left(\frac{T_i - Z_i^* \delta_1}{\sigma_1}\right) \Phi\left(-\frac{1 - \rho^2}{\frac{1 - \rho^2}{\frac{1}{2}}\left(\frac{\bar{S} - Z_i^* \delta_2}{\sigma_2} - \rho\left(\frac{T_i - Z_i^* \delta_1}{\sigma_1}\right)\right)}\right), \]

\[ L_{2i} \equiv f(T_i, S_i) \]
\[ = (2\pi)^{-1} \sigma_1 \sigma_2 (1 - \rho^2)^{-1/2} \exp\left\{\frac{-1}{2(1 - \rho^2)}\left[\left(\frac{T_i - Z_i^* \delta_1}{\sigma_1}\right)^2 - 2 \rho\left(\frac{T_i - Z_i^* \delta_1}{\sigma_1}\right) \left(\frac{S_i - Z_i^* \delta_2}{\sigma_2}\right) + \left(\frac{S_i - Z_i^* \delta_2}{\sigma_2}\right)^2\right]\right\}, \]

\[ L_{3i} \equiv \int_{-\infty}^{0} f(T_i, S_i^*) dS_i^* \]
\[ = f(T_i) \int_{-\infty}^{0} f(S_i^* | T_i) dS_i^* \]
\[ = \frac{1}{\sigma_1} \phi\left(\frac{T_i - Z_i^* \delta_1}{\sigma_1}\right) \Phi\left((1 - \rho^2)^{-1/2} \left(\frac{-Z_i^* \delta_2}{\sigma_2} - \rho\left(\frac{T_i - Z_i^* \delta_1}{\sigma_1}\right)\right)\right).\]
References


Quisumbing, A. R. (1994) “Intergenerational Transfers in Philippine Rice Villag:
Gender Differences in Traditional Inheritance Customs,” *Journal of Develop-
ment Economics* 43: 167-196.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T$</td>
<td>net income transfers from child to parents per month (in NT$1,000)</td>
</tr>
<tr>
<td>$S$</td>
<td>number of visits (to parents) by child per month</td>
</tr>
<tr>
<td>$E_1$</td>
<td>the years of education the child received</td>
</tr>
<tr>
<td>$E_2$</td>
<td>=1 if the years of education the child received is more than 6-year mandatory education; =0 otherwise</td>
</tr>
<tr>
<td>$E_3$</td>
<td>=1 if the years of education the child received is more than the average level of his siblings; =0 otherwise</td>
</tr>
<tr>
<td>$INCC$</td>
<td>the child’s monthly income (in NT$1,000)</td>
</tr>
<tr>
<td>$MALEC$</td>
<td>=1 if the child is male; =0 otherwise</td>
</tr>
<tr>
<td>$DIST_1$</td>
<td>=1 if the distance, measured by travelling time, between the child and the parents is shorter than 10 minutes; =0 otherwise</td>
</tr>
<tr>
<td>$DIST_2$</td>
<td>=1 if the distance, measured by travelling time, between the child and the parents is longer than 1 hour; =0 otherwise</td>
</tr>
<tr>
<td>$CITYC$</td>
<td>=1 if the child lives in city area; =0 otherwise</td>
</tr>
<tr>
<td>$KIDC$</td>
<td>number of children of the adult child</td>
</tr>
<tr>
<td>$SIBC$</td>
<td>number of siblings of the adult child</td>
</tr>
<tr>
<td>$EDUP$</td>
<td>years of education of the parents</td>
</tr>
<tr>
<td>$ALIVEP$</td>
<td>=1 if both parents are alive; =0 otherwise</td>
</tr>
<tr>
<td>$PHEALTHP$</td>
<td>the number of parents in poor health relative to the number of alive parents</td>
</tr>
</tbody>
</table>
Table 2: The Basic Statistics of Various Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Sample</th>
<th>Sample with no. of siblings ≥ 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>standard deviation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T$</td>
<td>0.952</td>
<td>2.419</td>
</tr>
<tr>
<td>$S$</td>
<td>12.170</td>
<td>12.933</td>
</tr>
<tr>
<td>$E1$</td>
<td>8.5130</td>
<td>4.314</td>
</tr>
<tr>
<td>$E2$</td>
<td>0.492</td>
<td>0.500</td>
</tr>
<tr>
<td>$E3$</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>$INCC$</td>
<td>34.835</td>
<td>25.195</td>
</tr>
<tr>
<td>$MALEC$</td>
<td>0.455</td>
<td>0.498</td>
</tr>
<tr>
<td>$DIST1$</td>
<td>0.376</td>
<td>0.485</td>
</tr>
<tr>
<td>$DIST2$</td>
<td>0.311</td>
<td>0.463</td>
</tr>
<tr>
<td>$CITYC$</td>
<td>0.570</td>
<td>0.495</td>
</tr>
<tr>
<td>$KIDC$</td>
<td>2.175</td>
<td>1.322</td>
</tr>
<tr>
<td>$SIBC$</td>
<td>4.915</td>
<td>2.023</td>
</tr>
<tr>
<td>$EDUP$</td>
<td>4.167</td>
<td>4.214</td>
</tr>
<tr>
<td>$ALIVEP$</td>
<td>0.562</td>
<td>0.496</td>
</tr>
<tr>
<td>$PHEALTHP$</td>
<td>0.582</td>
<td>0.610</td>
</tr>
<tr>
<td>no. of observations</td>
<td>3,562</td>
<td>3,529</td>
</tr>
</tbody>
</table>
Table 3: Regression Models of Income Transfers and Services

<table>
<thead>
<tr>
<th></th>
<th>Model (1)</th>
<th>Model (2)</th>
<th>Model (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$T$</td>
<td>$S$</td>
<td>$T$</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.951**</td>
<td>4.010**</td>
<td>-0.711**</td>
</tr>
<tr>
<td></td>
<td>(3.166)</td>
<td>(3.481)</td>
<td>(2.454)</td>
</tr>
<tr>
<td>$E1$</td>
<td>0.058**</td>
<td>0.191**</td>
<td>0.028*</td>
</tr>
<tr>
<td></td>
<td>(4.047)</td>
<td>(3.340)</td>
<td>(1.855)</td>
</tr>
<tr>
<td>$E2$</td>
<td>0.058**</td>
<td>0.191**</td>
<td>0.028*</td>
</tr>
<tr>
<td></td>
<td>(4.047)</td>
<td>(3.340)</td>
<td>(1.855)</td>
</tr>
<tr>
<td>$E3$</td>
<td>0.058**</td>
<td>0.191**</td>
<td>0.028*</td>
</tr>
<tr>
<td></td>
<td>(4.047)</td>
<td>(3.340)</td>
<td>(1.855)</td>
</tr>
<tr>
<td>$INCC$</td>
<td>0.018**</td>
<td>-0.019**</td>
<td>0.019**</td>
</tr>
<tr>
<td></td>
<td>(29.415)</td>
<td>(2.149)</td>
<td>(33.334)</td>
</tr>
<tr>
<td>$MALEC$</td>
<td>0.945**</td>
<td>5.514**</td>
<td>1.016**</td>
</tr>
<tr>
<td>$DIST1$</td>
<td>-0.151</td>
<td>20.244**</td>
<td>-0.158</td>
</tr>
<tr>
<td></td>
<td>(1.322)</td>
<td>(32.930)</td>
<td>(1.383)</td>
</tr>
<tr>
<td>$DIST2$</td>
<td>-0.069</td>
<td>-4.175**</td>
<td>-0.066</td>
</tr>
<tr>
<td></td>
<td>(0.580)</td>
<td>(7.425)</td>
<td>(0.553)</td>
</tr>
<tr>
<td>$CITYC$</td>
<td>0.188*</td>
<td>0.448</td>
<td>0.221**</td>
</tr>
<tr>
<td></td>
<td>(1.804)</td>
<td>(1.072)</td>
<td>(2.128)</td>
</tr>
<tr>
<td>$KIDC$</td>
<td>-0.102**</td>
<td>-0.145</td>
<td>-0.098**</td>
</tr>
<tr>
<td></td>
<td>(2.713)</td>
<td>(0.982)</td>
<td>(2.612)</td>
</tr>
<tr>
<td>$SIBC$</td>
<td>0.010</td>
<td>-0.250**</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>(0.421)</td>
<td>(2.628)</td>
<td>(0.330)</td>
</tr>
<tr>
<td>$EDUP$</td>
<td>0.004</td>
<td>-0.120**</td>
<td>0.016</td>
</tr>
<tr>
<td></td>
<td>(0.379)</td>
<td>(2.131)</td>
<td>(1.547)</td>
</tr>
<tr>
<td>$ALIVEP$</td>
<td>0.492**</td>
<td>1.088</td>
<td>0.477**</td>
</tr>
<tr>
<td></td>
<td>(2.763)</td>
<td>(1.502)</td>
<td>(2.671)</td>
</tr>
<tr>
<td>$PHEALTHP$</td>
<td>0.347**</td>
<td>1.708**</td>
<td>0.313**</td>
</tr>
<tr>
<td></td>
<td>(2.506)</td>
<td>(2.948)</td>
<td>(2.270)</td>
</tr>
<tr>
<td>$\rho$</td>
<td>-0.021</td>
<td>-0.019</td>
<td>-0.020</td>
</tr>
<tr>
<td></td>
<td>(0.796)</td>
<td>(0.724)</td>
<td>(0.763)</td>
</tr>
<tr>
<td>log-likelihood</td>
<td>-13,821.8</td>
<td>-13,828.9</td>
<td>-13,712.2</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>27.278</td>
<td>13.624</td>
<td>20.985</td>
</tr>
<tr>
<td>sample size</td>
<td>3,562</td>
<td>3,562</td>
<td>3,529</td>
</tr>
</tbody>
</table>

Note: absolute t-values in parentheses.

* statistically significant at the two-tailed 10% level.

** statistically significant at the two-tailed 5% level.