Estimating the Determinants of Bargaining Power Within the Family using Semiprivate Consumption: Transfers to Parents from Their Adult Children and Vice-versa in South Korea

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ABSTRACT

We investigate transfers from adult children to their parents (and vice-versa) in South Korea. We derive a model of family decision determining such transfers and then estimate the model using Korean panel data. To identify the model we use results from laboratory experiments on the differences in altruism between men and women for the Korean cohort we study and for the U.S. We allow bargaining power between the husband and wife to be an unrestricted function of each partner’s age and education, as opposed to allowing these variables to affect bargaining power only through potential wages. We find that adult children each transfer approximately 25% of any increase in their total family income to each set of parents, with increases in the husband’s bargaining power increasing (decreasing) transfers to his (his wife’s) parents. Further, we find that women have slightly greater bargaining power on average, and that this almost equal division of bargaining power with regard to transfers to and from parents is consistent with sentiment on this issue contained in responses to nationwide surveys in Korea over the period we study. Finally, we find that a partner’s bargaining power depends not only on his or her current potential wage but also on the partner’s age; intuitively this is consistent with the idea that, all else held equal, it is better to be single when one is young.
1. Introduction

Private intergenerational transfers have been, and continue to be, extensively studied empirically by economists; see Altonji, Hayashi, and Kotlikoff (1997), Duflo (2003) Lundberg, Pollak and Wales (1996), and Thomas (1994) for some of the important papers in this literature. In the U.S., Canada and other developed European countries, market institutions and government pensions supplement, or entirely substitute for, the support that younger family members would provide to older ones in the absence of these programs. As a result, much of the work on transfers in developed countries has focused on transfers from parents to adult children. However, in developing countries, transfers from adult children to their parents tend to be much more important given the general absence of pension programs and (often) quickly rising real wages. At the same time, there is a large and rapidly growing empirical literature on estimating models of family decision making; Browning, Bourguignon, Chiappori and Lechene (1994), Behrman and Rosenzweig (2006), Blundell, Chiappori, Magnac and Meghir (2007), and Mazzocco (2007) are examples of important papers in this literature.

Our goal in this paper is to draw on, and extend, both of the above literatures to understand transfers from adult children to their parents in modern South Korea (hereafter Korea). Moreover, since there are transfers from parents to adult children (albeit less important than those in the other direction) in Korea, we also allow for such transfers in our analysis. Specifically, we derive a model of family decision making that determines transfers from an adult couple to each set of parents and vice-versa. We then estimate our model using panel data from South Korea; to identify the model we use results from laboratory experiments on the differences in altruism between men and women for the Korean cohort we study. We allow bargaining power between the husband and wife to be an unrestricted function of each partners age and education, as opposed to allowing these variables to enter bargaining power only through potential wages as in Blundell et al (2007); our specification is
consistent with results in Lee and Ham (2012) who find that decision making in the Korean dating and marriage market depends on age and education, holding wages constant.

In summary, our work extends the above literatures by considering two-way transfers, using experimental evidence to identify the model, and allowing bargaining power to depend on more than current potential wages. Further, we advance the literature by addressing Behrman and Rosenzweig’s (2006) contention that observable semiprivate consumption is essential for investigating bargaining power within the family. Specifically, they argue that rather than assuming that one spouse cares more about a certain type of consumption (e.g., their children’s consumption or their own clothing purchases), it is better to consider expenditure on consumption that benefits only one spouse directly. We believe that it is plausible in our problem that wife cares about transfers to her parents but not to her husband’s parents, and vice-versa for the husband; thus, we arguably observe a better example of semiprivate consumption that constitutes a significant portion of the couple’s joint income, than the measures used in many previous studies.

We find that adult children each transfer approximately 25% of any increase in their total family income to each set of parents (so that the adult children transfer 50% in total of any increase in their income); our results are qualitatively and quantitatively similar to earlier work by Raut and Tran (2005) on transfers from adult children to their parents in Indonesia. Further, we find evidence that women have slightly greater bargaining power on average, and that this almost equal division of bargaining power with regard to transfers to and from parents is consistent with sentiment on this issue contained in nationwide surveys in Korea over the period we consider. Finally, we find that bargaining power depends not only on current potential wages but also on each partner’s age; intuitively this is consistent with the idea that, all else held equal, it is better to be single when one is young.
2. Within-Family Transfers, Tradition, and Institutional Features in South Korea

2.1 Basic Facts on Within-Family Transfers in South Korea

To see the importance of transfers from children to parents in the rapidly developing economies in S.E. Asia, including Korea, relative to that in many Western economies, consider Figure 1. For each country, the first (blue) line shows the percentages of the elderly (age≥50) who receive net positive transfers from their children, while the second (brown) line shows the fraction of the elderly (age≥50) who make net positive transfers to their adult children. For example, in Austria about 7% of parents receive a net transfer from their adult children, while about 26% make a net transfer. (Approximately 67% of elderly couples who have children do not make or receive a net transfer.) In all of the Western countries, the percentage of elderly making net transfers is at least twice as large as the percentage receiving a net transfer, and on average the percentage making a net transfer is about five times as large as the percentage receiving a transfer. On the other hand, Korean parents are twice as likely to receive a net transfer from their children than to make one.¹

Table 1 shows the contribution of net transfers from children to the total income of elderly parents in Korea relative to Taiwan, Japan, the US, and Germany and focuses on both the frequency and magnitude of transfers from adult children to their elderly parents. Korea and Taiwan show similar patterns. However, the difference between Korea and the Western countries is dramatic: transfers from children make up over half the total income of elderly Koreans, while these transfers constitute less than ten percent of the income of the elderly in the Western countries.

¹ Transfers from adult children to their parents are an important component of the elderly’s income in other S.E. Asian countries, and tend to be considerably larger than transfers from parents to children in these countries - see Kagitcibasi (1982, 2007), Lee, Parish and Willis (1994) and Lillard and Willis (1997), Mason et al. (2006), and the National Transfer Accounts (NTA) website (http://www.ntaccounts.org) for the general pattern of the intergeneration transfers in various countries such as China, India, Indonesia, Japan, Philippines, South Korea, Taiwan, Thailand and Vietnam.
Table 2 shows the percentage distribution of adult children across different net transfer behaviors toward parents for the years 2001-2005 in the Korea Labor and Income Panel Study (KLIPS). For example, column 1 indicates that, on average, 40% of Korean couples make net transfers to both sets of parents, while columns 2 indicates that 14% make a net transfer only to the husband’s parents and do not receive a net transfer from the wife’s parents. Further, column 3 indicates that, on average, 3% of couples make a net transfer only to the wife’s parents and do not receive a transfer from the husband’s parents, while column 4 indicates that, on average, 22% of couples neither make nor receive a net transfer from either set of parents. Finally, column 5 indicates that, on average, 21% of couples receive a net transfer from at least one set of parents.

Four points may be observed from the table. First, because first sons and sons over 40 are omitted, the disparity between making a transfer only to the husband’s parents and to the wife’s parents is not due to first sons, or sons over 40, facing social pressure to take care of the husband’s parents. However, it is worth noting that husbands are generally older than their wives, and thus the husband’s parents are generally older (and poorer) than the wife’s parents. Second, almost 60% of the couples make a transfer to at least one set of parents. Third, a substantial fraction of couples have zero net transfers to or from parents, and a substantial fraction of couples receive a positive net transfer from the parents. The econometric model we use below allows for all of these features of the data.

Columns 1 and 2 of Table 3 indicate that, conditional on a couple making a transfer to both sets of parents, the transfer to the husband’s parents is, on average, about 50% greater than the transfer to the wife’s parents. Further, column 4 indicates that among these couples approximately 6% of a

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2 As we discuss below, social norms in Korea dictate that men in these groups have special responsibilities to their parents.
couple’s before-tax household income is allocated to transfers to the parents. This amount is substantial and indicates that if, as we argue below, transfers to parents represent semiprivate consumption, the level of this consumption is important relative to household income.

Table 3 here.

2.2 Tradition and Support for Parents

Greenhalgh (1985, p.265) states: “Traditional Confucian China and its cultural offshoots, Japan and Korea, evolved some of the most patriarchal family systems that ever existed.” We believe that while elderly persons may have depended on their adult sons (especially the first son) for old-age support in these countries, the Confucian patriarchal family system is no longer valid for all of families in modern East Asian society – see Xie and Zhu (2009). In particular, many changes have occurred to the Korean family structure, partly as a result of the increasing employment of women and decreasing gender inequality in socioeconomic status. For example, gender difference has been substantially reduced in years of schooling over time. In our work below, we allow for such changes by only including households whose heads’ age is less than or equal to 40 years and whose head is not a first son.

2.3 Institutional Background: Public Support for the Elderly in Korea

Public pension plans are a very recent phenomenon in South Korea. For example, the compulsory coverage of the social security system was not extended to all residents until 1999. In addition to the National Pension Program, various types of assistance under the National Basic Livelihood Security System are currently provided to elderly low-income citizens. To be eligible for government support citizens need to show that their imputed total income is lower than the minimum cost of living as

3 The National Pension Act came into effect in January 1988 in Korea. It covered only those who were working in firms with more than 10 full-time employees. The National Pension has extended coverage to workplaces with more than 5 full-time employees (January 1992), and farmers and fishermen (July 1995). In April 1999, the National Pension Program extended compulsory coverage to all residents aged 18 to 60 in Korea. As a result, the number of insured persons increased from about 6.5 million in 1998 to about 16 million in 1999.
defined by government guidelines. A certain level of financial support from children is assumed to exist and is included in the government’s imputed value of total income. That is, under Korean law, there is a legal family responsibility for adult children to support their parents, and the government assumes that children provide a certain level of such support regardless of the amount actually transferred by the children. Hence, even if the children do not provide any transfers, low-income elderly citizens can be excluded from public assistance if their children are capable of support. Further, daughters have the same degree of responsibility toward their parents as their male siblings under Korean law. Thus, if husbands have greater bargaining power and the result is a small contribution to the wife’s parents, the public safety net would not compensate for this.

3. A Family Decision Making Model of Transfers from Adult Children to Their Parents and Vice-versa

3.1 Basic Setup

We allow for both bargaining between the adult children, and between each of them and their own parents, but we do not allow for bargaining between the adult children and their in-laws, or between the in-laws. We assume that the husband cares only about his consumption and that of his parents, while the wife cares only about her consumption and that of her parents. The parents care only about their consumption and their own child’s consumption. In our setup, bargaining will take place simultaneously between all parties, so that the husband and wife will take into account transfers to or from each set of the parents when bargaining with each other, and also will take into account the split between the husband and wife when they bargain with their respective parents. We find that to

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4 Altonji et al. (1993) consider intergenerational transfers between parents who were in the PSID and their children (i.e. they have information on only one set of parents for a couple) as the outcome of efficient bargaining, but do not use an explicit bargaining model.
obtain tractable estimating equations, we must keep our specification of preferences and bargaining power relatively simple.

Let $C^h, C^{hp}, C^w$ and $C^{wp}$ represent the consumption of the husband, his parents, the wife and her parents respectively, and let $Y, Y^{hp}$ and $Y^{wp}$ represent the income of the couple, the husband’s parents, and the wife’s parents respectively. Transfers between the adult couple and the husband’s parents are given by

$$T^{hp} = C^{hp} - Y^{hp}, \quad (0)$$

while transfers between the couple and the wife’s parents are given by

$$T^{wp} = C^{wp} - Y^{wp}. \quad (0)$$

We assume that the husband’s preferences are

$$U^h(C^h, C^{hp}) = \ln C^h + \alpha \ln C^{hp}, \quad (0)$$

while the wife’s preferences are

$$U^w(C^w, C^{wp}) = \ln C^w + \alpha \ln C^{wp}. \quad (0)$$

Further, we assume that the husband’s parents have preferences

$$U^{hp}(C^h, C^{hp}) = \ln C^{hp} + k\alpha \ln C^h, \quad (0)$$

while those of the wife’s parents are

$$U^{wp}(C^{bw}, C^{wp}) = \ln C^{wp} + k\alpha \ln C^w. \quad (0)$$

In this specification, we are assuming equal altruism toward their parents for the husband and wife; this is an exactly identifying assumption that enables us to identify the husband’s bargaining power, and like all exactly identifying assumptions, it cannot be tested within our model. (This assumption was also made by Behrman and Rosenzweig 2006.) To gain some insight into the reasonableness of this assumption, we reviewed available experimental evidence on this issue in general, and for Korea in particular. Most relevant for our purposes is the Johnson et al. (1989)
study from the psychology literature. They considered gender differences in altruism in the late 1980s among college students in seven locations: Australia, Egypt, Korea, Hawaii, Missouri, Taiwan, and (the former) Yugoslavia. (Note that the Korean students are members of the cohort we study below for Korea). They measured altruism in five situations: i) those involving donations of time; ii) those involving donations of time and effort; iii) those involving money or goods; iv) those involving risk or harm; and v) those involving possible loss of status. They found significant differences between men and women only for Egypt and Korea, and in all such cases, men were more altruistic than women. However, in Korea, the smallest difference between men and women occurred when the donation involved money or goods (which is the case we consider below), and in this case men were approximately 5% more altruistic than women. Interestingly, for the U.S., the Andreoni, Harbaugh and Vesterlund (2007) study argues that the studies by Andreoni and Miller (2002) and Andreoni and Vesterlund (2001) indicate that men and women are equally altruistic when giving is neither subsidized (thus lowering the price of giving a dollar below a dollar) nor taxed (thus raising the price of giving a dollar above a dollar), as in our model. Given the above results, we argue that available evidence suggests that equal altruism for men and women in Korea with regard to monetary transfers for the cohorts we study is not an unreasonable assumption. Note that we allow the parents to have a different altruism parameter than the children.

When the wife and the husband bargain, the husband has bargaining power given by

$$0 \leq \mu^h(X) \leq 1,$$

where we discuss our specification of $X$ below. Further, when the husband and wife bargain with their respective parents, each set of parents has bargaining power $0 \leq \mu^p \leq 1.$

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5 They note that men and women will differ in terms of altruism when this condition does not hold, as Andreoni and Vesterlund (2001) find that men are significantly more generous when giving is cheap (that is, it costs the giver less than one to give one), but women are significantly more altruistic when giving is expensive (costs more than or equal to one to give one).

6 Kagel (2012) states that, to the best of his knowledge, ours is the first study to use results from laboratory experiments to identify an econometric model estimated from micro data.
Since $\mu^p$ will not be identified given our data, for simplicity we treat it as a constant rather than as a function of the parent’s characteristics.

3.2 Derivation of the Transfer Functions

Our problem is to derive the optimal consumption levels for the couple and both sets of parents given our setup above, since by (1) and (2) these levels of course also determine the optimal transfer functions to each set of parents. Following the literature, e.g. Chiappori (1992), we solve the two stage collective model recursively. Specifically, we first solve the bargaining between children and parents given an arbitrary split of the couple’s income, which provides the value function for each adult child. Given these value functions, we can solve for the optimal split by the couple, and thus the optimal transfers, by substituting the respective shares of the couple’s income into the first stage decision rules.

Assume that the husband and wife split their income so that they receive $\rho^h$ and $\rho^w$ respectively such that $\rho^h + \rho^w = Y$. The optimization problem is for each adult child is

$$V^j(\rho^j, Y, Y^{hp}, Y^{wp}) = \max_{C^{jp}, C^{jp}} \mu^p (\ln C^{jp} + k\alpha \ln C^{jp}) + (1 - \mu^p) (\ln C^j + \alpha \ln C^{jp}),$$

s.t. $C^j + C^{jp} = \rho^j + Y^{jp}, \quad j = h, w.$

The first order conditions are

$$\frac{\mu^p}{C^{jp}} - \frac{\mu^p k\alpha}{\rho^j + Y^{jp} - C^{jp}} - \frac{1 - \mu^p}{\rho^j + Y^{jp} - C^{jp}} + \frac{(1 - \mu^p)\alpha}{C^{jp}} = 0, \quad j = h, w.$$  \hspace{1cm} (0)

From equation (8) we obtain an expression for the consumption of each party as a function of the adult child’s share of the couples’ income $\rho^j$ and their parents’ income

$$C^j = \frac{1 + \mu^p (1 + k\alpha)}{1 + \alpha + \mu^p \alpha(k - 1)} (\rho^j + Y^{jp}), \quad j = h, w,$$

$$C^{jp} = \frac{\alpha + \mu^p (1 - \alpha)}{1 + \alpha + \mu^p \alpha(k - 1)} (\rho^j + Y^{jp}), \quad j = h, w.$$  \hspace{1cm} (0)
We now use (9) to determine how the adult children actually split their joint income by considering the following optimization problem

$$\begin{align*}
\text{Max } & \mu^h(X)[\mu^p(\ln C^{hp} + k\alpha \ln C^h) + (1 - \mu^p)(\ln C^h + \alpha \ln C^{hp})] \\
+ & (1 - \mu^h(X))[\mu^p(\ln C^{wp} + k\alpha \ln C^w) + (1 - \mu^p)(\ln C^w + \alpha \ln C^{wp})],
\end{align*}$$

subject to

$$\rho^h + \rho^w = Y,$$  \hspace{1cm} (0)

$$C^j = \frac{1 + \mu^p(1 + k\alpha)}{1 + \alpha + \mu^p\alpha(k - 1)}(\rho^j + Y^{jp}), \quad j = h, w,$$

$$C^{jp} = \frac{\alpha + \mu^p(1 - \alpha)}{1 + \alpha + \mu^w\alpha(k - 1)}(\rho^j + Y^{jp}), \quad j = h, w.$$  \hspace{1cm} (0)

It is straightforward to show that this yields the following sharing rule

$$\begin{align*}
\rho^h &= \mu^h(X)(Y + Y^{wp}) - (1 - \mu^h(X))Y^{hp}, \\
\rho^w &= (1 - \mu^h(X))(Y + Y^{hp}) - \mu^h(X)Y^{wp}.
\end{align*}$$  \hspace{1cm} (0)

As one would expect, the husband’s portion of the couple’s income, $\rho^h$, is an increasing function of his bargaining power, the couple’s income, and the wife’s parents’ income, but is decreasing in his parent’s income. Substituting (11) into (9) yields the optimal consumption levels of the husband’s parents, the wife’s parents, and the adult children

$$\begin{align*}
C^{hp} &= \theta \mu^h(X)(Y + Y^{hp} + Y^{wp}), \\
C^{wp} &= \theta(1 - \mu^h(X))(Y + Y^{hp} + Y^{wp}), \\
C &= C^h + C^w = (1 - \theta)(Y + Y^{hp} + Y^{wp}), \\
\text{where } \theta &= \left(\frac{\alpha + \mu^p(1 - \alpha)}{1 + \alpha + \mu^w\alpha(k - 1)}\right).
\end{align*}$$  \hspace{1cm} (0)

From (12) it is clear that the model implies simple Engel curves for each family in terms of the pooled income $(Y + Y^{hp} + Y^{wp})$. Intuitively, from the perspective of the husband’s parents, including the wife’s parents in the bargaining procedure has the disadvantage that husband’s parents will get to
consume less of any extra income they receive but has the advantage that their consumption will go up when, ceteris paribus, the wife’s parents receive extra income. Thus, the model implicitly provides insurance for each set of parents (as well as for the children).

Taking the difference between their consumption (12) and their income for each set of parents, implies the transfer functions from the children

\[
T^{hp} = \left[ \theta \mu^h(X)(Y + Y^{hp} + Y^{wp}) \right] - Y^{hp},
\]

\[
T^{wp} = \left[ \theta(1 - \mu^h(X))(Y + Y^{hp} + Y^{wp}) \right] - Y^{wp}.
\]

4. Estimation Strategy and Comparison to Previous Work

4.1 Specification of Bargaining Power and Identification

Because we have panel data, a natural starting point is to add ‘it’ subscripts and error terms to (13)

\[
T_{it}^{hp} = \theta \mu^h(X)(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) - Y_{it}^{hp} + e_{it}^{hp},
\]

\[
T_{it}^{wp} = \theta(1 - \mu^h(X))(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) - Y_{it}^{wp} + e_{it}^{wp},
\]

where \(e_{it}^{hp}\) and \(e_{it}^{wp}\) will reflect preference shocks to the husband, wife, and each set of parents. A natural choice for \(\mu^h(X)\) is

\[
\mu^h(X) = [1 + \exp(-\beta_0 + \beta_1 X)]^{-1}
\]

since it constrains \(0 \leq \mu^h(X) \leq 1\).

A less clear issue is the choice of \(X\); essentially, it needs to reflect how well each spouse will do outside the marriage. One possibility is to use let bargaining power depend solely the wage or income each would earn when single, as suggested in different forms by Browning et al. (1994), Blundell et al. (2007), and Mazzocco (2007), but we view such a formulation as too narrow, since Ham and Lee (2012) find that factors such as age and education affect how well each spouse will do
outside marriage for (this cohort) for Korea, in addition of their wages. Instead we assume that $X$ contains each partner’s age and education

$$
\mu^{X}(X) = \left[ 1 + \exp \left( \beta_0 + \beta_{11} A_w + \beta_{12} E_w + \beta_{13} A_h + \beta_{14} E_h \right) \right]^{-1},
$$

where $A_w$ and $E_w$ ($A_h$ and $E_h$) denote the wife’s (husband’s) age and education respectively. The coefficients in (16) will reflect the effect of, e.g. husband’s age, on his potential wage and on his expected utility when single conditional on the potential wage. As one would expect, in our data age and wages, and education and wages, are both positively correlated, and thus the coefficients on the husband’s (wife’s) characteristics should be positive (negative) if bargaining power depends solely on these variables. However, below we find that the husband’s (wife’s) coefficient on age in (16) is negative (positive), suggesting that bargaining power in Korea depends on more than potential wages, and that previous specifications would have been too restrictive in our data.

For our model to be identified we need age and education not to affect preferences (as reflected in $\theta$) and to be independent of the transitory preference shocks captured by $e_{it}^{hp}$ and $e_{it}^{sp}$. This identification issue is not unique to our study and previous studies have either made analogous assumptions or instead invoke strong exogeneity assumptions. Specifically, Blundell et al. (2007) assume that age and education affect preferences while the effect of age and education on wages varies by year; this is similar to the assumption in Ham (1986) and Ham and Reilly (2002) that age and education affect preferences but these variables interacted with industry and occupation unemployment rates affect wages in the current year. They then estimate potential wage equations allowing for selection due to nonparticipation, and make bargaining power a function of estimated

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7 We also consider more parsimonious versions of (16), i.e. with some of the coefficients set to zero.
8 Recall that we will consider families where the husband is 40 years of age or younger.
potential wages.\(^9\) Thus our identifying assumptions are simpler than, but in the same spirit as, Blundell et al (2007);\(^\,10\) note that these identifying assumptions are analogous to the assumptions one would make when estimating a labor supply model with endogenous wages and participation.

Alternatively Browning, Bourguignon, Chiappori, and Lechene (1994) obtain identification as follows. First, they assume that each spouse’s bargaining power depends only on his or her current wages; implicitly they are assuming (i) that the current wage of each spouse, particularly the wife, does not depend on bargaining power, as would occur if the wife stayed home to care for the children or took a job with flexible hours at a relatively low wage and (ii) that these wages will be independent of the error terms \(e_{ht}^{\text{hp}}\) and \(e_{ht}^{\text{wp}}\), which reflect the husband and wife’s preference shocks respectively. Finally, they assume there is no selection bias by considering only couples where both partners work, since they cannot observe wages for nonparticipants. Mazzocco (2007) takes a somewhat similar approach to identification. First, he considers all married couples, and assumes that bargaining power depends on each spouse’s current income (even if it is zero); note that this implies that that a college educated wife who is not working has less bargaining power than a high school dropout who works a positive number of hours at a low wage. Second, he rules out taste shocks, and thus needs only be concerned about the potential endogeneity of income due to forecast errors or measurement errors (that are independent over time). These are quite strong assumptions, but of course, but in fairness it is important to note that Mazzocco uses these assumptions and presents to estimate the only dynamic family bargaining model in the literature.

\(^9\) They also allow the family’s unearned income to affect bargaining power, but do not distinguish whether this income flows to the husband or wife. In this case our bargaining power estimates will also reflect the effect of each spouse’s age and education on family unearned income.

\(^{10}\) We also could have obtained identification by allowing preferences to be a linear function of age and education while bargaining power depends on age and education interacted with time dummies. We choose the simpler approach in this paper to keep a relatively complicated estimation problem from becoming even more complicated.
4.2 Accounting for Missing Data on Parent’s Income, Endogenous Income for the Couple, and a Large Number of Zero Transfers

Because $T_{it}^{hp}$ and $T_{it}^{hp}$ can take both positive and negative values, and the model predicts that $T_{it}^{hp}$ and $T_{it}^{hp}$ are determined by continuous functions, it would be natural to estimate (14) by random effects nonlinear least squares (RENLS) while imposing the cross-equation restrictions, where the random effects would capture the correlation in observations over time from the same family. However, we face several problems in estimating (14) that preclude simply using RENLS. First, in the data set we use, the Korean Labor and Income Panel Study (KLIPS), we see transfers and the couple’s income, but not the parents’ incomes. To avoid this missing data problem, we impute parents’ income from a data set on the elderly, the Korean Longitudinal Study of Ageing (KLoSA), using a procedure suggested by Skinner (1987). Specifically, we run the following regressions using data from KLoSA, using explanatory variables $Z_{it}^{hp}$ and $Z_{it}^{vp}$ (which we observe in both data sets):

\[
Y_{it}^{hp} = \delta_{hp} Z_{it}^{hp} + u_{hpi},
\]

\[
Y_{it}^{vp} = \delta_{vp} Z_{it}^{vp} + u_{vpi}.
\]

In (17) $Z_{it}^{hp}$ is a vector of exogenous variables containing the husband’s age, age-squared, education, parents’ education, husband’s birth order, and a dummy for the case where only one parent still living; $Z_{it}^{vp}$ is defined analogously. Second, we must deal with the potential endogeneity of the couple’s total income, which consists of the sum of each spouse’s wage times his or her hours, plus any family nonlabor income. Since we do not wish to model labor supply and nonlabor income, we predict family income simply by

\[\text{11 All monetary units are in real (2004) } \text{ values.}
\]

\[\text{12 Note that this imputation procedure eliminates the potential problem that the parents’ incomes may be endogenous.}\]
projecting it on a number of explanatory variables \( Z^c_{it} \):

\[
\hat{Y} = \hat{\pi}Z^c_{it}, \tag{0}
\]

where \( \hat{\pi} \) comes from the usual first stage equation. Specifically, in our empirical work below, \( Z^c_{it} \) consists of both the husband and wife’s age, age-squared, education, parents’ education, birth order, and dummy for only one parent still living.\(^{13}\) After taking into account the missing data on the parents’ incomes and the potential endogeneity of the couple’s income, we have

\[
T_{it}^{hp} = [1 + \exp(-\gamma_0 + \gamma_1E_{it} + \gamma_2A_{it} + \gamma_3A_{iw})]^{-1}\theta(\hat{Y}_{it} + \hat{\pi}^{hp} + \hat{\pi}^{wp}) - \hat{Y}_{it}^{hp} + \nu_{it}^{hp}, \tag{0}
\]

\[
T_{it}^{wp} = (1-[1 + \exp(-\gamma_0 + \gamma_1E_{it} + \gamma_2A_{it} + \gamma_3A_{iw})]^{-1}\theta(\hat{Y}_{it} + \hat{\pi}^{hp} + \hat{\pi}^{wp}) - \hat{Y}_{it}^{wp} + \nu_{it}^{wp}. \tag{0}
\]

Third, we also face the issue that over 35% of couples have a zero transfer with at least one set of parents,\(^{14}\) and a regression model cannot adequately deal with this large spike at zero. This problem was also encountered by Udry (1996) and Kazianga (2006), and we follow their solution. Specifically, we assume that when the absolute value of a desired transfer to a parent in (13) is less than some limit \( K \), transactions costs make it optimal to set the transfer to the parent to zero instead. In this case \( T_{it}^{wp} \) and \( T_{it}^{wp} \) become latent net desired transfers. Denoting actual transfers by \( T_{it}^{hp} \) and \( T_{it}^{wp} \), we have a bivariate version of Rosett’s (1959) friction model

\[
T_{it}^{adj} = \begin{cases} 
T_{it}^{j} + K & \text{if } T_{it}^{j} < -K < 0, \\
0 & \text{if } -K < T_{it}^{j} < K, \ (j = hp, wp) \\
T_{it}^{j} - K & \text{if } T_{it}^{j} > K > 0,
\end{cases} \tag{0}
\]

\(^{13}\) We also included \( \hat{Y}_{it}^{hp} \) and \( \hat{Y}_{it}^{wp} \) when predicting \( Y_{it} \) to make them orthogonal to the residual for \( Y_{it} \). Unfortunately, there is no way to make \( \hat{\pi} \) orthogonal to the forecast errors in \( \hat{Y}_{it}^{hp} \) and \( \hat{Y}_{it}^{wp} \), since KLoS∆ does not contain information on, for example, an elderly couple’s daughter-in-law. Our \( \hat{\pi} \) orthogonal to the forecast errors in \( \hat{Y}_{it}^{hp} \) and \( \hat{Y}_{it}^{wp} \) may induce a small sample bias problem here, but of course this problem will disappear asymptotically. We did not follow Kazianga in using the couple’s assets as an excluded instrument for their income because one believed that these assets are likely to be correlated with the couples unobserved preference shocks.

\(^{14}\) Add columns 2, 3 and 4 in Table 2.
where $K$ denotes the unobserved (symmetric) transaction cost.\(^{15}\)

Assuming that the errors in (19) $(v_{1it}, v_{2it}) \sim iid \ N(0, \Sigma)$ over $i$ for a given $t$, we can derive the contribution to the likelihood function for family $i$ in year $t$; we denote the logarithm of this contribution as $L^*_i$. Since each contribution will take one of nine functional forms, for ease of exposition all of the possible contributions are given in Appendix A. We then estimate the parameters of the model by maximizing the quasi-likelihood

$$L^* = \sum_{i=1}^{T} \sum_{t=1}^{T} L^*_i.$$

These estimates can be shown to be consistent using arguments from Amemiya (1979). However, in calculating the standard errors, we need to allow both for correlation over time in observations from the same family and the prediction errors in $\hat{Y}_{it}^{hp}$, $\hat{Y}_{it}^{wp}$ and $\hat{Y}_{it}$. As a result, obtaining analytical expressions for the standard errors is a complicated task; instead, we obtain consistent standard errors using the bootstrap procedure described in Appendix B. Some of the previous work in the literature on transfers in developing countries has obtained inconsistent estimates of the standard errors by ignoring the prediction errors in $\hat{Y}_{it}^{hp}$, $\hat{Y}_{it}^{wp}$ and $\hat{Y}_{it}$. While in general it is not possible to obtain the direction of the inconsistency in the standard errors, practical experience suggests that these authors are likely to have underestimated the size of their standard errors and hence overstated the precision of their parameter estimates.

4.3 Comparison to Some Other Models of Within-Family Transfers in Developing Countries

Kazianga (2006, hereafter Kazianga) is a very careful empirical study of income transfers to and from a couple which addresses a number of estimation issues that arise in this context. First, as noted above, he uses Rosett’s friction model and we adopt his approach. Second, he allows family

\(^{15}\) Net transfers to the parents are positive and net transfers received from parents are negative.
income to be endogenous, using family assets as an excluded (from the second stage equation) instrument for permanent income and rainfall as an excluded instrument for transitory income. We also allow family income to be endogenous but do not use family asset as an excluded instrument. Further, Kazianga also allows for a very flexible response of transfers to income by considering a spline function in income in the transfer equation; this approach is straightforward if income can be considered exogenous.

Finally, Kazianga allows transfers to be non-separable functions of income and the unobservables, using the approach in Altonji, Ichimura and Otsu (2008); however, this procedure cannot be used when allowing both positive and negative transfers. Thus, Kazianga focuses on positive (and not negative) transfers, whereas we chose not to use the Altonji et al. (2008) procedure given our focus on allowing both positive and negative transfers. In summary, Kazianga covers a number of areas that we do not, but we note that the reverse is also true. First, we deal with missing parents’ income, while Kazianga simply considers the biases that arise from omitting it. Second, we argue that our approach has a closer link to economic theory than his. Third, and perhaps most importantly, we also allow for a separate role of both sets of parents, while Kazianga considers only total transfers to and from the adult couple. Fourth, as noted above, we use the bootstrap method to obtain consistent standard errors. In summary, our paper deals with different issues and is a complement to, rather than a substitute for, his important paper.

There are at least three other important papers specifically on transfers from children to parents in developing countries using a bargaining approach. Lee, Parish, and Willis (1994, hereafter LPW) were the first to address bargaining power in the adult children’s families when analyzing upstream transfers. Using data from the 1989 Taiwan Family and Women Survey, they find that the higher the wife’s income, the greater the support she provided to her parents. Lillard and Willis (1997, hereafter LW) replicate LPW for Malaysia, and also find that the amount being transferred to the wife’s
parents depends more strongly on the wife’s income than on the husband’s income, and that an analogous result occurs with regard to transfers to the husband’s parents.

Khemani (1999) focuses on a bargaining model and, using Indonesian data, found that the distribution of assets between husbands and wives affects the likelihood of transfers to their respective families. From her bargaining model, she derives equations for two latent variables that determine whether transfers are made to the parents of the husband and the wife, respectively. She then reports reduced-form probit estimates describing whether a transfer takes place but does not consider the actual amounts transferred to each set of parents. Thus, she cannot identify effect of assets (or income) on the level of transfers.\(^{16}\)

We extend the above papers in several directions. First, we use a formal bargaining model to derive our estimating equations. Second, we use the parents’ characteristics and a second data set to impute the parents’ income, while LPW, LW and Khemani only use parents’ characteristics as control variables. Third, in LPW, LW and Khemani, positive (net) transfers from parents to children are treated as zero transfers, while our model allows for two-way transfers. Finally, LPW, LW and Khemani ignore the role of tradition in upstream transfers, while we allow for first-born sons to differ in their transfer behavior, since they have traditional obligations to take care of the parents. Further, as noted above, we focus on families where the head is 40 years or younger, allowing for the possibility that older adult couples to have different preferences (since they may be more affected by tradition than their younger counterparts).\(^{17}\)

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\(^{16}\) Formally, Khemani can identify the coefficient of assets up to a factor of proportionality, e.g. divided by the standard deviation of the error term in Tobit transfer equations.

\(^{17}\) In a paper that appears to have been written concurrently with ours, Pan (2009) considers a regression where the dependent variable is the ratio of the transfers to husband’s and wife’s parents and the independent variables consist of the husband’s and wife’s income. Pan uses a sample that has positive transfers to at least one set of parents and that treats husband’s and wife’s labor market participation as endogenous using regional unemployment rates as excluded instruments. Three potential problems with this approach are sample selection, whether bargaining power is determined by current income (or permanent
Finally, Raut and Tran (2005, hereafter RT) is one of the few papers that look at two-way transfers between parents and their children in a developing country (Indonesia). They derive and test two models. The first is a “Pure Loan” model with two stages. In this model, parents invest in their children’s education in the first stage as a loan, and then their children pay back the loan to their parents in the second stage. The second is a “Two-Sided Altruism” model where transfers go from parents to their children in the first period, and from children to their parents in the second period, simply because parents and their children care about each other. Thus, their second model is in the same spirit as ours, except that RT does not consider family bargaining or transfers from parents to children in the second period, while we do not consider transfers from parents to children in the earlier period. They reject their “Pure Loan Model” in favor of their “Two-Sided Altruism” model, lending support to our approach. Moreover, we will show below that our parameter estimates predict transfers from children to parents at a level quantitatively close to the ones estimated by RT. They also find that that income neutrality holds. i.e. the “transfer derivative” is not significantly different from –1.0, which again lends support to our specification, which constrains this derivative to be 1.0.\textsuperscript{18} Finally, we improve on their work by using the bootstrap to obtain consistent standard errors.

\textbf{4.3 Comparison to Other Studies in Terms of Outcome Variable}

Given the vastness of the family bargaining literature and space constraints, we first compare our approach in this regard to Browning et al. (1994), Blundell et al. (2007) and Mazzocco (2007). Browning et al. focus on clothing consumption, Mazzocco considers general consumption and saving behavior, and Blundell et al. (2007) study labor supply decisions, while of course we consider income proxied by education), and whether transitory fluctuations in income due to the business cycle affect bargaining power.

\textsuperscript{18} See, e.g., Cox and Rank (1992) and Altonji, Hayashi and Kotlikoff (1997) for a detailed discussion of transfer derivatives.
intergenerational transfers. As discussed above, we believe that among these outcome variables, ours is more likely to represent semiprivate consumption.

We should also note an interesting paper by Lee (2007), since he studies family bargaining using Korean data. Specifically, he considers a static model of bargaining between husband and wife where private assignable/semiprivate consumption is represented by “pocket money.” He defines pocket money as spending items such as recreation, a hobbies, and alcoholic beverages.¹⁹ Unlike our study, Lee estimates a reduced form model and does not attempt to estimate bargaining power parameter.

5. Data

We use data from the “Korean Labor and Income Panel Study” (KLIPS), which is administrated by the Korea Labor Institute (KLI). We briefly discuss the data and emphasize the unique features of KLIPS that we exploit in this paper. KLIPS is a longitudinal study of a representative sample of Korean households and individuals living in urban areas. Begun in 1998, it is conducted annually to track the characteristics of households as well as the economic activities, labor movements, incomes, expenditures, education, job training, and social activities of individuals and families. Especially important for us is the fact that this panel data set contains information on financial exchanges with parents from the 4th wave (2001) on. Specifically, a household is asked whether the household head has surviving parents who do not co-reside with the couple, and, if so, how much financial support to and from the household head’s parents was made last year. Further, the same questions are asked about the spouse’s parents. This financial exchange with parents is, of course, our focus of interest. Finally, to impute parents’ income, we run regressions using the KLoSA data for each set of parents’

¹⁹ One’s initial reaction may be that pocket money is too small a fraction of family resources to justify substantial bargaining on the part of the couple, but Lee finds that, in his data, the sum of the husband and wife’s pocket money constitutes about 12%-15% of the family’s before-tax earnings. To us, this percentage seems implausibly high for covering recreation, hobbies, and alcohol that the husband and wife consume separately, suggesting there may be a joint aspect to his measure of consumption.
income using explanatory variables common to both KLoSA and KLIPS. (Note that KLoSA cannot be used to analyze two-way transfers since it does not have information on the income of the adult couple or on the characteristics or income of the in-laws.)

We construct our sample used for estimation follows. First, we include only couples where each spouse has at least one living parent. Second, we do not use data on couples who co-reside with parents since it is not possible to determine the level and direction of the transfers within such a family. Third, only couples whose head is less than or equal to 40 years old are included, to allow for older couples’ transfer behavior to be affected more by tradition. Fourth, we exclude couples where the husband is a first son because tradition dictates that such sons have greater responsibility toward their parents than other children. Summary statistics for our sample are presented in Table 4. The table shows that the net average transfer to the husbands’ parents is greater than the net average transfer to the wife’s parents. Further, the husbands and wives have a similar average education but, on average, the wife is almost two years younger than the husband. Further, we see that the adult children’s family income is almost twice of that of the parents’ average family income. Finally, the wife’s parents have, on average, higher education and higher income than the husband’s parents.

[Table 4 here.]

6. Estimation Results

When we estimated our model, we found that the data were not rich enough to support precise estimates of the fixed costs $K$. Instead, we set $K = \text{₩}100,000$, but also checked the robustness of our estimates to assuming $K = \text{₩}50,000$. As noted above, we use the bootstrap method (by couple) to obtain consistent standard errors. Table 5 reports the parameter estimates that determine

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20 We use those in KLoSA who have at least one married child who does not live with them.
21 \text{₩}100,000 equaled approximately US$100 in 2004.
the husband’s bargaining power \( \mu^h(X_i) \) for three specifications of \( X_i \): the husband’s and wife’s education; the husband’s and wife’s age and both education and age for the husband and wife. Interestingly, all relevant specifications imply that the husband’s bargaining power is significantly increasing in his education and his wife’s age, and significantly decreasing in her education and his age. As discussed above, our estimated age coefficients suggest that bargaining power depends both on age and potential wages in Korea. As a robustness check, we also estimate the model for \( K = \text{₩}50,000 \). The results are presented in Table 6 and are very similar to those in Table 5.

[Table 5 here.]

We predict the husband’s bargaining power for the nine cases where the husband and wife’s bargaining power each take on 3 possible values: 16 years of schooling (high education); 14 years of schooling (middle education), and 12 years of schooling (low education). (In this exercise we assume that the husband’s and wife’s ages are always equal to the sample mean values of 34.56 and 32.32 years respectively.) The results for \( K = \text{₩}100,000 \), reported in Table 7, indicate that husbands have slightly (and statistically significantly) less bargaining power than their wives for all of the nine combinations of education levels; when husbands and wives have the medium level of education, the husband’s relative bargaining power is estimated at 0.4480 with a standard error of 0.010. Our results are consistent with Korean survey data on attitudes towards bargaining power. Specifically, the “Korean Value Survey” asks ‘who should have more bargaining power between husband and wife when determining support for parents,’ and reports that over our sample period, at least 80% of respondents felt that husbands and wives should have equal bargaining power when determining monetary transfers to their parents.\(^{22}\) Of course what people claim they believe and what they actually do is not necessarily consistent, but our estimate of nearly equal bargaining power between the husband and wife is qualitatively consistent with popular opinion in Korea over this period.

\(^{22}\) This Survey has been conducted in 1996, 2001, 2006, and 2008.
The husband’s bargaining power estimate increases by about 0.014 when his education increases from the low to middle level and by about 0.010 when it increase from the middle to high level. Further, the husband’s bargaining power falls by about 0.014 both when his wife’s education increases from low to middle and when it increases from middle to high. The analogous results for $K = ¥50,000$ are presented in Table 8 and again are very similar to those in Table 7.

[Table 7 here.]

[Table 8 here.]

We next consider the husband’s bargaining power when the husband’s and wife’s ages can take on three values. For the husband we use: 38 years - husband’s high age; 35 years - husband’s middle age; and 32 years - husband’s low age. For the wife’s we use: 35 years - wife’s high age; 32 years - wife’s middle age; and 29 years - wife’s low age. (Now we assume that the husband’s and wife’s schooling take on the mean levels of 13.68 years and 13.12 years respectively.) The results for $K = ¥100,000$, reported in Table 9, indicate that the estimated husband’s bargaining power decreases by about 0.03 both when his age increases from low to middle, and when it increases from middle to high. Further, we estimate that the husband’s bargaining power rises by about 0.03 both when his wife’s age increases from low to middle age and when it increases from middle to high. The results for $K = ¥50,000$ are presented in Table 10 and again are very similar to those in for $K = ¥100,000$.

[Table 9 here.]

[Table 10 here.]

Finally, in Table 11, we consider the effect of an extra ¥6,000 in income to any of the parties on the consumption of the couple, the husband’s parents, and the wife’s parents.²³ Because our model has income pooling, any additional income to any party will be allocated across the three

²³ We use the parameter estimates for $K = ¥100,000$ in Table 11. The results when we use the parameter estimates based on $K = ¥50,000$ are very similar and thus are omitted to save space.
agents independent of which party receives the extra income. We see that an increase in the wife’s bargaining power relative to the husband’s has only a small effect on how much of an increase in income her parents receive relative to the husband’s parents. Moreover, we see that the couple consumes approximately one-half of the additional income, and each set of parents consumes about approximately one-quarter of the increase in income.

[Table 11 here.]

A natural question is how our estimated transfer functions compare to those estimated in previous work. In terms of previous work on transfers from adult children to their parents, Raut and Tran’s (2005) model of transfers is the closest to ours; recall that in stage 2 they consider only transfers from the children to their parents. They estimate that a child will transfer approximately 50% of any extra income to his parents. In other words, if a couple gets an extra 6,000 and splits it 50-50 between them, in RT each partner will keep approximately 1,500 and give 1,500 to his or her parents. Thus, the couple will keep 3,000 and give 1,500 to each set of parents, which is approximately the same allocation that our model predicts. On the other hand, our estimate (and RT’s) of the couple transferring 50% of an increase in income to their parents is larger than Kazianga’s estimate that a family will only transfer out 24% of an increase in income to all family members, including parents. This difference in estimated transfer functions may reflect differences in specification, estimation error, or cultural differences between Burkina Faso and Korea.

Of course, one may ask whether a model that involves each set of parents transferring away 75% of any increase in income is reasonable. However, we would argue that the transfers from one set of parents to the other set are better viewed as insurance. Consider the husband’s parents: 50%}

---

24 Specifically, this is based on their preferred estimate using the Altonji-Ichimura approach.
25 This is the largest estimate calculated using splines for the 3rd income quartile for urban area in 1998. See Table 6 in Kazianga (2006).
26 Kazianga’s estimate has a standard error of only 5.1% but, as we argue above, we expect his standard errors to be biased downward.
of an increase in their income goes to the adult children and 25% goes to the wife's parents; however, sending 25% of the income increase to the wife's parents is compensated by the fact that they will receive 25% of any increase in income that the wife's parent's experience. For example, suppose each set of parents has an increase in income of ₩3,000. Then, in our model, each set of parents will increase their consumption by approximately ₩1,500, or by 50% of the increase in income, which we believe is reasonable. (They each transfer the other ₩1,500 to their children.)

7. Conclusion

We estimate a model of family bargaining that determines transfers to and from an adult couple and both sets of their parents using panel data from South Korea. An exactly identifying assumption in the model is that husbands and wives share the same degree of altruism and we present experimental data for Korea and the U.S. which suggests that this is a reasonable assumption. We specify that the bargaining power between the husband and wife depends in an unrestricted way on their age and education; this specification is consistent with a model where bargaining power depends only on potential wages, as well as a model where education and age also play a role.

We precisely estimate the determinants of bargaining power, and that, at mean values, husbands have slightly (but statistically significantly) less bargaining power than their wives; this approximate equality in bargaining power is consistent with sentiments given in Korean survey data. Moreover, the husband’s bargaining power is (statistically significantly) increasing in his education and his wife’s age, and (also significantly) decreasing in her education and his age. These results support a model where bargaining power depends on age as well as potential wages, which is consistent with Lee and Ham’s (2012) results for expected utility when single in the Korean marriage market. Consistent with RT’s work, we find that adult children transfer approximately 50% of any increase in income to their parents, with 25% of the increase going to each set of parents.
Our paper makes several other contributions to the transfer and family bargaining literature. First, we are the first paper to consider two-way transfers between an adult couple and both sets of parents. Second, we obtain consistent estimates of the standard errors for our estimated parameters, while this has not always been true in this literature. Third, we use an outcome measure that is arguably closer to semi-private consumptions.

In future research, it would be very useful to consider dynamic models, such as that in Mazzocco (2007). The current version of KLIPS is probably too short for us to estimate such a model, but it will be interesting to investigate this possibility as future waves of KLIPS become available.
References


Appendix A: The Overall Likelihood Function

Since we assume that error terms in (19) are bivariate normally distributed, we can construct likelihood function by combining the contribution of the likelihood function of each transfer pattern. $T_{ht}^{hp}$ and $T_{ht}^{wp}$ in (19) can be positive or negative or zero. Hence, we have total 9 cases. For the case where $T_{ht}^{hp} > 0$ and $T_{ht}^{wp} > 0$, the density for this event is

$$f(T_{ht}^{hp}, T_{ht}^{wp}) = n_2(v_0; 0, \Sigma),$$

where $n_2(v_0; 0, \Sigma)$ is the bivariate normal density with zero means and covariance matrix $\Sigma$, and the error terms $v_0 = (v_{ht}^{hp}, v_{ht}^{wp})$ are defined in (19); in other words this is the standard regression contribution to the likelihood function with normally distributed error terms. In the same way, the contribution of the likelihood function of the other eight cases are shown below

$$L(T_{ht}^{hp}, T_{ht}^{wp}) = \prod_{i=1}^{N} \prod_{t=1}^{T} \left[ n_2(v_0; 0, \Sigma) \right]^{(T_{ht}^{hp}, T_{ht}^{wp}) > 0} \left[ \int_{-z_{2\alpha}}^{z_{2\alpha}} n_2(v_0; 0, \Sigma) dv_{ht}^{hp} \right]^{(T_{ht}^{hp}, T_{ht}^{wp}) = 0} \left[ \int_{-z_{2\alpha}}^{z_{2\alpha}} n_2(v_0; 0, \Sigma) dv_{ht}^{wp} \right]^{(T_{ht}^{hp}, T_{ht}^{wp}) > 0} \left[ \int_{-z_{2\alpha}}^{z_{2\alpha}} n_2(v_0; 0, \Sigma) dv_{ht}^{wp} \right]^{(T_{ht}^{hp}, T_{ht}^{wp}) = 0} \left[ \int_{-z_{2\alpha}}^{z_{2\alpha}} n_2(v_0; 0, \Sigma) dv_{ht}^{hp} \right]^{(T_{ht}^{hp}, T_{ht}^{wp}) < 0} \left[ \int_{-z_{2\alpha}}^{z_{2\alpha}} n_2(v_0; 0, \Sigma) dv_{ht}^{hp} \right]^{(T_{ht}^{hp}, T_{ht}^{wp}) < 0} \left[ \int_{-z_{2\alpha}}^{z_{2\alpha}} n_2(v_0; 0, \Sigma) dv_{ht}^{wp} \right]^{(T_{ht}^{hp}, T_{ht}^{wp}) < 0} \left[ \int_{-z_{2\alpha}}^{z_{2\alpha}} n_2(v_0; 0, \Sigma) dv_{ht}^{wp} \right]^{(T_{ht}^{hp}, T_{ht}^{wp}) < 0}.$$

where $Z_{1ht}^{wp} = -(1 - \mu^h(X))\theta(Y_{ht}^{hp} + Y_{ht}^{wp} + Y_{ht}^{wp}) + K$, $Z_{2ht}^{wp} = -(1 - \mu^h(X))\theta(Y_{ht}^{hp} + Y_{ht}^{wp} + Y_{ht}^{wp}) - K$. 

32
\[ Z_{3u}^{hp} = -\mu^h(X)\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} + K, \]

\[ Z_{4u}^{hp} = -\mu^h(X)\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} - K, \]

\[ Z_{5u}^{wp} = -(1 - \mu^h(X))\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{wp} + K, \]

\[ Z_{6u}^{wp} = -(1 - \mu^h(X))\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{wp} - K, \]

\[ Z_{7u}^{hp} = -\mu^h(X)\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} + K, \]

\[ Z_{8u}^{hp} = -\mu^h(X)\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} - K, \]

\[ Z_{9u}^{hp} = -\mu^h(X)\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} + K, \]

\[ Z_{10u}^{hp} = -\mu^h(X)\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} - K, \]

\[ Z_{11u}^{wp} = -(1 - \mu^h(X))\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{wp} - K, \]

\[ Z_{12u}^{wp} = -(1 - \mu^h(X))\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{wp} - K. \]
Appendix B: Our Bootstrap Procedure for Obtaining Standard Errors

We use the bootstrap with 500 replications to obtain the standard errors. Each bootstrap replication involves:

1. Choose a new bootstrap cross-section sample in KLoSA;
2. Estimate both parents’ income equations from the KLoSA replication sample;
3. Choose a new bootstrap sample of family histories from KLIPS, i.e. resample by families, not by family-year observations;
4. Impute parent’s income for the KLIPS families.
5. Predict the couple’s income and substitute all predicted values into the transfer functions.
6. Remaximize the quasi-likelihood for the bootstrap sample.
Table 1
Income Sources for the Elderly in 1995 (Age ≥ 60) in Percentages

<table>
<thead>
<tr>
<th>Income source</th>
<th>Korea</th>
<th>Taiwan</th>
<th>Japan</th>
<th>U.S.</th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor income</td>
<td>26.6</td>
<td>15.2</td>
<td>21.6</td>
<td>15.5</td>
<td>4.6</td>
</tr>
<tr>
<td>Financial income</td>
<td>9.9</td>
<td>18.6</td>
<td>6.6</td>
<td>23.3</td>
<td>13.7</td>
</tr>
<tr>
<td>Private transfer</td>
<td>56.6</td>
<td>40.3</td>
<td>6.6</td>
<td>1.6</td>
<td>1.9</td>
</tr>
<tr>
<td>Public pension</td>
<td>6.6</td>
<td>26.1</td>
<td>57.4</td>
<td>55.8</td>
<td>77.6</td>
</tr>
</tbody>
</table>


Note:
The data of Taiwan is the percentage of consumption source of the elderly over 65 in 1998.
Table 2  
The Percentage Distribution of Household by Type of Net Transfers

<table>
<thead>
<tr>
<th>Year</th>
<th>To Both sets of parents</th>
<th>Only to Husband’s parents</th>
<th>Only to Wife’s Parents</th>
<th>To Neither parents</th>
<th>Receive Net Transfer from parents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>37</td>
<td>16</td>
<td>3</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>(2.57)</td>
<td>(1.96)</td>
<td>(.96)</td>
<td>(2.26)</td>
<td>(2.13)</td>
</tr>
<tr>
<td>2002</td>
<td>38</td>
<td>18</td>
<td>4</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>(2.57)</td>
<td>(2.03)</td>
<td>(1.03)</td>
<td>(2.14)</td>
<td>(2.09)</td>
</tr>
<tr>
<td>2003</td>
<td>37</td>
<td>11</td>
<td>3</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>(2.41)</td>
<td>(1.59)</td>
<td>(.78)</td>
<td>(2.14)</td>
<td>(2.15)</td>
</tr>
<tr>
<td>2004</td>
<td>44</td>
<td>14</td>
<td>2</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>(2.56)</td>
<td>(1.79)</td>
<td>(.74)</td>
<td>(2.00)</td>
<td>(2.09)</td>
</tr>
<tr>
<td>2005</td>
<td>44</td>
<td>11</td>
<td>4</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>(2.61)</td>
<td>(1.67)</td>
<td>(.98)</td>
<td>(2.17)</td>
<td>(2.08)</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>14</td>
<td>3</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>(1.49)</td>
<td>(.97)</td>
<td>(.44)</td>
<td>(1.21)</td>
<td>(1.23)</td>
</tr>
</tbody>
</table>

Source: Calculated by the authors using KLIPS (2001-2005).

Notes:

(1) First-born sons and heads older than 40 are excluded.

(2) Standard errors are in parentheses.
### Table 3
Real (2004 ₩) Transfer Amounts for Households with Transfers to Both Parents

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Transfer to Husband's parents</th>
<th>Transfer to Wife's parents</th>
<th>Couple's Household income</th>
<th>Ratio*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>130</td>
<td>102.76</td>
<td>61.40</td>
<td>3024.52</td>
<td>6.47%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10.64)</td>
<td>(5.57)</td>
<td>(129.09)</td>
<td>(.73)</td>
</tr>
<tr>
<td>2002</td>
<td>137</td>
<td>132.82</td>
<td>86.03</td>
<td>3542.07</td>
<td>6.46%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(14.32)</td>
<td>(12.31)</td>
<td>(173.89)</td>
<td>(.53)</td>
</tr>
<tr>
<td>2003</td>
<td>149</td>
<td>116.68</td>
<td>71.36</td>
<td>3501.00</td>
<td>6.13%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(9.44)</td>
<td>(6.02)</td>
<td>(151.60)</td>
<td>(.48)</td>
</tr>
<tr>
<td>2004</td>
<td>168</td>
<td>118.59</td>
<td>69.30</td>
<td>3844.25</td>
<td>5.18%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(11.28)</td>
<td>(5.90)</td>
<td>(166.67)</td>
<td>(.35)</td>
</tr>
<tr>
<td>2005</td>
<td>159</td>
<td>123.98</td>
<td>87.23</td>
<td>3674.20</td>
<td>5.64%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12.95)</td>
<td>(13.50)</td>
<td>(145.72)</td>
<td>(.41)</td>
</tr>
<tr>
<td>Total</td>
<td>729</td>
<td>119.21</td>
<td>75.25</td>
<td>3539.88</td>
<td>5.93%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(7.00)</td>
<td>(5.02)</td>
<td>(104.14)</td>
<td>(.25)</td>
</tr>
</tbody>
</table>

Source: Calculated by the authors using KLIPS (2001-2005).

See notes to Table 2.

(1) Transfer amount is measured in tens of thousands of Korean Won (₩). ₩10,000 is approximately U$10 in 2004.

* Ratio = (Column 1 + Column 2) / Column 3.
<table>
<thead>
<tr>
<th>Variables</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer to husband's parents</td>
<td>72.80</td>
<td>(4.12)</td>
</tr>
<tr>
<td>Transfer to wife's parents</td>
<td>40.25</td>
<td>(4.17)</td>
</tr>
<tr>
<td>Transfer from husband's parents</td>
<td>16.50</td>
<td>(2.01)</td>
</tr>
<tr>
<td>Transfer from wife's parents</td>
<td>15.80</td>
<td>(2.06)</td>
</tr>
<tr>
<td>Couple's household income</td>
<td>3114</td>
<td>(67.60)</td>
</tr>
<tr>
<td>Husband's parents' imputed income</td>
<td>1319</td>
<td>(36.26)</td>
</tr>
<tr>
<td>Wife's parents' imputed income</td>
<td>1646</td>
<td>(42.08)</td>
</tr>
<tr>
<td>Husband’s years of education</td>
<td>13.68</td>
<td>(.0980)</td>
</tr>
<tr>
<td>Wife’s years of education</td>
<td>13.12</td>
<td>(.0851)</td>
</tr>
<tr>
<td>Husband’s age</td>
<td>34.57</td>
<td>(.0862)</td>
</tr>
<tr>
<td>Wife’s age</td>
<td>32.33</td>
<td>(.0885)</td>
</tr>
</tbody>
</table>

Observation 1854

Notes:
(1) First-born sons and heads older than 40 excluded.
(2) Zero transfers are included; transfers are in real (2004) $.
(3) Standard errors are in parentheses.
Table 5  
The Determinants of the Husband’s Bargaining Power $\mu^h$ for $K=₩100,000$

<table>
<thead>
<tr>
<th></th>
<th>Specification 1</th>
<th>Specification 2</th>
<th>Specification 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.1228</td>
<td>-.3735</td>
<td>-.3889</td>
</tr>
<tr>
<td></td>
<td>(.1836)</td>
<td>(.6068)</td>
<td>(.7354)</td>
</tr>
<tr>
<td>Husband’s Education</td>
<td>.0237*</td>
<td>.0279**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0128)</td>
<td>(.0129)</td>
<td></td>
</tr>
<tr>
<td>Wife’s Education</td>
<td>-.0294***</td>
<td>-.0287***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0112)</td>
<td>(.0109)</td>
<td></td>
</tr>
<tr>
<td>Husband’s age</td>
<td>-.0390***</td>
<td>-.0397***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0100)</td>
<td>(.0100)</td>
<td></td>
</tr>
<tr>
<td>Wife’s age</td>
<td>.0475***</td>
<td>.0484***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0135)</td>
<td>(.0145)</td>
<td></td>
</tr>
</tbody>
</table>

Notes:

(1) Bootstrapped standard errors are in parentheses. Resampling is by household and 500 replications are used - see Appendix B.

(2) *** p<0.01, ** p<0.05, * p<0.1.
<table>
<thead>
<tr>
<th></th>
<th>Specification 1</th>
<th>Specification 2</th>
<th>Specification 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.1242</td>
<td>-.3636</td>
<td>-.3796</td>
</tr>
<tr>
<td></td>
<td>(.1880)</td>
<td>(.6109)</td>
<td>(.7396)</td>
</tr>
<tr>
<td>Husband's Education</td>
<td>.0238*</td>
<td>.0279**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0131)</td>
<td>(.0130)</td>
<td></td>
</tr>
<tr>
<td>Wife's Education</td>
<td>-.0294***</td>
<td>-.0288***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0117)</td>
<td>(.0109)</td>
<td></td>
</tr>
<tr>
<td>Husband's age</td>
<td>-.0392***</td>
<td>-.0399***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0101)</td>
<td>(.0101)</td>
<td></td>
</tr>
<tr>
<td>Wife's age</td>
<td>.0474***</td>
<td>.0483***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.0136)</td>
<td>(.0146)</td>
<td></td>
</tr>
</tbody>
</table>

Note:
See notes to Table 5.
Table 7
The Husband’s Bargaining Power $\mu^h$ for Various Levels of Education for the Husband and Wife for $K=₩100,000$

<table>
<thead>
<tr>
<th>Wife’s Education</th>
<th>Husband’s High Education</th>
<th>Husband’s Middle Education</th>
<th>Husband’s Low Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Education</td>
<td>.4476 (.0102)</td>
<td>.4339 (.0118)</td>
<td>.4202 (.0159)</td>
</tr>
<tr>
<td>Middle Education</td>
<td>.4617 (.0096)</td>
<td>.4480 (.0100)</td>
<td>.4343 (.0137)</td>
</tr>
<tr>
<td>Low Education</td>
<td>.4762 (.0117)</td>
<td>.4623 (.0108)</td>
<td>.4484 (.0133)</td>
</tr>
</tbody>
</table>

Notes:
1. Parameters from Column 3, Table 5 are used to predict the husband’s bargaining power. The husband’s age and wife’s age are evaluated at their mean values (husband’s age=34.56, wife’s age=32.32).
2. High Education: 16 years of schooling (College graduate), Middle Education: 14 years of schooling, Low Education: 12 years of schooling (High School graduate).
3. Standard errors are in parentheses. The delta method is used to compute standard errors.
### Table 8

The Husband’s Bargaining Power $\mu^h$ for Various Levels of Education for the Husband and Wife for $K=₩50,000$

<table>
<thead>
<tr>
<th>Wife’s Education</th>
<th>Husband’s High Education</th>
<th>Husband’s Middle Education</th>
<th>Husband’s Low Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Education</td>
<td>.4474</td>
<td>.4337</td>
<td>.4200</td>
</tr>
<tr>
<td></td>
<td>(.0103)</td>
<td>(.0119)</td>
<td>(.0160)</td>
</tr>
<tr>
<td>Middle Education</td>
<td>.4617</td>
<td>.4479</td>
<td>.4341</td>
</tr>
<tr>
<td></td>
<td>(.0096)</td>
<td>(.0100)</td>
<td>(.0137)</td>
</tr>
<tr>
<td>Low Education</td>
<td>.4760</td>
<td>.4612</td>
<td>.4483</td>
</tr>
<tr>
<td></td>
<td>(.0117)</td>
<td>(.0108)</td>
<td>(.0134)</td>
</tr>
</tbody>
</table>

Notes:
Parameters from Column 3, Table 6 are used to predict the husband’s bargaining power.

See notes to Table 7.
Table 9
The Husband’s Bargaining Power $\mu^h$ for Various Ages of the Husband and Wife for $K=¥100,000$

<table>
<thead>
<tr>
<th></th>
<th>Husband’s High Age</th>
<th>Husband’s Middle Age</th>
<th>Husband’s Low Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wife’s High Age</td>
<td>.4504</td>
<td>.4800</td>
<td>.5098</td>
</tr>
<tr>
<td></td>
<td>(.0122)</td>
<td>(.0103)</td>
<td>(.0132)</td>
</tr>
<tr>
<td>Wife’s Middle Age</td>
<td>.4147</td>
<td>.4439</td>
<td>.4735</td>
</tr>
<tr>
<td></td>
<td>(.0114)</td>
<td>(.0106)</td>
<td>(.0143)</td>
</tr>
<tr>
<td>Wife’s Low Age</td>
<td>.3800</td>
<td>.4084</td>
<td>.4375</td>
</tr>
<tr>
<td></td>
<td>(.0179)</td>
<td>(.0184)</td>
<td>(.0214)</td>
</tr>
</tbody>
</table>

Notes:
1. Parameters from Column 3, Table 5 are used to predict the husband’s bargaining power. The husband’s education and wife’s education are evaluated at their mean values (husband’s education=13.68, wife’s education=13.12).
2. Husband’s High Age: 38, Husband’s Middle Age: 35, Husband’s Low Age: 32.
4. Standard errors are in parentheses. The delta method is used to compute standard errors.
Table 10
The Husband’s Bargaining Power $\mu^h$ for Various Ages of the Husband and Wife for $K=₩50,000$

<table>
<thead>
<tr>
<th></th>
<th>Husband's High Age</th>
<th>Husband's Middle Age</th>
<th>Husband's Low Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wife's High Age</td>
<td>.4500 (.0123)</td>
<td>.4798 (.0104)</td>
<td>.5097 (.0133)</td>
</tr>
<tr>
<td>Wife's Middle Age</td>
<td>.4144 (.0114)</td>
<td>.4438 (.0106)</td>
<td>.4735 (.0144)</td>
</tr>
<tr>
<td>Wife's Low Age</td>
<td>.3797 (.0179)</td>
<td>.4083 (.0184)</td>
<td>.4375 (.0215)</td>
</tr>
</tbody>
</table>

Notes:
Parameters from Column 3, Table 6 are used to predict the husband’s bargaining power.

See notes to Table 9.
Table 11
The Allocation of an Extra ₦6,000 of Pooled Income across the Consumption of the Couple, the Husband's Parents and the Wife’s Parents for Different Levels of Bargaining Power

(a) The Husband has High Education and the Wife has High Education

<table>
<thead>
<tr>
<th>Couple’s Consumption</th>
<th>Husband’s Parents’ Consumption</th>
<th>Wife’s Parents’ Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,095 (44.50)</td>
<td>1,336 (34.26)</td>
<td>1,649 (38.61)</td>
</tr>
</tbody>
</table>

(b) The Husband has High Education and the Wife has Middle Education

<table>
<thead>
<tr>
<th>Couple’s Consumption</th>
<th>Husband’s Parents’ Consumption</th>
<th>Wife’s Parents’ Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,095 (44.50)</td>
<td>1,378 (33.09)</td>
<td>1,606 (37.24)</td>
</tr>
</tbody>
</table>

(c) The Husband has High Education and the Wife has Low Education

<table>
<thead>
<tr>
<th>Couple’s Consumption</th>
<th>Husband’s Parents’ Consumption</th>
<th>Wife’s Parents’ Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,095 (44.50)</td>
<td>1,421 (39.19)</td>
<td>1,563 (42.44)</td>
</tr>
</tbody>
</table>

(d) The Husband has Middle Education and the Wife has High Education

<table>
<thead>
<tr>
<th>Couple’s Consumption</th>
<th>Husband’s Parents’ Consumption</th>
<th>Wife’s Parents’ Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,095 (44.50)</td>
<td>1,295 (37.32)</td>
<td>1,690 (43.03)</td>
</tr>
</tbody>
</table>

(e) The Husband has Middle Education and the Wife has Middle Education

<table>
<thead>
<tr>
<th>Couple’s Consumption</th>
<th>Husband’s Parents’ Consumption</th>
<th>Wife’s Parents’ Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,095 (44.50)</td>
<td>1,337 (32.65)</td>
<td>1,647 (38.83)</td>
</tr>
</tbody>
</table>
Table 11 (Continued)

(f) The Husband has Middle Education and the Wife has Low Education

<table>
<thead>
<tr>
<th>Couple’s Consumption</th>
<th>Husband’s Parents’ Consumption</th>
<th>Wife’s Parents’ Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,095 (44.50)</td>
<td>1,380 (35.36)</td>
<td>1,605 (40.89)</td>
</tr>
</tbody>
</table>

(g) The Husband has Low Education and the Wife has High Education

<table>
<thead>
<tr>
<th>Couple’s Consumption</th>
<th>Husband’s Parents’ Consumption</th>
<th>Wife’s Parents’ Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,095 (44.50)</td>
<td>1,254 (48.13)</td>
<td>1,730 (53.91)</td>
</tr>
</tbody>
</table>

(h) The Husband has Low Education and the Wife has Middle Education

<table>
<thead>
<tr>
<th>Couple’s Consumption</th>
<th>Husband’s Parents’ Consumption</th>
<th>Wife’s Parents’ Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,095 (44.50)</td>
<td>1,296 (41.97)</td>
<td>1,688 (48.39)</td>
</tr>
</tbody>
</table>

(i) The Husband has Low Education and the Wife has Low Education

<table>
<thead>
<tr>
<th>Couple’s Consumption</th>
<th>Husband’s Parents’ Consumption</th>
<th>Wife’s Parents’ Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,095 (44.50)</td>
<td>1,388 (41.25)</td>
<td>1,646 (47.63)</td>
</tr>
</tbody>
</table>

Notes: The consumption is measured in real (2004) $\,$. See notes to Table 7.
Figure 1: Inter-Vivos Transfers to and from the Elderly (Age ≥50)