The Determinants of Bargaining Power in an Empirical Model of Transfers between Adult Children, Parents, and In-Laws for South Korea

John C. Ham
University of Maryland and National University of Singapore
IFAU, IFS, IRP (Madison) and IZA

Heonjae Song
University of Seoul

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* Corresponding author: John Ham, john.ham.econ@gmail.com. We thank Xiaochen Bian, Eleanor Choi, Monica Das Gupta, Hanan Jacoby, Tarun Jain, John Kagel, Saima Kahn, Sooyhung Lee, Maurizio Mazzocco, Jeffrey Nugent, Aloysius Siow, John Strauss, Naomi Utgoff and Lise Vesterlund for many important conversations and comments, as well as and seminar participants at the Korea Development Institute, Korea Institute for International Economic Policy, Korea Institute of Public Finance, Korea Labor Institute, Maryland, NEUDC (2009), the Seoul Summer Economics Conference at Seoul National University (2010), the Econometric Society World Congress (2010) and USC for helpful comments. Two anonymous referees and a Co-Editor made numerous comments that substantially improved the paper. We would also like to thank Professor H. Kazianga for providing us with his computer program. Ham’s research was partially supported by the NSF. We are responsible for all errors, and this paper reflects the views of the authors and in no way represents the views of the NSF.
ABSTRACT

We derive a bargaining model of family transfers between adult children and their parents, and then estimate the model using data from South Korea. Our analysis extends the literature on family bargaining by addressing two existing problems in the bargaining literature. First, the existing literature examines goods that both spouses care about, such as spending on children, making it difficult to separate taste parameters from bargaining parameters. Second, authors often need to make strong assumptions on preferences to identify and estimate their model. We address these problems in the following manner. First, we argue that transfers from the couple represent semiprivate consumption, e.g. it is plausible that the wife cares more about her parents than about the husband’s parents, and vice-versa. Second, we use results from laboratory experiments to help identify the model.

We find that women have slightly more bargaining power than men in the couple’s decision making, and that this is consistent with responses to nationwide surveys in Korea over this period. We also find that when an adult child receives an extra dollar of income, she transfers half of it to her parents; this result is consistent with that in Raut and Tran (2005). Finally, we reject the null hypothesis that bargaining power within the family depends only on the potential wage of each spouse.
1. Introduction

There is a large and rapidly growing empirical literature on estimating models of family decision making; see, e.g., Browning, Bourguignon, Chiappori and Lechene (1994), Behrman and Rosenzweig (2006), Blundell, Chiappori, Magnac and Meghir (2007), and Mazzocco (2007). Here we argue that this literature can be improved in three ways. First, many papers examine goods that both spouses care about, such as spending on children, clothing or leisure/home production by each spouse. For example, Rubalcava and Thomas (2000) and Lundberg, Pollak and Wales (1996) use expenditure on children’s food and children’s clothing respectively. Browning et al. (1994) considers each partner’s consumption of clothing. The leisure activities of the marital partners are other important subjects to analyze. There have been numerous studies using this measure, including Chiappori, Portin, and Lacroix (2002) and Blundell et al. (2007). Apps and Rees (1997) incorporate home production into a collective model framework. Mazzocco (2007) considers household consumption and saving behavior in a dynamic model. However, as Behrman and Rosenzweig (2006) stress, this makes it difficult to separate taste parameters from bargaining parameters, and they argue forcefully that researchers use a measure of semiprivate consumption; they proceed by considering a couple’s number of visits to the husband’s parents and wife’s parents as their measures of semiprivate consumptions. We continue and complement their work by using monetary transfers to and from an adult couple to their parents. We argue that such transfers do indeed represent semiprivate consumption, since it is plausible that the wife cares more about her parents than about the husband’s parents, and vice-versa.

Further, structural econometric models of bargaining power often have to identify the parameters of interest by making arbitrary assumptions on preferences. For example, Behrman and Rosenzweig (2006) must assume that men and women have an equal degree of altruism. This

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1 See Del Boca, Flinn and Wiswall (2013) and the papers cited therein for a somewhat different approach to family decision making.
assumption is also an exactly identifying one in our main model, but the question remains as to whether it is a reasonable one. To investigate this, we examine evidence from the experimental economics literature on the relative altruism of men and women; here Andreoni, Harbaugh and Vesterlund (2007) find that, among their American subjects, men and women do indeed have equal altruism. Under an assumption of equal altruism, we estimate male bargaining power equal to 0.4646, with a 95% confidence interval [0.4482, 0.4811]; since this is significantly less than 0.5, we can reject the null hypothesis of equal bargaining power.

Of course, Koreans may have different altruism parameters than Americans, so we also consider the experimental evidence in Johnson et al. (1989), which is applicable to the very Korean cohort that we study here. Johnson et al. (1989) results imply that the ratio of the male altruism parameter to the female altruism parameter is 1.0615 with a 95% confidence interval of [1.003, 1.120], and thus one (barely) rejects the null hypothesis of equal altruism. With unequal altruism, our estimate of male bargaining power is a function of our estimated parameters, the ratio of male and female altruism, and two other parameters we must calibrate. Conditional on these two other parameters, we can obtain a point estimate and confidence interval for male bargaining power that incorporates estimation error both in the parameters we estimate from our data and in the parameter taken from Johnson et al. Then, for a range of reasonable values of the calibrated parameters, we present the relevant point estimate of male bargaining power and its standard error. For all values of the calibrated parameters we reject the null hypothesis of equal bargaining power in favor of the alternative that men have less bargaining power.

Our paper also extends the work of Kazianga (2006) and Raut and Tran (2005) on intergenerational transfers in developing countries by considering transfers between a married couple and both sets of parents. Raut and Tran found that, for Indonesia, adult children transfer about half of any increase in income to their parents, and our results are consistent with their results.
Kazianga made an extensive investigation of the motives for household private transfers in Burkina Faso. However, he did not try to impute the donor or recipient’s missing income in his data and just considered omitted variable bias. In contrast, we impute (missing) parents’ income by using a second data set.

Finally, our results have implications for reducing the fraction of the Korean elderly living in poverty. Korea has the one of the best records in terms of this fraction among OECD when only family transfers are considered, but the poorest performance among the OECD countries when both family and government transfers are taken into account. Thus, it would seem that significant change will come only with increased government expenditure on the elderly. However, when choosing the level of increased expenditure, the government needs to take into account that if it transfers ₩100,000 to each elderly person, our results indicate that the children will claw back half of this increase.

2. Within-Family Transfers, Tradition, and Institutional Features in South Korea

Because structural models are abstract approximations of reality, it is important to consider whether it is reasonable to use such a given model in a particular empirical context. In this section we attempt to describe the environment in Korea with regard to intergenerational transfers to help readers make this assessment concerning our model. We first review the basic facts on within-family transfers in Korea, where, unlike many developed countries, transfers tend to flow from the children to the parents. We then discuss Korean beliefs and customs about the nature of parental support. Finally, since such transfers do not take place in a vacuum, we also consider support to the elderly from the government.
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 as to make one.2

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, focusing 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.

2 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 intergenerational 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 column 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 dropped, 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 couple’s before-tax household income is allocated to transfers to the parents. This amount is

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3 As we discuss below, social norms in Korea dictate that men in these groups have special responsibilities to their parents.
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 including only 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,

4 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.
citizens need to show that their imputed total income is lower than the minimum cost of living as 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 such support. Further, daughters have the same degree of responsibility toward their parents as their male siblings under Korean law. That children are doing a good job of supporting their parents is illustrated by the fact that before considering public transfers, Korea ranks 23rd among 25 OCED countries in terms of the fraction of the elderly in poverty, i.e. has the third lowest fraction. However, after considering public transfers, Korea ranks 1st (worst) among OCED countries in terms of the fraction of elderly in poverty, reflecting a very low level (relative to other OECD countries) of government support – see OECD (2011).

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

In sections 3.1 and 3.2 we consider a Nash bargaining problem between a married couple and each set of parents, keeping in mind the institutional features described in section 2. Under the assumption of equal altruism on the part of men and women, we are able to obtain closed form transfer functions between the adult couple and both sets of parents, which is a function of the relative bargaining power of the husband compared to his wife and the respective incomes of the three parties. (Behrman and Rosenzweig (2006) also make this equal altruism assumption for men and women.) In section 3.3 we discuss the reasonableness of the equal altruism assumption that
exactly identifies our model by drawing on experimental evidence for the US and Korea; to the best of our knowledge, this is the first attempt to identify (or to justify an exactly identifying assumption) a structural model by drawing on experimental evidence. We find that US results support the equal altruism assumption, while the Korean data suggest that men may be slightly more altruistic. Below we expand our model to allow for unequal altruism. Finally, we discuss in section 3.4 how we will conduct a sensitivity analysis for the estimate of the husband’s bargaining power to reasonable values of the other parameters that appear, but are not identified, when we have unequal altruism values of the relative altruism that are consistent with the 95% confidence interval for Korean estimates. To forecast our results, below we find that our estimates of relative bargaining power are remarkably insensitive to varying the ratio of male to female altruism in a reasonable way.

**3.1 Basic Setup**

We allow for bargaining both 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 obtain tractable estimating equations, we must keep our specification of preferences and bargaining power relatively simple.

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5 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.
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

$$T^{hp} = C^{hp} - Y^{hp},$$

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

$$T^{wp} = C^{wp} - Y^{wp}.$$

We assume that the husband’s preferences are

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

and that the wife’s preferences are

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

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

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

and those of the wife’s parents are

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

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. (Note that we allow for the parents to have altruism parameters different from their children if $k \neq 1$ in (5) and (6).) However, as noted above, we draw on research from Experimental Economics to assess its reasonableness, and also conduct a sensitivity analysis for the case where the husband and wife have different altruism.

When the wife and the husband bargain, the husband has bargaining power given by $0 \leq \mu^b(X) \leq 1$, 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 \(0 \leq \mu^p \leq 1\). 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

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

s.t. \(C^j + C^{hp} = \rho^j + Y^{hp}, j = h, w\).

The first order conditions are

\[
\frac{\mu^p}{C^{hp}} - \frac{\mu^p k\alpha}{\rho^j + Y^{hp} - C^{hp}} = \frac{1 - \mu^p}{\rho^j + Y^{hp} - C^{hp}} + \frac{(1 - \mu^p)\alpha}{C^{hp}} = 0, \quad j = h, w.
\]

From equation (8) we obtain an expression for the consumption of each party as a function of the adult child’s share of the couple’s income \(\rho^j\) and their parents’ income.
\[
C^{j} = \frac{1 + \mu^{p}(k\alpha - 1)}{1 + \alpha + \mu^{p}\alpha(k - 1)}(\rho^{j} + Y^{jp}), \quad j = h, w,
\]

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

We now use (9) to determine how the adult children actually split their joint income by considering the following optimization problem

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

s.t. \quad \rho^{h} + \rho^{w} = Y,

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

\[
\begin{aligned}
&\text{s.t. } \rho^{h} + \rho^{w} = Y,
\end{aligned}
\]

\[
\begin{aligned}
&\rho^{h} = \mu^{h}(X)(Y + Y^{hp}) - (1 - \mu^{h}(X))Y^{hp}, \\
&\rho^{w} = (1 - \mu^{h}(X))(Y + Y^{hp}) - \mu^{h}(X)Y^{wp}.
\end{aligned}
\]

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

\[
\begin{aligned}
&\rho^{h} = \mu^{h}(X)(Y + Y^{hp}) - (1 - \mu^{h}(X))Y^{hp}, \\
&\rho^{w} = (1 - \mu^{h}(X))(Y + Y^{hp}) - \mu^{h}(X)Y^{wp}.
\end{aligned}
\]

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 parents' income. Substituting (11) into (9) yields the optimal consumption levels of the husband's parents, the wife's parents, and the adult children

\[
\begin{aligned}
C^{hp} &= \theta\mu^{h}(X)(Y + Y^{hp} + Y^{wp}), \\
C^{wp} &= \theta(1 - \mu^{h}(X))(Y + Y^{hp} + Y^{wp}), \\
C &= C^{h} + C^{w} = (1 - \theta)(Y + Y^{hp} + Y^{wp}),
\end{aligned}
\]

where \(\theta = \frac{\alpha + \mu^{p}(1 - \alpha)}{1 + \alpha + \mu^{p}\alpha(k - 1)}\).
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 the 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 yields the transfer functions from the children

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

**3.3 The Equal Altruism Assumption**

**3.3.1 Experimental Evidence**

The cleanest evidence of the equal altruism assumption comes from studies on differences in male and female altruism in the US. Specifically, Andreoni, Harbaugh and Vesterlund (2007) argue 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.\(^6\) One may be skeptical of this research given the large role that women play in care-giving for their children and both sets of parents, but this is consistent with a bargaining model where husbands and wives have equal altruism if wives are better caretakers than husbands and/or face

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\(^6\) 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).
lower wages. However, this point indicates that an important avenue of future research will be to consider both time and monetary transfers between adult couples and their parents. Unfortunately, we do not have information on time transfers, so we cannot proceed along these lines here.

There is also Korean evidence on this issue from the psychology literature. 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 male and female 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 6% more altruistic than women. While this point estimate suggests that the assumption of equal altruism may well be reasonable for our cohort, the confidence interval for this parameter is fairly wide.

3.3.2 Optimal Transfers with Unequal Altruism

When we consider unequal altruism parameters between the husband and wife, i.e. $\alpha^h \neq \alpha^w$, we also need to reconsider the parents’ altruism parameters. Assume that the husband’s parents have altruism parameter $k\alpha^h$ and that the wife’s parents have altruism parameter $k\alpha^w$. Then in Appendix A.1 we show that the transfer functions for the children are
\[ T^{hp} = \left[ \phi_1 \mu^h (Y^h + Y^{hp} + Y^{wp}) \right] - Y^{hp}, \]
\[ T^{wp} = \left[ \phi_2 (1 - \mu^h) (Y^h + Y^{hp} + Y^{wp}) \right] - Y^{wp}, \]

where
\[
\phi_1 = \frac{\alpha^h + \mu^p (1 - \alpha^b)}{1 + \alpha^w + \mu^p \alpha^w (k - 1) + \mu^h (\alpha^h - \alpha^w)(1 + \mu^p (k - 1))},
\]
\[
\phi_2 = \frac{\alpha^w + \mu^p (1 - \alpha^w)}{1 + \alpha^w + \mu^p \alpha^w (k - 1) + \mu^h (\alpha^h - \alpha^w)(1 + \mu^p (k - 1))}.
\]

We only have two estimated parameters, \( \hat{\phi_1} \) and \( \hat{\phi_2} \), which depend on all four of the structural parameters, and thus it is not surprising that none of the structural parameters are identified. However, below we show how we can estimate \( \mu^h \) given our estimates of \( \phi_1 \), \( \phi_2 \) and an estimate of \( \kappa = \alpha^h / \alpha^w \) from Johnson et al. (1989) for calibrated values of \( \alpha^h \) and \( \mu^p \). We then calculate point estimates of \( \mu^h \) (and the respective standard errors) for a number of reasonable values of \( \alpha^h \) and \( \mu^p \); our standard errors incorporate estimation error \( \hat{\phi_1} \), \( \hat{\phi_2} \) and \( \hat{\kappa} \).

4. Estimation Strategy and Comparison to Previous Work

For most of this section we consider only the case of equal altruism between the husband and wife; then in section 4.5 we consider the case of unequal altruism.

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

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

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 let bargaining power depend solely on 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 Lee (2009) finds that factors such as age and education affect how well each spouse will do outside marriage for (this cohort) for Korea conditional on wages. Part of the age effect presumably is due to potential mates desiring more attractive partners, and physical attractiveness being thought to decline with age. However, Lee also finds that age has a negative effect on one’s position in the marriage market, even conditional on income and attractiveness. One possibility is that young partners can contribute more to home production because they have more energy than older partners. Also, if one thinks of lifetime income, it is better to marry someone who is 30 and has an income of \( \text{₩3,000,000} \) than someone who is 39 and has an income of \( \text{₩3,000,000} \), since the younger worker will experience substantial wage growth between 30 and 39. In terms of education (generally) being more valued conditional on income, again, more educated partners may be able to contribute more to home production, or may simply be more enjoyable to spend time with. The upshot is that we assume \( X \) contains each partner’s age and education

\[ \mu^h(X) = \left[ 1 + \exp\left( -\left( \beta_0 + \beta_1 A_w + \beta_2 E_w + \beta_3 A_h + \beta_4 E_h \right) \right) \right]^{-1}, \]  

where \( A_w \) and \( E_w \) (\( A_h \) and \( E_h \)) denote the wife’s (husband’s) age and education respectively. The coefficients in (18) 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

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\(^7\) We also consider more parsimonious versions of (18), i.e. with some of the coefficients set to zero.
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 (18) 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 ) toward altruism and to be independent of the transitory preference shocks captured by and . This identification issue is not unique to our study; previous studies either make analogous assumptions or 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. They then estimate potential wage equations allowing for selection due to nonparticipation and make bargaining power a function of estimated potential wages. Thus, our identifying assumption that age and education do not affect preferences is simpler than, but in the same spirit as, those in Blundell et al. (2007).

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

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8 Recall that we will consider families where the husband is 40 years of age or younger.
9 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.
10 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.
11 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.
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 $e_{it}^{hp}$ and $e_{it}^{wp}$, which reflect the husband and wife’s preference shocks respectively. Finally, they assume that 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 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 to be concerned only about the potential endogeneity of income due to forecast errors or measurement errors (that are independent over time). These are quite strong assumptions, but in fairness it is important to note that Mazzocco uses them to estimate the only dynamic family bargaining model in the literature.

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 $T_{it}^{wp}$ can take both positive and negative values, and the model predicts that $T_{it}^{hp}$ and $T_{it}^{wp}$ are determined by continuous functions, it would be natural to estimate (16) 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 (16) 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’ incomes 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 $Z^{hp}_t$ and $Z^{wp}_t$ (which we observe in both data sets):

$$ Y^{hp}_t = \delta^{hp}_t Z^{hp}_t + u_{hpit},$$

$$ Y^{wp}_t = \delta^{wp}_t Z^{wp}_t + u_{wpit}. $$

In (19) $Z^{hp}_t$ 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 is still living; $Z^{wp}_t$ 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 projecting it on a vector of explanatory variables $Z^c_{it}$:

$$ \hat{Y}_t = \hat{\pi} Z^c_{it}, $$

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

$$ T^{hp}_t = [1 + \exp(-(\gamma_0 + \gamma_1 E_{ih} + \gamma_2 A_{iw} + \gamma_3 E_{iw} + \gamma_3 A_{iw}))]^{-1} \Theta(\hat{Y}_t + \hat{Y}^{hp}_{it} + \hat{Y}^{wp}_{it}) - \hat{Y}^{hp}_{it} + v^{hp}_{it},$$

$$ T^{wp}_t = (1 - [1 + \exp(-(\gamma_0 + \gamma_1 E_{ih} + \gamma_2 A_{iw} + \gamma_3 E_{iw} + \gamma_3 A_{iw}))]^{-1} \Theta(\hat{Y}_t + \hat{Y}^{hp}_{it} + \hat{Y}^{wp}_{it}) - \hat{Y}^{wp}_{it} + v^{wp}_{it}. $$

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12 All monetary units are in real (2004) ₩ values.
13 Note that this imputation procedure eliminates the potential problem that the parents’ incomes may be endogenous.
14 We also included $\hat{Y}_t$ and $\hat{Y}_t'$ when predicting $\hat{Y}_t$ to make them orthogonal to the residual for $\hat{Y}_t$. Unfortunately, there is no way to make $\hat{Y}_t$ orthogonal to the forecast errors in $\hat{Y}^{hp}_{it}$ and $\hat{Y}^{wp}_{it}$, because KLoSA does not contain information on, for example, an elderly couple’s daughter-in-law. Our $\hat{Y}_t$ orthogonal to the forecast errors in $\hat{Y}^{hp}_{it}$ and $\hat{Y}^{wp}_{it}$ 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 we believe that these assets are likely to be correlated with the couple’s unobserved preference shocks.
Third, we also face the issue that over 35% of couples have a zero transfer with at least one set of parents, 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 $K$, transaction costs make it optimal to set the transfer to the parent to zero instead. In this case $T_{it}^{hp}$ 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

$$
T_{it}^{Aj} = \begin{cases} 
T_{it}^{j} + K & \text{if } T_{it}^{j} < -K < 0, \\
0 & \text{if } -K < T_{it}^{j} < K, \quad (j = hp, wp) \\
T_{it}^{j} - K & \text{if } T_{it}^{j} > K > 0,
\end{cases}
$$

where $K$ denotes the unobserved (symmetric) transaction cost.

Assuming that the errors in (21) $(v_{1it}, v_{2it}) \sim iid N(0, \Sigma)$ over $i$ for a given $t$, we can derive the contribution to the likelihood function for family $i$ in year $t$, and we denote the logarithm of this contribution as $L_{it}^*$. Since each contribution will take one of nine functional forms, for ease of exposition all of the possible contributions are given in Appendix B. We then estimate the parameters of the model by maximizing the quasi-likelihood

$$
L^* = \sum_{i=1}^{I} \sum_{t=1}^{T} L_{it}^*,
$$

These estimates can be shown to be consistent using arguments from Amemiya (1979). However, in calculating the standard errors, we need to allow for both 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

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15 Add columns 2, 3 and 4 in Table 2.
16 Net transfers to the parents are positive and net transfers received from parents are negative.
consistent standard errors using the bootstrap procedure described in Appendix C. 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 $\hat{Y}^{hp}_t$, $\hat{Y}^{wp}_t$ and $\hat{Y}_t$. 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), a very careful empirical study of income transfers to and from a couple, 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 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, finds 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.17

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 use only parents’ characteristics as inputs.

17 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.
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 old or younger, allowing for the possibility that older adult couples have different preferences (since they may be more affected by tradition than their younger counterparts).\textsuperscript{18}

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 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

\textsuperscript{18} 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 income proxied by education), and whether transitory income fluctuations due to the business cycle affect bargaining power.
different from –1.0, which again lends support to our specification, which constrains this derivate to be 1.0.\textsuperscript{19} Finally, we improve on their work by using the bootstrap to obtain consistent standard errors.

\textbf{4.4 Comparison to Other Studies in Terms of the 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 intergenerational transfers. As discussed above, we believe that, among these outcome variables, ours is most 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 on items such as recreation, hobbies, and alcoholic beverages.\textsuperscript{20} Unlike our study, Lee estimates a reduced form model and does not attempt to estimate bargaining power parameter.

\textbf{4.5 Sensitivity Analysis for the Case of Unequal Altruism for Husband and Wife}

\textsuperscript{19} See, e.g., Cox and Rank (1992) and Altonji, Hayashi and Kotlikoff (1997) for a detailed discussion of transfer derivatives.

\textsuperscript{20} 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.
To consider the implications of unequal altruism between the husband and wife, for simplicity we continue to treat the husband’s bargaining power $\mu^h$ as a fixed parameter. Consider the coefficients $\hat{\phi}_1$ and $\hat{\phi}_2$ estimated from the unrestricted model:

$$T_{it}^{hp} = \phi_1(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) - Y_{it}^{hp} + e_{it}^{hp},$$

$$T_{it}^{wp} = \phi_2(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) - Y_{it}^{wp} + e_{it}^{wp}.$$

Equation (24) implies that

$$\frac{\alpha^h + \mu^p(1 - \alpha^h)}{1 + \alpha^w + \mu^p \alpha^w (k-1) + \mu^h (\alpha^h - \alpha^w)(1 + \mu^p (k-1))} \cdot \mu^h = \text{plim}(\hat{\phi}_1),$$

(0)

$$\frac{\alpha^w + \mu^p (1 - \alpha^w)}{1 + \alpha^w + \mu^p \alpha^w (k-1) + \mu^h (\alpha^h - \alpha^w)(1 + \mu^p (k-1))} \cdot (1 - \mu^h) = \text{plim}(\hat{\phi}_2).$$

(0)

Dividing (25) by (26), using the properties of probability limits, and cancelling terms yields

$$\frac{\alpha^h + \mu^p (1 - \alpha^h)}{\alpha^w + \mu^p (1 - \alpha^w)} \cdot \frac{\mu^h}{(1 - \mu^h)} = \text{plim}\left(\frac{\hat{\phi}_1}{\hat{\phi}_2}\right).$$

(0)

Equation (27) implies

$$\mu^h = \frac{(\mu^p + (1 - \mu^p)\alpha^h / \kappa)\phi_1}{(\mu^p + (1 - \mu^p)\alpha^w)\phi_2 + (\mu^p + (1 - \mu^p)\alpha^h / \kappa)\phi_1}.$$

(0)

We obtain estimates $\hat{\phi}_1$ and $\hat{\phi}_2$ from our data, and in Appendix A.2 we show how to obtain an estimate $\hat{\kappa}$ from Johnson et al. Thus, conditional on values of $\mu^p$ and $\alpha^h$, we can estimate $\mu^h$ from $\hat{\phi}_1$, $\hat{\phi}_2$ and $\hat{\kappa}$ using (28).

To obtain the variance of $\hat{\mu}^h$ conditional on values of $\alpha^h$ and $\mu^p$, we use the delta method:

$$V(\hat{\mu}^h) = \left[ \frac{\partial \hat{\mu}^h}{\partial \hat{\phi}_1}, \frac{\partial \hat{\mu}^h}{\partial \hat{\phi}_2}, \frac{\partial \hat{\mu}^h}{\partial \hat{\kappa}} \right] V^* \left[ \frac{\partial \hat{\mu}^h}{\partial \hat{\phi}_1}, \frac{\partial \hat{\mu}^h}{\partial \hat{\phi}_2}, \frac{\partial \hat{\mu}^h}{\partial \hat{\kappa}} \right]^T,$$

where

$$V^* = \left[ \frac{\partial \hat{\phi}_1}{\partial \hat{\phi}_1}, \frac{\partial \hat{\phi}_1}{\partial \hat{\phi}_2}, \frac{\partial \hat{\phi}_1}{\partial \hat{\kappa}} \right] V^* \left[ \frac{\partial \hat{\phi}_1}{\partial \hat{\phi}_1}, \frac{\partial \hat{\phi}_1}{\partial \hat{\phi}_2}, \frac{\partial \hat{\phi}_1}{\partial \hat{\kappa}} \right]^T,$$

(0)
\[
\hat{V}^* = V\left[\hat{\phi}_1, \hat{\phi}_2, \hat{\kappa}\right] = \begin{bmatrix}
\hat{V}_{\phi} & 0 \\
0 & \hat{\sigma}_2^2
\end{bmatrix},
\hat{V}_{\phi} = V\left[\hat{\phi}_1, \hat{\phi}_2\right].
\] (30)

and \(V(\bullet)\) denotes the variance operator. The term \(\hat{\sigma}_2^2 = V(\hat{\kappa})\) is derived from the results in Johnson et al.\(^{21}\) and in (30) we use the fact that \(\text{Cov}\left[\hat{\phi}_j, \hat{\kappa}\right] = 0, j = 1, 2\) since \([\hat{\phi}_1, \hat{\phi}_2]\) and \(\hat{\kappa}\) are estimated using different samples from the same cohort.

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 4\(^{th}\) 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’ income using explanatory variables common to both KLoSA and KLIPS.\(^{22}\) (Note that KLoSA

\(^{21}\) Of course \(\hat{V}_{\phi}\) comes directly from the estimation of (24) and the bootstrap procedure discussed in Appendix C.

\(^{22}\) We use those in KLoSA who have at least one married child who does not live with them.
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 as 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 husband’s 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 for the Husband’s Bargaining Power

6.1 Results for the Model with Equal Altruism for the Husband and Wife

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 $K = ¥100,000$ but also checked the robustness of our estimates to assuming $K = ¥50,000$.\(^{23}\) As noted above, we use the bootstrap method (by couple) to obtain consistent standard errors. Table 5 reports the parameter estimates that determine the husband’s bargaining power $\mu^h(X_i)$ for three specifications of $X_i$: the husband’s and wife’s

\(^{23}\) ¥100,000 equaled approximately US$100 in 2004.
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 in Korea bargaining power depends both on age and potential wages. 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’s and wife’s bargaining power each takes on three 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 toward 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.\(^{24}\) Of course, what people claim they believe and what they actually do believe are 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.

\(^{24}\) This survey was 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 increases 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 $K = \text{₩50,000}$ 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, 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 $K = \text{₩100,000}$, 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 $K = \text{₩50,000}$ are presented in Table 10 and, again, are very similar to those in for $K = \text{₩100,000}$.

[Table 9 here.]

[Table 10 here.]

Finally, in Table 11, we consider the effect of an extra $\text{₩6,000}$ in income to any of the parties on the consumption of the couple, the husband’s parents, and the wife’s parents. Because our

25 We use the parameter estimates for $K = \text{₩100,000}$ in Table 11. The results when we use the parameter estimates based on $K = \text{₩50,000}$ are very similar and thus are omitted to save space.
model has income pooling, any additional income to any party will be allocated across the three 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.26 In other words, if a couple gets an extra W6,000 and splits it 50-50 between them, in RT, each partner will keep approximately W1,500 and give W1,500 to his or her parents. Thus, the couple will keep W3,000 and give W1,500 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.27 This difference in estimated transfer functions may reflect differences in specification, estimation error,28 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

26 Specifically, this is based on their preferred estimate using the Altonji-Ichimura approach.
27 This is the largest estimate calculated using splines for the 3rd income quartile for urban areas in 1998. See Table 6 in Kazianga (2006).
28 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.
parents to the other set are better viewed as insurance. Consider the husband’s parents: 50% 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.)

6.2 Sensitivity Analysis for the Model with Unequal Altruism for the Husband and Wife

To minimize the computational burden, we conduct this sensitivity analysis \( \mu^h \) is constant (i.e. does not depend on the spouses’ age and education.); when \( \mu^h \) is constant, for the equal altruism case we estimate it as 0.4646 with a standard error of (0.0084). We must choose calibrated values for \( \alpha^h \) and \( \mu^p \) and do so as follows. First, we assume \( 0 < \alpha^h, \alpha^w < 1 \) (to be consistent with the literature), and consider \( \alpha^h = 0.1, 0.3, 0.5, 0.7, \) and 0.9 respectively. Second, by definition \( 0 < \mu^p < 1 \), and we consider \( \mu^p = 0.4, 0.5, \) and 0.6. Given each of these calibrated values, we solve for \( \hat{\mu}^h \) as a function of \( \hat{\phi}_1, \hat{\phi}_1, \) and \( \hat{k} \).

The first column of Table 12 shows the point estimate and standard error\(^{29} \) of \( \mu^h \) for each of the values of \( \alpha^h \) when \( \mu^p = 0.4. \) The second and third columns show the corresponding results for \( \mu^p = 0.5 \) and \( \mu^p = 0.6, \) respectively. The point estimates of \( \mu^h \) range from 0.4562 to 0.4637, and in all cases we reject the null hypothesis that \( \mu^h = 0.5 \) at the 5% significance level.

\(^{29}\) As noted above, these standard errors incorporate the estimation error in \( \hat{\phi}_1, \hat{\phi}_1, \) and \( \hat{k}. \)
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 data from South Korea. We advance the bargaining literature by considering outcomes that are likely to take the form of semiprivate consumption, relaxing the assumption that bargaining power depends solely on (potential) wage and income, and using results from Experimental Economics to consider the reasonableness of one of our modeling assumptions. We specify that the bargaining power between the husband and wife depends in an unrestricted way on their age and education, and we estimate that, at the mean values of these variables, husbands have slightly (but statistically significantly) less bargaining power than their wives. While this result may strike some readers as counter-intuitive, it is consistent with the sentiments that Koreans express in 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’s (2009) results for the Korean marriage market. Consistent with Raut and Trans’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. We find that the assumption in our model of equal altruism between the husband and wife is relatively consistent with experimental results for the US. Korean experimental evidence suggests that men have slightly greater altruism than women, but allowing for this does not change the general nature of our results.

Our paper also adds to the within-family transfer literature by considering two-way transfers between an adult couple and both sets of parents, and helps us to shed important light on increasing the public safety net for the elderly in Korea. As noted in section 2, Korea has the worst record among the OECD countries in terms of the fraction of the elderly living in poverty, after
considering both family and government support. However, the discussion in section 2 suggests that
the children seem to be doing a good job of supporting their parents, and it does not seem realistic
to hope that their contribution will increase. Rather, the discussion in section 2 suggests that the
government needs to increase its support to substantially reduce the fraction of the elderly living in
poverty. However, care will have to be taken in estimating the expenditure necessary to achieve this
aim, since we estimate that if the government offers each elderly couple an additional ￦100,000, the
adult children will claw back ￦50,000.

There are at least two important avenues for future research. First, it would be very helpful to
consider both time and monetary transfers if the appropriate data become available. Second, 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.

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Appendix A.1: Optimal Transfers with Unequal Altruism

When we consider unequal altruism parameters between the husband and wife, i.e. $\alpha^h \neq \alpha^w$, we assume that the husband’s parents have altruism parameter $k\alpha^h$ and that the wife’s parents have altruism parameter $k\alpha^w$. Then the optimization problem is as follows. 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

$$V^j(\rho^j, Y, Y^h, Y^w) = \max_{C^i, C^j} (\mu^p (\ln C^i + k\alpha^j \ln C^j) + (1-\mu^p)(\ln C^j + \alpha^i \ln C^i),$$

s.t. $C^j + C^p = \rho^j + Y^p$, $j = h, w$. \hspace{1cm} (A0)

The first order conditions are

$$\frac{\mu^p}{C^p} - \frac{\mu^p k\alpha^j}{\rho^j + Y^p - C^p} - \frac{1 - \mu^p}{\rho^j + Y^p - C^p} + \frac{(1 - \mu^p)\alpha^j}{C^p} = 0, \hspace{1cm} j = h, w. \hspace{1cm} (A0)$$

From equation (A2) we obtain expressions for the consumption of each party as a function of the adult child’s share of the couple’s income $\rho^j$ and their parents’ income
\[ C^j = \frac{1 + \mu^j (k \alpha^j - 1)}{1 + \alpha^j + \mu^j \alpha^j (k-1)} (\rho^j + Y^{jp}), \quad j = h, w, \]  
\[ C^{jp} = \frac{\alpha^j + \mu^j (1 - \alpha^j)}{1 + \alpha^j + \mu^j \alpha^j (k-1)} (\rho^j + Y^{jp}), \quad j = h, w. \]  

We now use (A3) to determine how the adult children actually split their joint income by considering the following optimization problem

\[ \begin{align*}
\max_{\rho^h, \rho^w} & \quad \mu^h \left[ \mu^p (\ln C^{hp} + k \alpha^h \ln C^h) + (1 - \mu^p)(\ln C^h + \alpha^h \ln C^{hp}) \right] \\
& \quad + (1 - \mu^h)\left[ \mu^w (\ln C^{wp} + k \alpha^w \ln C^w) + (1 - \mu^w)(\ln C^w + \alpha^w \ln C^{wp}) \right], \\
\text{s.t.} & \quad \rho^h + \rho^w = Y, \\
\end{align*} \]  

\[ (A0) \]

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

\[ \rho^h = \frac{1}{\mu^h A + (1 - \mu^h (X))B} [\mu^h A(Y + Y^{wp}) - (1 - \mu^h)BY^{hp}], \]
\[ \rho^w = \frac{1}{\mu^h A + (1 - \mu^h)B} [(1 - \mu^h)B(Y + Y^{hp}) - \mu^h AY^{wp}], \]  
\[ (A0) \]

\[ A = 1 + \alpha^h + \mu^p \alpha^h (k-1), \quad B = 1 + \alpha^w + \mu^p \alpha^w (k-1), \]

where for ease of exposition we have written the husband’s bargaining power as a constant \( \mu^h \).

Substituting (A5) into (A3) yields the optimal consumption levels of the husband’s parents, the wife’s parents, and the adult children.
\[ C^{hp} = \frac{\alpha^h + \mu^p (1 - \alpha^h)}{1 + \alpha^w + \mu^p \alpha^w (k - 1) + \mu^b (\alpha^h - \alpha^w)(1 + \mu^p (k - 1))} \mu^b (Y + Y^{hp} + Y^{wp}), \]

\[ C^{wp} = \frac{\alpha^w + \mu^p (1 - \alpha^w)}{1 + \alpha^w + \mu^p \alpha^w (k - 1) + \mu^b (\alpha^h - \alpha^w)(1 + \mu^p (k - 1))} (1 - \mu^b) (Y + Y^{hp} + Y^{wp}), \]  \hspace{1cm} (A1)

\[ C = C^{hp} + C^{wp} = \frac{1 - ((\alpha^h + \mu^p (1 - \alpha^h) \mu^b) + (\alpha^w + \mu^p (1 - \alpha^w)) (1 - \mu^b))}{1 + \alpha^w + \mu^p \alpha^w (k - 1) + \mu^b (\alpha^h - \alpha^w)(1 + \mu^p (k - 1))} (Y + Y^{hp} + Y^{wp}). \]

Taking the difference between their consumption \((A6)\) and their income for each set of parents, implies the transfer functions from the children

\[ T^{hp} = \left[ \phi_1 \mu^b (Y + Y^{hp} + Y^{wp}) \right] - Y^{hp}, \]

\[ T^{wp} = \left[ \phi_2 (1 - \mu^b) (Y + Y^{hp} + Y^{wp}) \right] - Y^{wp}, \]  \hspace{1cm} (A1)

\[ \phi_1 = \frac{\alpha^h + \mu^p (1 - \alpha^h)}{1 + \alpha^w + \mu^p \alpha^w (k - 1) + \mu^b (\alpha^h - \alpha^w)(1 + \mu^p (k - 1))}, \]

\[ \phi_2 = \frac{\alpha^w + \mu^p (1 - \alpha^w)}{1 + \alpha^w + \mu^p \alpha^w (k - 1) + \mu^b (\alpha^h - \alpha^w)(1 + \mu^p (k - 1))}. \]  \hspace{1cm} (A1)

Appendix A.2: Obtaining a Confidence Interval for \( \kappa = \alpha^h / \alpha^w \),

Johnson et al. (1989) estimate altruism parameters \( \mu^m \) and \( \mu^w \) for men and women respectively, using answers based on 1-5 scale, where one is the lowest and 5 is the highest. They find a mean level of men’s and women’s altruism as \( \hat{\mu}^m = 2.19 \) and \( \hat{\mu}^w = 2.07 \), respectively. Since the level of the altruism measure is arbitrary, so is the level of the difference, \( \hat{\mu}^m - \hat{\mu}^w \). Given this we believe it is reasonable to assume that

\[ \text{plim}(\hat{\mu}^m / \hat{\mu}^w) = \alpha^h / \alpha^w = \kappa, \]

which is independent of the scaling in Johnson et al. (1989). If we knew the variance of \( \hat{\mu}^m \) and \( \hat{\mu}^w \) separately, it would be straightforward to obtain a confidence interval for \( \hat{k} = \hat{\mu}^m / \hat{\mu}^w \) using the delta method. However, from the Johnson et al. (1989) results, it is possible to obtain only an
estimate of the standard deviation \( \hat{\sigma}_d \) of \( \hat{\mu}_m - \hat{\mu}_w \), so we proceed as follows. The 95% confidence interval for \( \hat{\mu}_m - \hat{\mu}_w = 0.12 \pm 1.96 \hat{\sigma}_d = 0.12 \pm 1.96 \times 0.057 \) or \([0.0083, 0.2317]\). Conditional on \( \hat{\mu}_w = 2.07 \), the lower limit for \( \hat{\mu}_m \) is \( \hat{\mu}_m^l = 2.07 + 0.0083 = 2.0783 \) and the upper limit for \( \hat{\mu}_m \) is \( \hat{\mu}_m^u = 2.07 + 0.2317 = 2.3017 \). Thus, one possible approximate confidence interval for \( \hat{\kappa} = \hat{\mu}_m / \hat{\mu}_w \) is \([2.07, 2.07 + 0.0083], 2.07 + 0.2317 \) or \([0.0083, 0.2317]\). Using the same approach but conditioning on \( \hat{\mu}_m = 2.19 \), the 95% confidence interval for \( \hat{\kappa} \) is \([2.19, 2.19 - 0.0083], 2.19 - 0.2317 \) or \([1.003, 1.120]\). Thus, the two approaches produce confidence intervals that are virtually identical. We now use this wider confidence interval to solve for \( \hat{\kappa} = [1.003 + 1.120] / 2 = 1.0615 \). Further, the standard deviation of \( \hat{\kappa} \) is defined by \( 1.003 = 1.0615 - 1.96 \hat{\sigma}_\kappa \) or \( 1.96 \hat{\sigma}_\kappa = 1.0615 - 1.003 \), which implies \( \hat{\sigma}_\kappa = [1.0615 - 1.003] / 1.96 = 0.0298 \). Thus, we find that \( \hat{\sigma}_\kappa^2 = 0.000891 \).

**Appendix B: The Overall Likelihood Function**

Since we assume that error terms in (21) are bivariate normally distributed, we can construct the likelihood function by combining the contribution of the likelihood function of each transfer pattern. \( T^{bp}_{it} \) and \( T^{wp}_{it} \) in (21) can be positive or negative or zero. Hence, we have a total of nine cases. For the case where \( T^{bp}_{it} > 0 \) and \( T^{wp}_{it} > 0 \), the density for this event is

\[
f(T^{bp}_{it}, T^{wp}_{it}) = n_2(v_{it}; \Omega, \Sigma),
\]

where \( n_2(v_{it}; \Omega, \Sigma) \) is the bivariate normal density with zero means and covariance matrix \( \Sigma \), and the error terms \( v_{it} = (v_{it}^{bp}, v_{it}^{wp}) \) are defined in (21); in other words, this is the standard regression contribution to the likelihood function with normally distributed error terms. In the same way, the contributions of the likelihood function of the other eight cases are shown below:
\[
L(T_{it}^{hp}, T_{it}^{wp}) = \prod_{i=1}^{N} \prod_{t=1}^{T} \left[ n_2 \left( v_{it}; 0, \Sigma \right) \right]^{[T_{it}^{hp} > 0, T_{it}^{wp} > 0]} \cdot \left[ \int_{-z_{it}^{hp}}^{z_{it}^{hp}} n_2 \left( v_{it}; 0, \Sigma \right) dv_{it}^{hp} \right]^{[T_{it}^{hp} > 0, T_{it}^{wp} = 0]} \]
\[
\cdot \left[ n_2 \left( v_{it}; 0, \Sigma \right) \right]^{[T_{it}^{hp} > 0, T_{it}^{wp} < 0]} \cdot \left[ \int_{-z_{it}^{hp}}^{z_{it}^{hp}} n_2 \left( v_{it}; 0, \Sigma \right) dv_{it}^{hp} \right]^{[T_{it}^{hp} = 0, T_{it}^{wp} > 0]} \]
\[
\cdot \left[ \int \int_{-z_{it}^{wp}}^{z_{it}^{wp}} n_2 \left( v_{it}; 0, \Sigma \right) dv_{it}^{hp} \, dv_{it}^{wp} \right]^{[T_{it}^{hp} = 0, T_{it}^{wp} = 0]} \]
\[
\cdot \left[ \int n_2 \left( v_{it}; 0, \Sigma \right) dv_{it}^{hp} \right]^{[T_{it}^{hp} < 0, T_{it}^{wp} > 0]} \cdot \left[ n_2 \left( v_{it}; 0, \Sigma \right) \right]^{[T_{it}^{hp} < 0, T_{it}^{wp} < 0]} \cdot \left[ \int n_2 \left( v_{it}; 0, \Sigma \right) dv_{it}^{hp} \right]^{[T_{it}^{hp} > 0, T_{it}^{wp} < 0]} \cdot \left[ n_2 \left( v_{it}; 0, \Sigma \right) \right]^{[T_{it}^{hp} > 0, T_{it}^{wp} = 0]} .
\]

where

\[
Z_{1it}^{wp} = -(1 - \mu^h(X)) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{wp} + K,
\]
\[
Z_{2it}^{wp} = -(1 - \mu^h(X)) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{wp} - K,
\]
\[
Z_{3it}^{hp} = -\mu^h(X) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} + K,
\]
\[
Z_{4it}^{hp} = -\mu^h(X) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} - K,
\]
\[
Z_{5it}^{wp} = -(1 - \mu^h(X)) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{wp} - K,
\]
\[
Z_{6it}^{wp} = -(1 - \mu^h(X)) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{wp} - K,
\]
\[
Z_{7it}^{hp} = -\mu^h(X) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} + K,
\]
\[
Z_{8it}^{hp} = -\mu^h(X) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} - K,
\]
\[
Z_{9it}^{hp} = -\mu^h(X) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} + K,
\]
\[
Z_{10it}^{hp} = -\mu^h(X) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{hp} - K,
\]
\[
Z_{11it}^{wp} = -(1 - \mu^h(X)) \theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{wp}) + Y_{it}^{wp} + K,
\]
Appendix C: Our Bootstrap Procedure for Obtaining Consistent 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 parents’ 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.

\[ Z_{12t}^{\nu_p} = -(1 - \mu^h(X))\theta(Y_{it} + Y_{it}^{hp} + Y_{it}^{\nu_p}) + Y_{it}^{\nu_p} - K. \]
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>US</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:
(1) The data for Taiwan show the percentage of consumption made up by the different income sources.

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>
</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 in this table and the following ones.
Table 3
Real (2004 Won) 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).

Notes:

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

(2) * Ratio = (Column 1 + Column 2) / Column 3.
Table 4
Summary Statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfer to husband's parents</td>
<td>72.80</td>
</tr>
<tr>
<td></td>
<td>(4.12)</td>
</tr>
<tr>
<td>Transfer to wife's parents</td>
<td>40.25</td>
</tr>
<tr>
<td></td>
<td>(4.17)</td>
</tr>
<tr>
<td>Transfer from husband's parents</td>
<td>16.50</td>
</tr>
<tr>
<td></td>
<td>(2.01)</td>
</tr>
<tr>
<td>Transfer from wife's parents</td>
<td>15.80</td>
</tr>
<tr>
<td></td>
<td>(2.06)</td>
</tr>
<tr>
<td>Couple's household income</td>
<td>3114</td>
</tr>
<tr>
<td></td>
<td>(67.60)</td>
</tr>
<tr>
<td>Husband's parents' imputed income</td>
<td>1319</td>
</tr>
<tr>
<td></td>
<td>(36.26)</td>
</tr>
<tr>
<td>Wife's parents' imputed income</td>
<td>1646</td>
</tr>
<tr>
<td></td>
<td>(42.08)</td>
</tr>
<tr>
<td>Husband's years of education</td>
<td>13.68</td>
</tr>
<tr>
<td></td>
<td>(.0980)</td>
</tr>
<tr>
<td>Wife's years of education</td>
<td>13.12</td>
</tr>
<tr>
<td></td>
<td>(.0851)</td>
</tr>
<tr>
<td>Husband's age</td>
<td>34.57</td>
</tr>
<tr>
<td></td>
<td>(.0862)</td>
</tr>
<tr>
<td>Wife's age</td>
<td>32.33</td>
</tr>
<tr>
<td></td>
<td>(.0885)</td>
</tr>
<tr>
<td>Observation</td>
<td>1854</td>
</tr>
</tbody>
</table>

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

(2) Zero transfers are included; transfers are in real (2004) W.
Table 5
The Determinants of the Husband's Bargaining Power $\mu^h$ for $K=W100,000$

<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 C.

(2) In this table and those following, *** p<0.01, ** p<0.05, * p<0.1.
Table 6
The Determinants of the Husband’s Bargaining Power $\mu^h$ for K=₩50,000

<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>-.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></td>
<td>(.0130)</td>
</tr>
<tr>
<td>Wife’s Education</td>
<td>-.0294***</td>
<td></td>
<td>-.0288***</td>
</tr>
<tr>
<td></td>
<td>(.0117)</td>
<td></td>
<td>(.0109)</td>
</tr>
<tr>
<td>Husband’s age</td>
<td></td>
<td>-.0392***</td>
<td>-.0399***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.0101)</td>
<td>(.0101)</td>
</tr>
<tr>
<td>Wife’s age</td>
<td></td>
<td>.0474***</td>
<td>.0483***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(.0136)</td>
<td>(.0146)</td>
</tr>
</tbody>
</table>
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>Wife’s High Education</td>
<td>.4476 (.0102)</td>
<td>.4339 (.0118)</td>
<td>.4202 (.0159)</td>
</tr>
<tr>
<td>Wife’s Middle Education</td>
<td>.4617 (.0096)</td>
<td>.4480 (.0100)</td>
<td>.4343 (.0137)</td>
</tr>
<tr>
<td>Wife’s 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) The delta method is used to compute the standard errors.
Table 8
The Husband's Bargaining Power $\mu^h$ for Various Levels of Education for the Husband and Wife for $K=\text{₩}50,000$

<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</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</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</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:
(1) Parameters from Column 3, Table 6 are used to predict the husband's bargaining power.
Table 9
The Husband’s Bargaining Power $\mu^b$ for Various Ages of the Husband and Wife for $K=\text{₩}100,000$

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

Table 10  
The Husband’s Bargaining Power $\mu^h$ for Various Ages of the Husband and Wife for $KW50,000$

<table>
<thead>
<tr>
<th>Wife’s Age</th>
<th>Husband’s High Age</th>
<th>Husband’s Middle Age</th>
<th>Husband’s Low Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Age</td>
<td>0.4500</td>
<td>0.4798</td>
<td>0.5097</td>
</tr>
<tr>
<td>(0.0123)</td>
<td>(0.0104)</td>
<td>(0.0133)</td>
<td></td>
</tr>
<tr>
<td>Middle Age</td>
<td>0.4144</td>
<td>0.4438</td>
<td>0.4735</td>
</tr>
<tr>
<td>(0.0114)</td>
<td>(0.0106)</td>
<td>(0.0144)</td>
<td></td>
</tr>
<tr>
<td>Low Age</td>
<td>0.3797</td>
<td>0.4083</td>
<td>0.4375</td>
</tr>
<tr>
<td>(0.0179)</td>
<td>(0.0184)</td>
<td>(0.0215)</td>
<td></td>
</tr>
</tbody>
</table>

Note:
(1) Parameters from Column 3, Table 6 are used to predict the husband’s bargaining power.
Table 11
The Allocation of an Extra W6,000 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</td>
<td>1,380</td>
<td>1,605</td>
</tr>
<tr>
<td>(44.50)</td>
<td>(35.36)</td>
<td>(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</td>
<td>1,254</td>
<td>1,730</td>
</tr>
<tr>
<td>(44.50)</td>
<td>(48.13)</td>
<td>(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</td>
<td>1,296</td>
<td>1,688</td>
</tr>
<tr>
<td>(44.50)</td>
<td>(41.97)</td>
<td>(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</td>
<td>1,388</td>
<td>1,646</td>
</tr>
<tr>
<td>(44.50)</td>
<td>(41.25)</td>
<td>(47.63)</td>
</tr>
</tbody>
</table>

Notes:
1. The consumption is measured in real (2004) ₩.
2. Consumption levels and standard errors are based on equation (12).
Table 12
Estimates of the Husband’s Bargaining Power in the Case of Unequal Altruism
for Various Values of $\alpha^h$ and $\mu^p$ when $K=W100,000$

<table>
<thead>
<tr>
<th>$\alpha^h$</th>
<th>$\mu^p = .4$</th>
<th>$\mu^p = .5$</th>
<th>$\mu^p = .6$</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1</td>
<td>.4628 (.0162)</td>
<td>.4633 (.0162)</td>
<td>.4637 (.0162)</td>
</tr>
<tr>
<td>.3</td>
<td>.4601 (.0161)</td>
<td>.4613 (.0161)</td>
<td>.4622 (.0162)</td>
</tr>
<tr>
<td>.5</td>
<td>.4584 (.0161)</td>
<td>.4598 (.0161)</td>
<td>.4610 (.0161)</td>
</tr>
<tr>
<td>.7</td>
<td>.4572 (.0160)</td>
<td>.4586 (.0616)</td>
<td>.4600 (.0161)</td>
</tr>
<tr>
<td>.9</td>
<td>.4562 (.0160)</td>
<td>.4577 (.0160)</td>
<td>.4592 (.0616)</td>
</tr>
</tbody>
</table>

Notes:
(1) To minimize the computational burden, we conduct the sensitivity analysis when $\mu^h$ is constant (i.e. does not depend on the spouses’ age and education). In this case with equal altruism, we estimate $\mu^h$ as 0.4646 (0.0084).

(2) Estimates are a function of $\hat{\phi}$, $\hat{\phi}$ and $\hat{\kappa}$, and the standard errors reflect the estimation error in these parameters using equation (29).
Figure 1: Inter-Vivos Transfers to and from the Elderly (Age ≥50)