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Intra-Familial Transfers, Son Preference, and Retirement Behavior in South Korea

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Intra-Familial Transfers, Son Preference, and Retirement Behavior in South Korea[+]

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Abstract

We consider the nexus of intra-familial transfers, the sex composition of the sibship, and parental retirement behavior in Korea. To investigate this, we employ the Korean Longitudinal Study of Aging and a research design that relies on plausibly exogenous variation in the sex composition of the sibship. We provide evidence that it costs more to raise sons than daughters in Korea. Thus, in the absence of sufficient transfers from adult sons to parents, parents will fund their earlier investments in their sons by increasing their labor supply. Consistent with this, we show that parents with more adult sons than daughters are more likely to delay their retirement. In particular, an elderly parent with all sons has a probability of being retired that is 7–10 percentage points lower than a comparable parent with all daughters. Elderly parents also work between 1.8 and 2.7 hours more per week when their sibship consists of all sons. These effects are the most pronounced when the first born is a son, as well as for poorer households.

JEL Codes: J1, J13, J16, J26

Key words: retirement, intra-familial transfers, gender, sex ratios

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1. Introduction

Households transfer a vast amount of resources across generations. When children are young, parents typically invest in their education and other forms of human capital. As a result, net transfers to the very young tend to be positive in most societies. However, as children grow older, transfers to them usually decline and, by the time they are adults, transfers from parent to child can turn negative if adult children care for their elderly parents.

Transfers from grown children to their parents in old age are often viewed as a form of repayment called for by an implicit contract (Lillard and Willis 1997). Despite the prevalence of public and private pensions, as well as more advanced financial products, many elderly parents in certain parts of the world still rely on familial transfers from their grown children for consumption. This is particularly true in Asia, where familial transfers from grown children to their parents are much more prevalent than in other economies (Lee, Mason, and Park 2011).[1]

The evidence on children providing care (either financial resources or time) for elderly parents as repayment for the parents' earlier investment in their upbringing is somewhat mixed and very much depends on context.[2] The practice is probably strongest in Asian countries, where there is evidence that adult sons tend to transfer more resources to their elderly parents than adult daughters (Yang 1996; Sun 2002; Lin et al. 2003; Kim 2010). This is consistent with an exchange model of transfers, since sons tend to receive more transfers than daughters in Asian countries. In the United States, however, studies of the role of a child's sex on transfers to their parents show the opposite—namely, that American daughters are more likely than sons to provide assistance to aging parents (Coward and Dwyer 1990; Dwyer and Coward 1991; Stoller 1990; Shuey and Hardy 2003). This finding is less consistent with an exchange model since there

[1]There is a substantial theoretical literature that considers the motives for these transfers. Some of the earliest models in this literature considered altruistic motives in which parents transfer resources to their children simply because they wish to support their well-being (Becker 1974; Becker and Tomes 1976). In contrast, exchange models consider transfers as part of a quid pro quo. Specifically, intra-familial transfers are motivated by an expectation of compensation from the recipient at some later point. A consequence of this is that parents tend to transfer more to children with higher incomes (Bernheim, Shleifer, and Summers 1985; Cox 1987; Bernheim 1991; Lillard and Willis 1997). In such a model, security in old age is often a concern; parents invest in children with the expectation that those children will provide either care or financial support for them when they are older. There is also a related literature such as Cigno (1993, 2016), Cigno, Komura, and Luporini (2016), which explains the emergence and presence of social and family norms as the outcome of intergenerational transfer game. Hajnal (1982) and a stream of literature have studied household formation system in the preindustrial European context.

[2] As Light and McGarry (2004) pointed out the lack of a consensus among previous researchers about motives ought not to be surprising because motivating factors appear to differ across families.

are fewer gender disparities in child investments in the United States. Finally, an interesting study by Xie and Zhu (2009) shows that in urban China married daughters provide more financial support to their elderly parents than married sons do. They interpret this result as a reflection of the rapid disappearance of the traditional Chinese family model in which sons take on the bulk of the responsibility for supporting their elderly parents.

What these findings suggest is that, over the life course, net transfers from parent to child can be positive, negative, or zero depending on the prevailing social mores of a given society. In the case of positive net transfers from parents to their children, parents will require additional income to fund these transfers. Probably the most obvious source of increased income available to parents is at the extensive margin via delayed retirement or at the intensive margin via longer work hours. However, little is understood about the extent to which parents actually adjust their labor supply in response to changes in net transfers within the household.

There are two primary reasons for the paucity of work on this topic. The first is that often little is understood about the nature of net transfers within households. The second is that finding credible exogenous variation in intra-familial transfers across households can be very difficult. As a consequence, the empirical question of how intra-familial transfers affect parental labor supply is difficult to answer.

One area that can shed light on this question is the gender disparity in parental investments in children, which often stems from long-standing social norms. When parents do not or cannot manipulate the sex composition of their sibships, the relative number of boys and girls within a household can provide researchers with plausible exogenous variation in intra-familial transfers.[3] Specifically, in societies with a strong bias toward males, households with relatively more boys will tend to have more transfers from parents to young children. Depending on the extent to which grown children take care of their elderly parents, this can result in more net transfers from parent to child over the life course of the parents.

[3] A few points are worth mentioning. First, gender bias can be present even if sex ratios are balanced. Second, as pointed out by Edlund (1999) and Edlund and Lee (2013), there may exist equilibria with balanced sex ratios in which they are skewed for some groups but not others. Third, while sex-selective abortion is one of the more common modern means of selecting boys, other means are possible that predate the advent of ultrasound technology, including infanticide.

Economic links between parents and their sons are particularly pronounced in East Asian countries such as South Korea (henceforth Korea), China, Japan, and Taiwan. In these countries, parents typically allocate more financial resources and time to their sons, especially to the eldest son. This is usually due to a combination of prevailing social norms and, possibly, exchange considerations (e.g., Strauss and Thomas 1995; Black, Devereux, and Salvanes 2005; Booth and Kee 2009; Jayachandran and Kuziemko 2011; Wong 2013; Qian 2008; Barcellos, Carvalho, and Lleras-Muney 2014; Bu 2014; Choi and Hwang 2015, Horioka et al. 2018).[4]

Korea provides a particularly interesting setting in which to investigate the effects of intra-familial transfers on parental labor supply. First, in Korea, the period over which parents transfer resources to their children tends to be longer than in many other countries because parents tend to be involved in numerous aspects of their children's lives for a longer period of time. Consistent with an exchange model, parents often make long-term financial and time commitments with the underlying expectation of obtaining some sort of security in old age, typically from the eldest son (Choi and Hwang 2015). Second, Korea's elderly population has the second highest labor force participation rate among the Organization for Economic Co-operation and Development (OECD) member countries. The labor force participation rate of people ages 65 or older was 32.2 percent in 2018, the second highest followed by Iceland (38.1 percent); the average in OECD countries was 15.3 percent (OECD 2019). Third, in spite of the high labor force participation rate of the elderly, older people in Korea tend to earn lower incomes. In fact, the poverty rate of those ages 65 or older was the highest among the OECD member countries at 43.8 percent in 2017 (OECD 2019). In large part, this is the result of the National Pension Scheme (NPS), which provides little or no pension income to those who retired before 2008.[5] Moreover, many of Korea's elderly have insufficient private savings (Lee and Kim 2014). This may be because they spent such a large share of their income on their children's

[4] For example, Strauss and Thomas (1995) find that girls in South Asia receive fewer nutritional, educational, and health inputs than boys. In India, Jayachandran and Kuziemko (2011) and Barcellos et al. (2014) document that boys receive more childcare time, vitamin supplements, and were breastfed more than girls. In China, Qian (2008) finds that an increase in relative female income in a household increases the survival rate of girls, whereas an increase in relative male income decreases the survival rate and educational attainment of girls. Wong (2013) shows that sons receive larger inter-vivos transfers and attain higher levels of education than daughters in Korea but that the opposite is true in the United States.

[5] The first disbursement of normal benefits by the NPS was in 2008. Individuals who retired before 2008 received either no or substantially lower pension benefits than those who retired after.

education or housing.[6] Fourth, the Korean population is aging rapidly largely because of the decline in its fertility rate, which decreased from 4.53 children per woman in 1970 to 2.06 in 1983, below the population replacement level. It remained around 1.6 from the mid-1980s to the mid-1990s, and was between 1.1 and 1.3 during the period 2002 to 2016. Finally, there is a common belief that the implicit contract is eroding in Korea: although many Korean parents continue to invest in their children, there is a widespread perception that those parents receive less in return when they are older. As the country's fertility declines and the young population migrates to cities, expectations and norms have changed dramatically.

Korea has a strong history of preference for sons. One of the more unpleasant manifestations of this occurred when ultrasound technology became widely available in Korea in 1985 (although there is some indication that it was available earlier). After 1985, sex-selective abortions became common and remained common until ultrasound tests (or more specifically, tests that revealed the sex of the fetus) were banned in 1995 (Lee and Smith 2018). It is believed that the new technology widened the sex ratio at birth substantially; it reached a peak of 116 boys to 100 girls in 1990. Subsequently, after ultrasounds were banned, the sex ratio narrowed and returned to a biologically normal level of 105 boys to 100 girls in 2014.[7] Despite this, however, gender bias has had other manifestations in Korea, namely, through differential investments in sons and daughters, as we will see. We argue that this generates a strong link between the sex composition of the sibship and intra-familial transfers in the Korean context.

In this study, we estimate the effects of the sex composition of the sibship on the labor supply of elderly Koreans. There are many studies on the determinants of labor supply of elderly or retirement behavior, such as Hall and Johnson (1980), Lumsdaine and Mitchell (1999), Bélanger, Carrière, and Sabourin (2016), to name a few. Lee (2008), Lee and Lee (2013), and Klassen and Yang (2013) also provides some useful retirement models in the Korean context. Our work is more closely related to a series of studies that investigate the effects of the sex composition of the sibship on labor supply earlier in the life course as opposed to the latter part, which we

[6] Education expenditures on children accounted for 14.6 percent of total household consumption expenditures in 2014 (Park 2015).

[7] The ban on ultrasounds was ruled unconstitutional in 2009 by Korea's Constitutional Court; but since the court's ruling, parents have been able to learn the sex of their child only after 32 weeks of pregnancy, when abortions are very rare.

consider. Specifically, Lundberg and Rose (2002) and Lundberg (2005) find that young fathers in the United States work longer hours in response to the birth of a son than in response to the birth of a daughter. The explanation that is offered for this finding is that boys increase the returns to marriage for fathers and that this provides a greater incentive for the father to invest in the marriage by working longer. Further evidence of this explanation from Morgan et al. (1988) and Dahl and Moretti (2008) shows that American parents with sibships consisting of more boys than girls are less likely to divorce than parents with more girls than boys.[8]

We employ the Korean Longitudinal Study of Aging (KLoSA) waves for the period 2006–2014 and find strong evidence that having more boys increases the labor supply of the elderly in Korea at both the intensive and extensive margins. We show that, conditional on the total number of children, families with all sons have a probability of being retired that is seven to ten percentage points lower than families with all daughters. Similarly, one additional son lowers the likelihood of retiring by 3.4 percentage points. These effects are the most pronounced when the first born is a son. Our findings are robust to a number of different specifications.

Our empirical results provide evidence of a link between the sex composition of the sibship and the labor supply of the elderly. Differences in intra-familial transfers across genders are apt to be a mechanism linking the two. We provide evidence from the existing literature that parental transfers to children are higher when households have more boys. Moreover, further evidence of an eroded social contract indicates that much of this investment in children may not be recouped in older age. As a consequence, our results suggest that parents with more boys than girls need to work longer hours and later in life to fund the investments that they made in their children earlier in the life course.

The remainder of this paper proceeds as follows. In the next section, we describe how intra-familial transfers affect labor supply in a simple model. We then provide some evidence for why these are so critically affected by the sex composition of the sibship in Korea. After that we

[8] Pabilonia and Ward-Batts (2007) investigate the effect of the gender composition of the sibship on labor supply using the Current Population Survey. They find weak evidence (i.e., not statistically significant) in accord with Lundberg and Rose (2002) and Lundberg (2005), but they find that the opposite is true among Asian immigrants, for whom they suspect the son bias might be greater.

discuss the data and the methods that we employ. We then present the results. Finally, we conclude.

2. A Simple Model of Intra-familial Transfers

In this section, we present a simple model that illustrates some of the relationships between gender, transfers, and parental labor supply. The model considers several plausible scenarios in which the sex composition of the sibship can affect retirement via the budget constraint, but also preferences. First, our model allows the utility from a married child to differ by gender. This reflects the idea that parents might value grandchildren from their sons more than from their daughters. Second, the model allows the effects of transfers to children on marriage prospects to differ by gender. This reflects the idea that daughters might have better marriage prospects than sons and so parents may need to invest in sons more to make them more appealing in the marriage market. Third, a consequence of these more primitive aspects of the model is that parents are willing to forgo more leisure to fund transfers to their sons.

We let c denote consumption and l denote leisure. Parents derive utility from these two goods given by $u(c, l)$. The utility function is increasing and concave in both of its arguments.

Parents have a simple budget constraint. For the ease of exposition, we do not consider dynamics which would not alter the main points of the model. We let w denote the parents' wage and E, their lifetime endowment of time. In addition, to choosing consumption and leisure, parents make a choice to transfer money to their child which is given by T. The household budget constraint is then given by $wl + c + T = wE$.

For simplicity, we assume that parents have one child, which can be either female or male. Gender is denoted by $g \in \{f, m\}$. Transfers increase the probability that the child gets married. We denote the probability of marriage by $\Lambda(\phi_g T)$ where ,$\phi_g > 0$, impacts the marginal efficiency of transfers for each gender. We assume that this probability is increasing in transfers. If it is relatively easier to marry daughters than sons then we will have $\phi_f > \phi_m$. This may happen when the sex ratio is highly skewed. In this case, the marginal impact of transfers to daughters has a higher impact on their marriage prospects than it has for sons.

If their child marries, the parents obtain additive utility that depends on two components. We denote the first by $\kappa_g > 0$. The utility of a married child is gender specific. For example, if $\kappa_m > \kappa_f$, this could reflect underlying preferences of the parents for sons that are common in Confucian societies. We discount this parameter by $\phi_g$so that the additive component to utility associated with a married child is $\frac{\kappa_g}{\phi_g}$. While this is mainly a modeling device, one interpretation of it is that parents receive less pleasure from marriage when it is relatively easier to marry that child. Parents' utility is then given by $u(c,l) + \frac{\kappa_g}{\phi_g}$.

Parents then solve

$$\max_{c,l,T} u(c,l) + \Lambda\left(\phi_g T\right)\frac{\kappa_g}{\phi_g} \tag{1}$$

subject to the budget constraint. The solution for transfers is (essentially) characterized by the following relationship

$$\Lambda'\left(\phi_g T\right)\kappa_g = \frac{u_l}{w} \tag{2}$$

Note that at a maximum, we must have that $\Lambda'' < 0$ which is easily satisfied for most probability functions for high enough values of their inputs.

Two comparative statics illustrate how social norms impact both transfers and labor supply. First, we have that

$$\frac{\partial T}{\partial \kappa_g} = -\frac{\Lambda'(\phi_g T)}{\Lambda''(\phi_g T)\kappa_g\phi_g + \frac{1}{w^2}u_{ll}} > 0. \tag{3}$$

This indicates that parents transfer more resources to their children when they value their marriages more. The second is

$$\frac{\partial T}{\partial \phi_g} = -\left(\frac{\Lambda''(\phi_g T)\kappa_g T}{\Lambda''(\phi_g T)\kappa_g\phi_g + \frac{1}{w^2}u_{ll}}\right) < 0. \tag{4}$$

This indicates that parents transfer fewer resources when they are more effective. For example, if the sex ratio is skewed and favors daughters in the marriage market, then parents can transfer less money and still have a favorable outcome in the marriage market with a high probability.

Accordingly, if parents value married sons more than married daughters ($\kappa_m > \kappa_f$) or if it is easier to marry daughters ($\phi_f > \phi_m$) then parents will transfer more resources to their sons.

In either of these scenarios, parents will work more to fund these transfers. This can be seen in the budget constraint. Effectively, an increase in transfers is a reduction in income and so the household will reduce its consumption and leisure. Hence, if parents either prefer married sons to married daughters or if there is a skewed sex ratio, then parents of sons will work more than parents of daughters.

Finally, one mitigating factor that could lessen the impact of child gender on parent labor supply is transfers from child to parent. We do not explicitly model these. If sons repay parents' investments in them, then this could obviate the need to use increases in labor supply to fund transfers to children. However, as we will see, there is evidence that most transfers to children are not repaid, at least in full.

3. Gender Preferences and Parental Transfers in Korea

The sex ratio at birth is one of the most prominent metrics of gender bias. In Korea currently, the sex ratio at birth is by and large normal, although there are many other important indications of differential investment in sons and daughters. Among these are: (1) educational investments; (2) contributions to children's marriage expenses; and (3) income transfers from adult children to elderly parents.[9] We provide evidence concerning each of these and discuss how each affects net transfers from parent to child.

Before we do this, it is important to provide some information on the cohorts that we are considering in this work. The mean birth years of fathers and mothers in our data are 1947 and 1949, and the mean birth years of sons and daughters in our data are 1978 and 1977. Thus the majority of the children in our study were enrolled in secondary or tertiary school sometime in the 1980s and 1990s. These children most likely married between the mid-1990s and mid-2010s. Finally, income transfers from children to elderly parents most likely occurred in the period after 2000.

[9]There is also differential investment in time use. For example, mothers of girls are more likely to return to work when their first-born child is female (Choi and Hwang 2015).

Education

Educational investments in children are very important to Korean parents, who typically spend a considerable amount of money on tuition, textbooks, private tutoring, and sometimes lodging (see Lee and Lee 2015, for example). Panels A and B of Figure 1 show the differences in school enrollment for boys and girls. In panel A, we see a higher secondary school enrollment rate for boys than for girls, which persisted throughout the 1980s.[10] Note that secondary enrollment rates were over five percentage points higher for sons than for daughters in 1981, which is substantial. We see in panel B that enrollments in tertiary education in the 1990s were higher for males than for females. These differences were on the order of about two percentage points throughout the decade. However, we see in panel A that secondary enrollment rates were roughly at parity between the sexes during the 1990s.[11] These differences suggest that parents invested substantially more in sons than in daughters throughout the 1980s and 1990s. Choi and Hwang (2015) also found that monthly expenditures on private after-school education are higher for first-born boys than for first-born girls and that this disparity persists to today.

Marriage

Many studies have investigated sex differences in marriage expenses in the Chinese context. On the whole, these studies show that the groom's family pays a bride price that exceeds the value of a dowry (Brown, Bulte, and Zhang 2011; Wei and Zhang 2011; Zhang 2000). For example, Wei and Zhang (2011) find that the groom's family saves over a longer period of time than the bride's family and pays for the majority of the wedding costs. They also show the groom's family is mainly responsible for procuring a house for the newlyweds, which is a significant financial burden (Wei and Zhang 2011; Zhang 2000).

A similar tradition is observed in Korea, where marriage requires a large sum of money for housing, fixtures, the wedding ceremony, the honeymoon, and gifts. Of these, the costliest is housing. Although many newlyweds rent apartments, doing so is still a financial burden due to

[10]Secondary school was not mandatory during this time.

[11] In Korea, secondary school became compulsory in 2004. Before then it was compulsory only in some parts of the country.

Korea's unique renting system, *jeonse*, which requires a large lump-sum deposit up front.[12] In Korea, the costs of marriage are typically higher for sons than for daughters because, by Korean custom, parents are responsible for procuring housing for their newly married sons.

Some studies have attempted to compute marital costs in Korea. According to Kim et al. (1994), the average cost of housing at marriage was $38,600 (in 1993 USD). They calculated that the groom's parents paid 47.4 percent of this cost and the bride's parents 10.4 percent. In addition, the National Survey on Marriage and Fertility Dynamics, a survey spanning the years 2010 to 2012 conducted by the Ministry of Health and Welfare and the Korea Institute for Health and Social Affairs (KIHASA), provides additional evidence on the cost of marriage (Kim et al. 2012). According to the survey, the groom pays, on average, $112,000 (in 2012 USD) upon marriage, with 42.7 percent of the total cost financed by his parents. In contrast, the cost of marriage for the bride was $33,700 (in 2012 USD) with 47.2 percent of this footed by her parents. In the same survey 75 percent of male respondents replied that the bulk of their marital costs were for housing. Table 1 provides some calculations from Lee (2011) showing that the groom's family pays approximately 80 to 90 percent of marriage expenditures. This is the case for all age groups in the study, which suggests that the tradition of the groom's side bearing the vast majority of marriage costs is still common. Taken together, these findings are strong evidence that the costs of marriage are substantially higher for sons than for daughters.

Transfers from Adult Children to Elderly Parents

In countries with strong Confucian traditions such as Korea, intergenerational transfers in a household flow both downward (from parents to children) and upward (from adult children to their retired parents). Traditionally, sons (especially the eldest) are expected to take more responsibility for supporting their parents than daughters are. Given this traditional relationship, there is a common view that elderly parents with sons are better supported financially. However, there are not many studies on this subject.

[12] *Jeonse* requires the tenant to make a deposit of approximately two-thirds of the property value for key money, which is then refunded when the lease expires. The landlord invests the deposit and keeps the interest earned. The tenant pays no monthly rent for the duration of the contract, which typically lasts for two years. Until recently, *jeonse* was traditionally much more popular than a monthly payment system.

One of the few studies on the topic available in the Korean context is by Kim (2010).[13] Using data from the KLoSA, the author finds that adult sons provided $260 (in 2005 USD) per annum more net financial support to their elderly parents than daughters provided. However, the value of this annual difference is small in comparison with the parents' expenditures on education and marriage if they have more sons than daughters. Moreover, the differences in transfers to parents between sons and daughters are even smaller (and possibly negative) when one considers that daughters are more likely to provide their time to caring for their elderly parents than sons. Within the context of the exchange model of intra-familial transfers, this suggests that, at least in the early 2000s, many parental investments in sons were not being fully paid back. One possible explanation for the small difference between the amount of parental support provided by sons and daughters is the fading of Confucian traditions among younger generations of Koreans.

Other evidence of the erosion of traditional Confucian values comes from Lee (2010). He shows that the number of children positively predicted retirement of urban dwellers until 2000, but this effect turned negative thereafter. Although this finding does provide evidence of shifting social mores, it does not provide evidence of differences in parental support based on the sex of the child.

According to a survey conducted by the Korean government, elderly parents still expect more support from sons than from daughters after retirement. Specifically, the survey asked the question (translated from Korean), "Who should primarily support elderly parents?" Figure 2 (panel A) presents the percentage of respondents who answered "the eldest son" in 1998 and in 2002 by age group. The figure suggests two important phenomena. First, all younger people are less likely to say that the eldest son bears the main responsibility for elder care, indicating an erosion of a core Confucian value among younger people. Second, the answers from 2002 indicate that the cohort that is just four years younger is even less likely to adhere to this value. Interestingly, panel B of Figure 2 also shows that more respondents believed that the elderly should take care of themselves in 2002 than in 1998; panel C shows that fewer respondents

[13] In this study, children are defined as adults aged 19 or over who do not live with their parents and are not students at the time of the survey. The average age of parents is 69.5, and that of their children is 41.5.

believed that the government should care for the elderly in 2002 than in 1998. Overall, Figure 2 suggests a move toward a more individualistic view of elder care in Korea.

Other factors may be influencing sons' willingness to provide the bulk of care for their elderly parents. For example, the 1990 revision of a civil law on inheritance may also matter. Prior to the revision of the civil law, the eldest son inherited most of his parents' wealth. Even younger sons inherited more than daughters. Since the revision, however, all children were entitled to an equal inheritance regardless of their sex or birth order. This change may be related to the changing relationship between the sibship size and the probability of retiring discussed in Lee (2010), since the sibship size positively predicted retirement until about 2000 but not after.

The improvement of the socio-economic status of women could also be an important factor. For example, several studies argue that an increase in women's earnings enhances women's relative bargaining power in intra-familial resource allocation (e.g., Manser and Brown 1980; McElroy and Horney 1981; Hoddinott and Haddad 1995; Thomas 1990; Chau et al. 2007). Women's greater bargaining power may have increased daughters' financial transfers to their own elderly parents rather than to their parents-in-law.

The evidence presented above suggests that parental lifetime net transfers to children are, on average, larger when parents have sons rather than daughters for the cohorts that we consider. The bulk of these transfers to sons seem to be accounted for by education and, especially, marriage expenses. Moreover, existing evidence suggests only a minor difference between sons' and daughters' provision of support for their elderly parents. This suggests that there has been some erosion of the implicit contract in recent years. Thus, having more sons than daughters could increase the parental labor supply, and this effect should be smaller for richer households. In the remainder of the paper we provide rigorous tests of this hypothesis.[14]

[14] Of course, it is still possible that the sex composition of the sibship has affected retirement via different mechanisms. For example, social changes have resulted in parents investing too much in sons relative to what they get back in old age support from them. Much of the young supporting the old in the Confucian system hinged on older parents living together with their adult son and his family. Rapid urbanization could have changed that, as the younger generation moved to apartments in the city, care is more likely to take the form of transfers, raising the ability and possibly willingness of daughters to contribute to their old age parents' support. In order to address these issues, we have conducted a number of additional estimations including by different cuts of the data or with some interactions. We thank a referee for these suggestions.

4. Data

We primarily use the fifth wave of the KLoSA from 2014. However, we also use the first, second, and third waves to collect information on the respondents' job history. Focusing on a single KLoSA wave is important because the anecdotal evidence on the nature of net intra-familial transfers that we presented earlier pertains to a cohort of adults who were born primarily in the 1940s and early 1950s. These are the average birth years of parents in the fifth wave of the survey. As we have shown, social mores have changed rapidly in Korea recently, so cohorts from earlier KLoSA waves may have been affected by different norms governing intra-familial transfers. In fact, to test whether social mores have changed, we also employ the first wave from the KLoSA and re-run some of the main specifications of the paper to test if the effects of the gender composition of the sibship on retirement are dampened.

The KLoSA is a biennial survey that began in 2006 and was created to provide researchers and policy makers with insights into aging issues in Korea. The baseline sample included 10,254 individuals who were age 45 or older in 2006. The survey consists of questions on demographic characteristics, health, employment, income, assets, and subjective expectations. Of the initial sample, 7,029 (2,987 males and 4,042 females) were present in the fifth wave. We restrict the samples to either retirees or people who reported themselves to be currently working in 2014.[15] We exclude people from the sample who were never in the labor force and those who had the intention to work but were not currently working. The final sample consists of 4,375 individuals (2,596 males and 1,779 females). The mean birth year in the sample is 1946.5 with a standard deviation of 9.28 for males, and 1948.8 with a standard deviation of 9.01 for females. For fathers, the 10^{th} percentile of the birth year is 1934 and the 90^{th} percentile is 1959; for mothers, the 10^{th} and 90^{th} percentiles are 1936 and 1960. For children, the mean birth year is 1978 with a standard deviation of 9.37 for males, and 1977 with a standard deviation of 9.26 for females. For sons, the 10^{th} and 90^{th} percentiles of the birth year are 1966 and 1990; for daughters, these percentiles are 1964 and 1988.

[15] In this study, we adopt the definition of retirement employed by the KLoSA, which is (1) having stopped income-earning activities, (2) presently not working or engaging only in pastime work, and (3) having no intention of engaging in anything more serious than pastime work as long as there is no special change in circumstances.

We report descriptive statistics for the variables used in this analysis in Table 2. Of the men in the sample, 41 percent were retired, with a mean age of 67.[16] The mean retirement year was 2003 among men. Note that the variable "work status" is dichotomous, equaling one if the respondent is retired and zero if he is working. Of the women in the sample, 38 percent were retired and their mean age was 65. The mean retirement year was also 2003 among women. Among those who were working, the average number of hours worked per week was 44 for men and 40 for women. On average, both the male and female samples had 2.8–2.9 children. The ratio of sons to the total number of children is about 52 percent for both samples. The average age of the youngest child is between 35 and 36 in both the male and female samples. About 69 percent of children were married in 2014 (not reported in Table 2). Finally, in the table, we also report information on education (defined as a dummy variable equal to one if the respondent has at least a high school education), self-employment status (defined as a dummy variable equal to one if the respondent's most recent job status was in self-employment), health (defined as a dummy variable equal to unity if the respondent reports poor health), rural status (defined as a dummy variable equal to unity if the respondent is a rural dweller), living arrangement (defined as a dummy variable equal to unity if the respondent is living with married sons), and (logged) net household assets.[17]

5. Methods

To test the predictions of the theory, we consider variants of the following parsimonious empirical model:

$$y_i = \beta_0 + \beta_1 chgender_i + \beta_2 X_i + \varepsilon_i \quad (5)$$

where y_i is an outcome, $chgender_i$ is a measure of the sex composition of the sibship in the household, and X_i is a vector of potentially confounding variables. The outcomes that we

[16] Many Koreans are actually pushed out of their career jobs much earlier than other advanced economies—at about age 50, on average (Statistics Korea, 2019). Many of them do not fully retire, however. Rather, they take up temporary positions with little job security and low wages, for example as building guards or taxi drivers. If older parents "expect" that they are not better taken care by sons in old age, then they will be more likely to take up these temporary positions after they pushed out of their career jobs. To see how the selection of sample affects our results we have also used several different age groups and cohorts.

[17] We took the log of the absolute value plus one. If net assets were negative, we multiplied the log transformation (of the absolute value plus one) by negative one.

consider are indicators for working, weekly working hours (during the reference week), and age at retirement. We employ the following measures of $chgender_i$: (1) the ratio of sons to the total number of children (while controlling for the total number of children), (2) the total number of sons and daughters, and (3) dummies for the sex of the child at each parity (while including dummies for the total number of children). We estimate probit and tobit models via MLE and linear models via ordinary least squares depending on the outcome variable. When the retirement age is the dependent variable, we estimate a selection model. We compute robust standard errors for all estimations.

We argue that $chgender_i$ is largely exogenous, since mostly biological processes should determine it. Perhaps the biggest threat to the identification of β_1 is sex-selective abortion. It is true that several studies have found that having access to ultrasound technology can increase the number of sex-selective abortions (Kim 2005; Chen, Li, and Meng 2013). However, this is not likely a problem in this study since we focus on children who were born before the diffusion of ultrasound technology in the late 1980s.[18]

Another threat to identification is suggested by theoretical work by Edlund and Lee (2013), which builds on Edlund (1999). These papers provide convincing arguments that son preferences can persist even in an equilibrium with balanced sex ratios. The basic idea is that households prefer married sons to married daughters, who are in turn preferred to unmarried sons. The authors argue that even in a sufficiently developed society (e.g., Korea during our time frame), richer households exhibit a strong son preference and poorer households exhibit a weaker son preference because everyone prefers married daughters to unmarried sons. This suggests that, controlling for socioeconomic status in our estimations will be critical as these authors showed that, in the Korean context, it is correlated with son preference. Consequently, in the bulk of our estimations we adjust for household wealth and educational attainment.

A final issue is that the sex of the first-born child may affect the parents' decision to have an additional child if parents have a strong preference for a boy or a girl (see, for example, Das Gupta 1987; Yamaguchi 1989; Dahl and Moretti 2008). Given families' preference for sons,

[18] In Korea, sex-selection technologies such as ultrasound tests were introduced in the early 1980s, and their diffusion was completed by the late 1980s (Lee and Lee 2015).

girls will tend to live in larger households. As we will see, this is the case in the KLoSA data. It is important, therefore, to control for the total number of children in some capacity because this number should be systematically correlated with measures of the sex composition of the sibship. However, failure to do so should result in an underestimation of β_1 since having a higher percentage of boys would be correlated with smaller households, which should be associated with fewer transfers from parent to child.

6. Results

6.1 Impact on Retirement Behavior

First we consider the effects of the sex composition of the sibship on parents' decision to retire. For these estimations, we employ the variable *work status* from Table 2, which is a binary variable that is unity if the respondent is retired and zero if currently working. We consider the three different definitions of $chgender_i$ discussed earlier.

In Table 3, we present probit estimates of equation (5) using the ratio of sons to the total number of children as the key independent variable. The first specification includes only the total number of children and parent's age as controls, while the second specification additionally includes controls for education, marital status, employment status, employment status of the spouse, health status, rural residence, the age of the youngest child, and household net assets. In the first two columns of the table we report results from the more parsimonious specification for men and women; we see that, conditional on the number of children in the household, moving from all daughters to all sons decreases the probability of the parents' retirement by 11.5 and 8.5 percentage points (PP) for men and women, respectively. The unconditional probability of retirement from Table 2 is roughly 40 percent for both sexes, which represents about a 28 percent decline for men and a 22 percent decline for women. In the next two columns of the table we include all of our control variables, and we see that the estimates of the coefficients on the son ratio variable are somewhat attenuated but remain significant and economically meaningful. The estimates move from 11.5 to 9.8 PP for men and from 8.5 to 7.1 PP for women. The decline in these estimates is mostly attributable to the controls for self-employment and living in rural areas. Both of these variables are correlated with larger families, which is correlated with fewer boys. In our data, the correlation between the number of children and the ratio of boys is –0.229.

Once again, this is consistent with the result discussed in Yamaguchi (1989) in which girls may live in larger households if there is stopping fertility behavior (i.e., parents do not stop having children until they have a boy).

In the final four columns of the table we include an interaction between log household assets and the son ratio. Although the interaction terms are not individually significant, they are the opposite sign of the estimate of the coefficient on the son ratio. This means that the effects of the son ratio are stronger for poorer households. Note that these interaction effects are substantially larger for mothers than they are for fathers. This finding suggests that female labor supply is more important in offsetting the costs of sons in poorer households.

To rigorously test if the impact of the son ratio is larger for poorer households, we computed F-statistics of the null that the son ratio and its interaction with household assets are jointly significant. In the more parsimonious specifications in columns five and six, the two estimates are jointly significant at the 1 and 5 percent levels for men and women, respectively. In the final two columns the p-values on the F-statistic are 3.16 percent and 13.64 percent for men and women, respectively. Accordingly, the impact of sons on retirement behavior is larger for poorer households.

We have also produced a set of results in which we interacted the sex ratio variable with place of residence, and co-residence with marreid sons (not reported in the table).[19] These additional interactions allows us to test if the impact of son ratio is higher for people living in rural areas or in an extended household. None of the interaction terms are individually significant, however, and they have opposite signs for mothers and fathers. The co-residence variable is large and significant for the male sample, suggesting that elderly living together with their adult sons can retire earlier. This supports the idea of the young supporting the old in the Confucian system. However, it is important to emphasize only 4% of older parents live with their adult sons in the sample. Also, the results should be interpreted with caution as this variable is potentially

[19] For co-residence variable, the co-residence with daughters is not included as the number of cases is very small.

endogenous.[20] Because none of the interaction terms are significant, the results are still consistent with those in Table 3 without the interaction terms.

One threat to the validity of the estimates in Table 3 occurs if the son ratio can somehow be manipulated. We argued that, in the Korean context, the son ratio was primarily manipulated via sex-selective abortion, which became possible in 1985 when ultrasound technology was introduced. To shed light on this, we estimated the models in the first four columns of Table 3 with the restriction that we only used households with children born before 1985. The results are reported in Table 4. We see that the results are not affected, which indicates that sex-selective abortions do not impact our estimations.

In Table 5, we consider a slightly different specification in which we employ the total number of sons and daughters as well as the gender of child at each parity, rather than the ratio of sons as our way of operationalizing $chgender_i$. We report two estimations for men and women, each having all of the control variables from the last two columns of the previous table. We see that, for both men and women, an additional son reduces the probability of retirement by 3.4 PP. The estimate for men is significant at the 1 percent level, and the estimate for women is significant at the 10 percent level.

Next we investigate whether the effects of child sex on retirement behavior vary by birth order. There is an extensive albeit conflicted literature that has explored birth-order effects on child education and health outcomes in developed countries (e.g., Hauser and Sewel 1985; Kessler 1991; Black et al. 2005; Wang et al. 2007; Booth and Kee 2009; Bu 2014; Lundborg, Nilsson, and Rooth 2014). Several studies have proposed some underlying mechanisms for various birth-order effects, including time constraints, disciplinary restrictions, and endowment effects (e.g., Price 2008; Hotz and Pantano 2015; Black et al. 2005). However, and particularly in Asia, the eldest son may receive more investments from parents for the reasons discussed above. Moreover, if the implicit contract between parents and the eldest son has eroded, then parents with a first-born child who is a son may choose to retire later since it is possible that their investments will not be fully repaid. The results are reported in columns 3 and 4, each including

[20] There is absolutely no question that many of other variables are endogenous and that poses as a threat. We have also run regression by excluding potentially endogenous variables such as education, health status, spousal work status. Excluding those variables, however, have very little impact on the estimated coefficients.

all of the controls from columns three and four of Table 3. The results indicate that the first-born child has the largest effect on retirement behavior. In particular, having a first-born son reduces the probability of parental retirement by 4.1 and 4.9 PP for men and women, respectively; both estimates are significant at the 10 percent level.

6.2 Impact on Labor Supply at the Intensive Margin

The theory is agnostic about whether parents will fund net transfers to their children by increasing the labor supply at either the intensive or the extensive margin. In the previous subsection we provide evidence for the latter. However, it is also possible for parents to fund their investments by working more intensively in a given week. To shed light on this, we estimate a Tobit variant of equation (5) with weekly working hours as the dependent variable. We estimate the model for men and for women, again using all of the control variables from the third and fourth columns of Table 3. Note that, per Table 2, the average of weekly working hours is 44.0 and 39.8 for the males and females, respectively.

The results, reported in Table 6, indicate that moving from a sibship with all daughters to all sons increases weekly working hours by about five for both fathers and mothers. Both estimates are significant at the 5 percent level. We also see that an additional son increases weekly working hours by 1.8 and 2.7 hours for fathers and mothers, respectively. Again both estimates are significant at the 5 percent level. Note that, in contrast to the results at the extensive margin, the effects are stronger at the intensive margin for mothers.

6.3 Impact on Age at Retirement

Finally, we estimate a variant of equation (5) using the age at retirement as the dependent variable which are reported in Table 7. In these estimations, we pool mothers and fathers because the sample sizes for this dependent variable are smaller. We employ the three measuees of $chgender_i$ discussed earlier. The total number of observations for these estimations is 6,262 with 3,952 censored or still working. For those who are retired, the mean age at retirement is 60.2 for the entire sample, 62.3 for fathers and 57.2 for mothers. Once again, all estimations include the comprehensive set of controls that the earlier estimations included, with the addition of a dummy variable for sex. The model is estimated by a Heckman two step procedure (Type II Tobit) in which the first step model estimates the probability of retiring.

We report the results of three estimations, each using a different measure of the sex composition of the sibship in Table 7. In all models, the estimated coefficients for the Inverse Mills' Ratio (lambda) are highly significant suggesting that ignoring the endogenous retirement decision biases the results. In the first column we employ the ratio of sons. We see that moving from a sibship with all daughters to all sons increases the retirement age by 2.0 years and that this effect is significant at the 1 percent level. In the next column we employ the total number of sons and daughters. Adding another son to the sibship increases the retirement age by 0.5 years; this estimate is significant at the 10 percent level. As before, there are no significant effects for the number of daughters. Finally, in the third column, we include dummy variables for the sex of the child in each birth position. We see that having a first-born son increases the retirement age by 0.73 years. This estimate is larger than the estimates for younger children, but the estimates for younger children still remain economically meaningful. Hence, as before, first-born sons have the largest effects.

6.4 Possible Reasons for Changing Social Mores

As already discussed, social mores concerning who should care for elderly parents appear to be changing in Korea. Evidence for this is provided in Figure 2. The figure suggests that social mores might have shifted either because younger cohorts do not share the same beliefs as older cohorts or because over time social mores about elderly care have changed even within the same cohort. The former is a cohort effect whereas the latter is a calendar year effect. Both of these effects suggest that the impact of the son ratio on retirement probabilities could be muted in either older cohorts or earlier KLoSA waves.

To test this, we estimate the same models as in Tables 3 and 5 but using older cohorts and/or earlier KLoSA waves. Specifically, we re-estimate the same models from Table 3, which employs the 2014 wave of the KLoSA, except that now we employ the 2006 wave. Using the 2006 wave accomplishes two things. First, it contains slightly older cohorts. In 2006, the average birth years for men and women were 1945.7 (SD 10.25) and 1947.5 (SD 10.16), whereas the corresponding statistics from 2014 are 1946.5 (SD 9.28) and 1948.8 (SD 9.01). Second, the 2006 data come from an earlier time period. Note that the calendar year might have an impact on social mores independent of the cohort, as evidenced by Figure 2. These results are reported in Table 8. These results indicate that, for men, the impact of the son ratio on the retirement

probability is smaller than it was in Table 3. However, the effects are roughly comparable for women. For example, for men, we do not see any significant impact of the son ratio on retirement in column one of Table 8 whereas there is a highly significant impact in the first column of Table 3. On the other hand, for women, the estimates in the second column of Tables 8 and 3 are -0.101 and -0.085, and these estimates are significant at the 1 percent and 5 percent levels, respectively. We see a similar pattern in Tables 3 and 4 when we add controls. The final four columns of Table 8 indicate that the impact of the son ratio is larger for poorer households. Once again, the effects are weaker for men in 2006 than in 2014 as evidenced by the larger p-values on the F-tests in columns five and seven of Table 8 as compared to Table 3.

In addition, we re-estimate the models from Table 7 while restricting the sample to parents born before 1940, which are not reported for the sake of brevity. If social mores changed due to either changes across cohorts or over time, then we should see smaller impacts of the son ratio on the labor supply of the elderly. The estimates are very similar to those in Table 7 that also include more recent cohorts. This indicates that the effects of son ratios on retirement behavior are not confined to younger cohorts. This stands in contrast to the results in Table 8 that did show attenuated effects of son ratios in the 2006 wave of the KLoSA.

Note that there is an important difference between the results from the sample of parents born before 1940 and those from the 2006 wave. The results that only employ the pre-1940 cohort do not differ from the results that use all cohorts. Accordingly, this suggests that changes across cohorts are not driving our results. In contrast, the differences that we see between Tables 3 and 8 come from different survey years (and to a lesser extent small changes in birth year). The fact that they are different strongly suggests that changes in social mores in Korea might be occurring over time rather than across cohorts.

7. Conclusions

In this study, we investigate the relationship between the sex composition of a household's sibship and the retirement behavior of Korean parents. We argue that, in households with relatively more sons than daughters, net intra-familial transfers from parent to child are higher. In particular, in Korea, parents are expected to provide housing for their newlywed sons. We argue that this is one of the largest expenses associated with having sons. We also provide anecdotal

evidence that an implicit contract requiring sons, particularly the eldest son, to care for their elderly parents is eroding. To fund the high transfers to sons, therefore, parents with relatively more sons will need to work longer hours and retire later.

Using the Korean Longitudinal Study of Aging and some simple econometric models, we provide strong evidence that, conditional on the total number of children, parents with relatively more sons work more at both the extensive and intensive margins. Having one additional son decreases the probability of retirement by 7 percentage points for mothers and 10 percentage points for fathers and increases the number of weekly hours worked by 2.7 for mothers and 1.8 for fathers. Also, an additional son delays retirement by roughly 0.7 years. We find no significant effects of additional daughters. The effects are the most pronounced for the eldest son.

These findings indicate that long-standing preferences for sons in Korea, in conjunction with fewer resources flowing from adult children to their parents, affect the retirement behavior of elderly Koreans. Indeed, we provide evidence from surveys that fewer Koreans adhere to the traditional Confucian belief that the eldest son bears the main responsibility of caring for his elderly parents. In addition, we provide some evidence that the impact of the son ratio on retirement behavior was weaker in earlier waves of the KLoSA. This is, at least, consistent with a gradual erosion of Confucian values over time.

Finally, our work suggests some future avenues for research. First, additional work should investigate these effects in other contexts, in particular other East Asian countries where son preferences are also strong. Second, research should attempt to quantify other means by which the costs of children can be repaid, such as time use (e.g., elder care) and shared housing. Finally, more work is needed on how the radical changes to Korea's inheritance laws in the 1990s affected retirement behavior and intra-familial transfers.

Compliance with Ethical Standards

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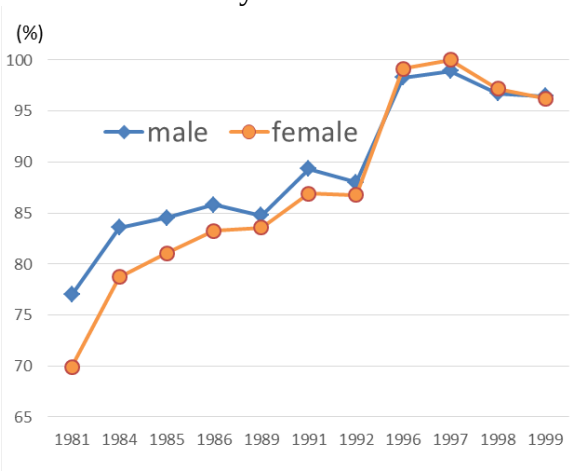
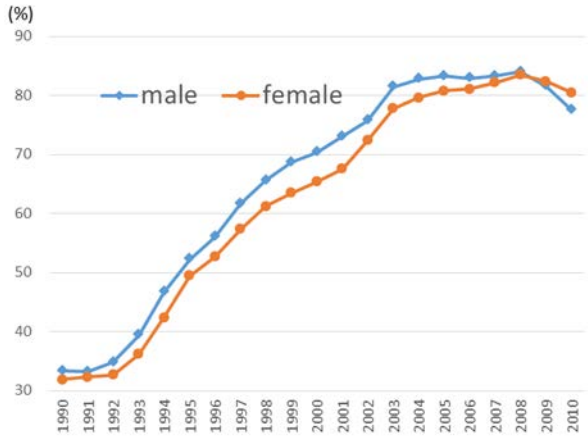
Figure 1 School Enrollment Rates in Korea

Panel A. Secondary School



Source: World Development Indicators (http://databank.worldbank.org/data/).

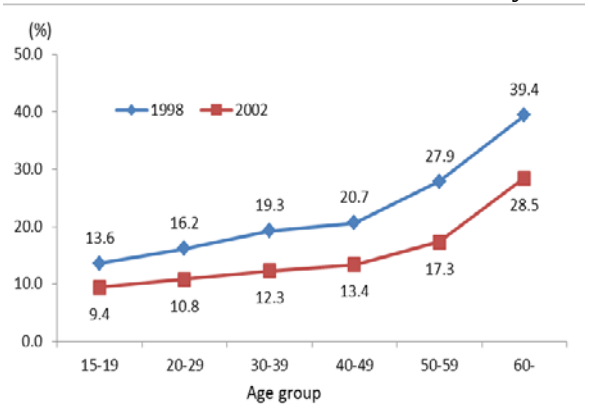
Panel B. Tertiary School



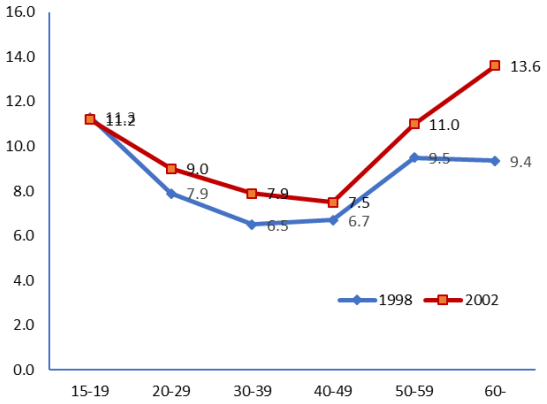
Source: Ministry of Education, Republic of Korea and Korean Educational Development Institute, *Statistical Yearbook of Education* (http://kess.kedi.re.kr/index).

Figure 2 Responsibility for Care of Elderly Parents

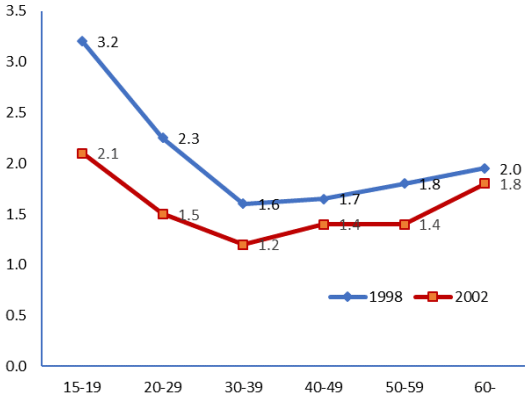
A. Those Who Believe the Eldest Son Should Care for Elderly Parents



B. Those Who Believe the Elderly Should Care for Themselves



C. Those Who Believe the Government Should Care for Elderly Parents



Source: Statistics Korea, Republic of Korea, *Social Survey* (http://kosis.kr/).

Table 1 Share of Housing Expenses at Marriage in Korea

	Age Group		
	20–30	40–50	60+
Groom	86.5%	78.3%	93.8%
Bride	13.5%	21.7%	6.2%

Source: Lee (2011).

Table 2 Summary Statistics

	Males				Females			
	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
Work status (0 = working, 1 = retired)	0.41	0.49	0	1	0.38	0.49	0	1
Weekly working hours (if working)	44.03	15.60	1	96	39.76	17.53	1	100
Retirement year (if retired)	2003	9.19	1965	2014	2003	10.25	1956	2014
Age	67.48	9.28	53	97	65.22	9.01	53	97
Ratio of sons to children	0.52	0.29	0	1	0.52	0.29	0	1
Number of children	2.82	1.25	1	9	2.95	1.37	1	9
Age of the youngest child	35.14	8.67	10	68	36.42	8.49	10	71
Birth year of the children	1978	9.37	1937	2004	1977	9.26	1936	2004
Education (1 = high school or more)	0.56	0.50	0	1	0.30	0.46	0	1
Health status (1 = poor health)	0.30	0.46	0	1	0.33	0.47	0	1
Employment status (1 = self-employed)[a]	0.47	0.50	0	1	0.49	0.50	0	1
Place of residence (1 = rural)	0.25	0.43	0	1	0.31	0.46	0	1
Household net assets (US$)[b]	316,885	391,724	-280,460	5,574,713	258,666	346,414	-86,206	4,367,816
Living with married sons (1 = yes)[c]	0.04	0.19	0	1	0.05	0.21	0	1
Observations	2,596				1,779			

Note: Calculated by the authors using data from the Korean Longitudinal Study of Aging.
[a] For retirees, this is measured as the employment status of the most recent job.
[b] Korean won were converted into USD using OECD PPP exchange rates (870 Korean won = 1 dollar, 2014).
[c] The data set also contains information on "living with any married children". The mean and s.d. is not very different from this variable, suggesting that living with married daughters is very rare in Korea.

Table 3 Probit Estimations (Dependent Variable: 0 = Working; 1 = Retired): Son Ratio

	(1) Male	(2) Female	(3) Male	(4) Female	(5) Male	(6) Female	(7) Male	(8) Female
Ratio of sons	-0.115***	-0.085**	-0.098***	-0.071*	-0.126	-0.253*	-0.101	-0.237
	(0.035)	(0.041)	(0.037)	(0.042)	(0.122)	(0.133)	(0.012)	(0.151)
Number of children	-0.059***	-0.054***	-0.017	-0.018	-0.059***	-0.054***	-0.017	-0.018
	(0.011)	(0.012)	(0.012)	(0.013)	(0.011)	(0.012)	(0.012)	(0.013)
Age	0.039***	0.029***	0.034***	0.023***	0.039***	0.029***	0.034***	0.024***
	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)
Ratio of sons × HH net assets(logged)					0.001	0.018	0.001	0.018
					(0.013)	(0.014)	(0.013)	(0.016)
Education (1 = high school or more)			0.066***	0.055*			0.066***	0.055*
			(0.025)	(0.033)			(0.025)	(0.033)
Health status (1 = poor health)			0.229***	0.169***			0.229***	0.169***
			(0.026)	(0.028)			(0.026)	(0.028)
Employment status (1 = self-employed)			-0.268***	-0.106***			-0.267***	-0.106***
			(0.024)	(0.028)			(0.024)	(0.028)
Place of residence (1 = rural)			-0.192***	-0.216***			-0.192***	-0.216***
			(0.030)	(0.032)			(0.030)	(0.032)
Age of the youngest child			0.007**	0.005			0.007**	0.005
			(0.003)	(0.003)			(0.003)	(0.003)
Spousal work status[a]								
Nonworking spouse			-0.051	-0.028			-0.051	-0.030
			(0.040)	(0.032)			(0.040)	(0.032)
Working spouse			-0.092**	-0.040			-0.092**	-0.041
			(0.042)	(0.034)			(0.042)	(0.034)
HH net assets(logged)			0.005	0.006	0.003	-0.007	0.005	-0.004
			(0.006)	(0.006)	(0.009)	(0.009)	(0.010)	(0.011)
F-Test[b]					10.82	6.27	6.91	3.98
					[0.0045]	[0.0435]	[0.0316]	[0.1364]
Obs.	2,596	1,779	2,596	1,779	2,596	1,779	2,596	2,596

Notes: We report marginal effects at the means of the right-hand side variables. Robust standard errors are reported in parentheses.
*, **, and *** indicate statistical significance at the 10, 5, and 1 percent level, respectively.
[a] Reference: No spouse. [b]F-test on the null that the son ratio and its interaction with HH assets is zero. The p-value is reported in brackets.

Table 4 Probit Estimations (Dependent Variable: 0 = Working; 1 = Retired): Son Ratio, Children Born before 1985

	(1) Male	(2) Female	(3) Male	(4) Female
Ratio of sons	-0.161***	-0.105**	-0.138***	-0.080†
	(0.042)	(0.048)	(0.045)	(0.050)
Number of children	-0.070***	-0.071***	-0.021†	-0.036**
	(0.013)	(0.014)	(0.014)	(0.016)
Age	0.040***	0.029***	0.036**	0.027***
	(0.002)	(0.002)	(0.004)	(0.004)
Education (1 = high school or more)			0.094***	0.067*
			(0.029)	(0.039)
Health status (1 = poor health)			0.207***	0.163***
			(0.030)	(0.032)
Employment status (1 = self-employed)			-0.294***	-0.108***
			(0.028)	(0.032)
Place of residence (1 = rural)			-0.209***	-0.225***
			(0.034)	(0.037)
Age of the youngest child			0.007†	0.001
			(0.004)	(0.004)
Spousal work status[a]				
Nonworking spouse			-0.027	-0.039
			(0.049)	(0.037)
Working spouse			-0.059	-0.063
			(0.051)	(0.039)
HH net assets(logged)			0.009	0.004
			(0.009)	(0.007)
Obs.	1,897	1,354	1,897	1,354

Notes: Per Table 3.
†, *, **, and *** indicate statistical significance at the 15, 10, 5, and 1 percent level, respectively.
a Reference: No spouse.

Table 5 Probit Estimations (Dependent Variable: 0 = Working; 1 = Retired): Number of Sons and Gender Effects by Birth Order.

	(1) Male	(2) Female	(3) Male	(4) Female
Number of sons	-0.034**	-0.034*		
	(0.016)	(0.018)		
Number of daughters	-0.002	-0.005		
	(0.012)	(0.013)		
1st child's sex (1 if son, 0 otherwise)			-0.041*	-0.049*
			(0.023)	(0.026)
2nd child's sex (1 if son, 0 otherwise)			-0.012	-0.002
			(0.025)	(0.027)
3rd child's sex (1 if son, 0 otherwise)			-0.046	-0.016
			(0.033)	(0.035)
4th child's sex (1 if son, 0 otherwise)			-0.036	0.010
			(0.048)	(0.048)
5th child's sex (1 if son, 0 otherwise)			-0.088	-0.091
			(0.073)	(0.068)
Age	0.034***	0.024***	0.034***	0.024***
	(0.003)	(0.003)	(0.003)	(0.003)
Education (1 = high school or more)	0.065***	0.055*	0.069***	0.055
	(0.025)	(0.033)	(0.025)	(0.033)
Health status (1 = poor health)	0.228***	0.169***	0.229***	0.173***
	(0.026)	(0.028)	(0.026)	(0.028)
Employment status (1 = self-employed)	-0.267***	-0.106***	-0.268***	-0.109***
	(0.024)	(0.028)	(0.025)	(0.028)
Place of residence (1 = rural)	-0.192***	-0.214***	-0.190***	-0.211***
	(0.030)	(0.027)	(0.030)	(0.032)
Age of the youngest child	0.007**	0.005	0.007**	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)
Spousal work status[a]				
Not working spouse	-0.051	-0.028	-0.056	-0.031
	(0.040)	(0.032)	(0.041)	(0.033)
Working spouse	-0.091**	-0.039	-0.094**	-0.047
	(0.042)	(0.034)	(0.042)	(0.034)
HH net assets(logged)	0.006	0.006	0.005	0.007
	(0.006)	(0.006)	(0.006)	(0.006)
Obs.	2,596	1,779	2,596	1,779

Notes: Per Table 3.
*, **, and *** indicate statistical significance at the 10, 5, and 1 percent level, respectively.
[a] Reference: No spouse.

Table 6 Tobit Estimations (Dependent Variable: Weekly Working Hours)

	(1) Male	(2) Female	(3) Male	(4) Female
Ratio of sons	4.983**	5.318**		
	(2.016)	(2.612)		
Number of children	1.090	1.558*		
	(0.751)	(0.886)		
Number of sons			1.816**	2.673**
			(0.936)	(1.164)
Number of daughters			0.312	0.632
			(0.782)	(0.890)
Age	-2.267***	-1.980***	-2.280***	-1.994***
	(0.176)	(0.211)	(0.176)	(0.210)
Education (1 = high school or more)	-4.041***	-0.910	-4.020***	-0.937
	(1.471)	(1.996)	(1.472)	(1.996)
Health status (1 = poor health)	-14.602***	-10.527***	-14.618***	-10.539***
	(1.633)	(1.926)	(1.633)	(1.927)
Employment status (1 = self-employed)	16.686***	11.217***	16.745***	11.214***
	(1.298)	(1.693)	(1.297)	(1.694)
Place of residence (1 = rural)	9.792***	11.440***	9.792***	11.351***
	(1.537)	(1.876)	(1.542)	(1.878)
Age of the youngest child	-0.335**	-0.161	-0.324**	-0.160
	(0.159)	(0.190)	(0.159)	(0.191)
Spousal work status[a]				
Not working spouse	4.234**	3.106	4.222**	3.090
	(2.094)	(2.185)	(2.093)	(2.187)
Working spouse	5.971***	2.206	5.964***	2.228
	(2.138)	(2.173)	(2.139)	(2.173)
HH net assets(logged)	0.022	-0.400	0.022	-0.404
	(0.275)	(0.357)	(0.275)	(0.357)
Obs.	2,596	1,779	2,596	1,779

Notes: Per Table 3.
*, **, and *** indicate statistical significance at the 10, 5, and 1 percent level, respectively.
[a] Reference: No spouse.

Table 7 Heckman Selection Model (Type II Tobit): Age at Retirement

	(1)	(2)	(3)
Ratio of sons	2.016***		
	(0.699)		
Number of children	0.217		
	(0.192)		
Number of sons		0.480*	
		(0.245)	
Number of daughters		-0.055	
		(0.206)	
1st child's gender (1 if son, 0 otherwise)			0.732*
			(0.411)
2nd child's gender (1 if son, 0 otherwise)			0.683
			(0.425)
3rd child's gender (1 if son, 0 otherwise)			0.484
			(0.511)
4th child's gender (1 if son, 0 otherwise)			0.493
			(0.696)
5th child's gender (1 if son, 0 otherwise)			-0.326
			(1.006)
Gender (1=male)	6.308***	6.313***	6.164***
	(0.720)	(0.721)	(0.698)
lambda	-11.394***	-11.292***	-10.723***
chi2(1) lambda=0	16.26	15.9	15.41
Other characteristics	Yes	Yes	Yes
Obs.	6,262	6,262	6,262
(selected)	2,310	2,310	2,310
(non-selected)	3,952	3,952	3,952

Notes: Per Table 3.

*, **, and *** indicate statistical significance at the 10, 5, and 1 percent level, respectively.

Dummies for public pension enrollment, occupation, marital status, spousal work status, birth cohort, and logged labor income (at the time of retirement for retirees).

Table 8 Probit Estimations (Dependent Variable: 0 = Working; 1 = Retired): Son Ratio, 2006 KLoSA Wave

	(1) Male	(2) Female	(3) Male	(4) Female	(5) Male	(6) Female	(7) Male	(8) Female
Ratio of sons	-0.028	-0.101***	-0.040	-0.078**	-0.140**	-0.139**	-0.122*	-0.102
	(0.027)	(0.036)	(0.027)	(0.038)	(0.062)	(0.062)	(0.063)	(0.068)
Number of children	-0.038***	-0.051***	-0.006	-0.011	-0.039***	-0.049***	-0.006	-0.012
	(0.007)	(0.010)	(0.008)	(0.012)	(0.007)	(0.010)	(0.008)	(0.012)
Age	0.033***	0.027***	0.024***	0.022***	0.033***	0.026***	0.024***	0.022***
	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)	(0.002)	(0.002)	(0.003)
Ratio of sons × HH net assets(logged)					0.014**	0.005	0.011	0.003
					(0.007)	(0.007)	(0.007)	(0.008)
Education (1 = high school or more)			0.081***	0.069**			0.081***	0.069**
			(0.018)	(0.030)			(0.018)	(0.030)
Health status (1 = poor health)			0.233***	0.205***			0.232***	0.205***
			(0.020)	(0.026)			(0.020)	(0.026)
Employment status (1 = self-employed)			-0.237***	-0.186***			-0.236***	-0.186***
			(0.018)	(0.025)			(0.018)	(0.025)
Place of residence (1 = rural)			-0.150***	-0.245***			-0.151***	-0.245***
			(0.023)	(0.031)			(0.023)	(0.031)
Age of the youngest child			0.009***	0.004			0.009***	0.004
			(0.002)	(0.003)			(0.002)	(0.003)
Spousal work status[a]								
Nonworking spouse			-0.100***	-0.078***			-0.101***	-0.078***
			(0.029)	(0.030)			(0.029)	(0.029)
Working spouse			-0.132***	-0.078***			-0.133***	-0.078***
			(0.030)	(0.029)			(0.030)	(0.029)
HH net assets(logged)			-0.002	0.009***	-0.008**	0.005	-0.007*	-0.007
			(0.002)	(0.003)	(0.004)	(0.007)	(0.004)	(0.005)
F-Test[b]					5.09	8.89	4.12	4.52
					[0.0783]	[0.0117]	[0.1272]	[0.1045]
Obs.	3,570	2,167	3,570	2,167	3,570	2,167	3,570	2,167

Notes: Per Table 3.
*, **, and *** indicate statistical significance at the 10, 5, and 1 percent level, respectively.