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Retirement Behavior in South Korea

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May 2018

# **The Betrayed Generation?**

## **Intra-Household Transfers and Retirement Behavior in South Korea<sup>+</sup>**

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### **Abstract**

We consider the nexus of intra-household transfers, the sex composition of the sibship, and parental retirement behavior in Korea. We provide evidence that the cost of raising sons is higher than it is for daughters in Korea. In the absence of sufficient transfers from adult sons to parents, this implies that parents will increase their labor supply to fund earlier investments in their sons. Consistent with this, we show that parents with more adult sons delay their retirements. In particular, an elderly parent with all sons has a retirement probability that is 7-10 percentage points lower than a comparable parent with all daughters. Elderly parents also work between 1.8-2.7 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-household 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 grown adults, transfers from parent to child can turn negative if adult children care for their elderly parents.

Such transfers from grown children to their parents in old age are often viewed as a form of repayment as part of an implicit contract (Lillard and Willis, 1997). Despite the prevalence of public and private pensions, and 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).

There is a substantial 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 have a preference for their well-being (Becker, 1974; Becker and Tomes, 1976). In contrast, exchange models consider transfers as part of a *quid pro quo*. Specifically, intra-family transfers are motivated by the 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 with parents investing in children with the expectation that they will be cared for when they are older.

However, the evidence on children providing care for elderly parents in such a manner is somewhat mixed and very much depends on context. It is probably the 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 since sons tend to receive more transfers than daughters in Asian countries. In the US, studies on the role of the child gender 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 is less consistent with an exchange model since there are fewer disparities in child investments across genders in the US. Finally, an interesting study by Xie and Zhu (2009) shows that in urban China, married daughters provide more financial support to 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 this suggests 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. Theoretically, 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 to increase their labor supply either at the extensive margin via delayed retirement or at the intensive margin via increased work hours. However, as of now, 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-household transfers across households can be very difficult. As a consequence, this renders the empirical question of how intra-household transfers impact parental labor supply quite challenging.

However, one avenue that can be exploited to shed light on this question is gender disparities in parental investments in children which often stem from long-standing social mores. In cases where parents do not or cannot manipulate the gender composition of their sibships, the relative number of boys and girls within a household can provide researchers with meaningful exogenous variation in intra-household transfers. Specifically, in societies with strong biases towards 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.

Economic linkages between parents and their sons are particularly pronounced in East Asian countries such as South Korea (henceforth Korea), China, and Taiwan. In these countries,

parents typically allocate more financial resources and time to their sons and, especially, to the eldest son 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; Barcellos, Carvalho, and Lleras-Muney 2014; Bu 2014, Choi and Hwang 2015). Specifically, Strauss and Thomas (1995) find that girls in South Asia receive fewer nutritional, educational, and health inputs. In India, Jayachandran and Kuziemko (2011) and Barcellos, *et al.* (2014) document that boys receive more childcare time, vitamin supplementation, and breastfeeding when compared to girls. In China, Qian (2008) finds that an increase in relative female income in a household increases the survival rates of girls, whereas an increase in relative male income decreases the survival rates and educational attainment of girls. Wong (2013) shows that sons receive larger inter-vivo transfers and attain higher levels of education than daughters in Korea while the opposite is true in the US.

While it is true that, theoretically, child gender may have significant effects on parents' labor supply, previous studies provide somewhat conflicting results. For example, Lundberg and Rose (2002) and Lundberg (2005) find that fathers work more in response to having a son rather than a daughter. On the other hand, Pabilonia and Ward-Batts (2007) investigate the same question also in the US but find evidence that Asian men work less relative to white men in response to having sons.

We examine a similar topic in Korea. However, there is a key difference between our study and the previous literature. The extant literature focuses on how parents' labor supply responds to the presence of young children in the household and, specifically, the gender composition of the sibship. In contrast, we focus on how the labor supply of elderly parents responds to the gender composition of their adult children's sibship and we do so in the context of an intra-household transfer model.

Korea provides a particularly interesting setting to investigate the effects of intra-household 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 as parents tend to be involved in numerous aspects of their children's lives. 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 oldest 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 age 65 or older was 31.3 percent in 2015 while the average value of OECD countries was 14.1 percent (OECD, 2017a). 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 aged 65 or older was the highest among the OECD member countries at 48.8% in 2014 percent (OECD, 2017b). In large part, this is the result of the National Pension Scheme (NPS) providing little or no pension income to those who retired prior the middle of the decade 2000-2010.<sup>1</sup> Moreover, many of Korea's elderly have insufficient private savings. In large part, this is due to incurring significant expenditures on their children's education or housing.<sup>2</sup> Finally, and as we will see, there is some indication that the implicit contract is eroding somewhat in Korea so that many Koreans continue to invest in their children while receiving less in return when they are older. Because of this, this cohort of Koreans has been called the "betrayed generation." However, we will also show that this moniker can apply to all of the cohorts that we consider in this study.

In this study, we estimate the effects of intra-household transfers on the labor supply of elderly Koreans. To do this, we exploit the fact that intra-household transfers critically depend on the gender composition of the sibship in Korea. We employ the KLoSA waves 2006-2014. We provide evidence that households with larger numbers of boys transfer more resources from parent to child and, also, of an erosion in the social contract in Korea. Taken together, this suggests that net lifetime transfers from parent to child have increased over time and tend to be larger in households with more boys. We then estimate how the gender composition of the sibship affects the labor supply and retirement behavior of parents.

We 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

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<sup>1</sup> The first disbursement of normal benefits by the NPS was in 2008. Individuals who retired before 2008 received either no or substantially reduced pension benefits.

<sup>2</sup> Education expenditures on children accounted for 14.6% of the total household consumption expenditures in 2014 (Park, 2015).

children, families with all sons have retirement probabilities that are 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.

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 is not recouped in older age. As a consequence, our results suggest that parents with greater numbers of boys 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-household transfers affect labor supply in a stripped-down lifecycle model. We then provide some evidence for why these transfers critically depend on the gender composition of the sibship in Korea. After that, we discuss the data and the methods that we employ. We then present the results. Finally, we conclude.

## **2. Intra-household Transfers**

### **2.1. A Stripped-Down Model**

In this section, we present a simple framework in which we conceptualize how parental labor supply, intra-household transfers, and child gender are related. The model that we present abstracts from household preferences and, instead, focuses on the lifetime budget constraint. The main reason for doing so is that unless the gender of the children in the household affects the marginal utility of leisure, only the budget constraint will matter when discussing the effects of the gender composition of the sibship on labor supply and retirement behavior.

The centerpiece of the model is the parent's lifetime budget constraint. We avoid the usual complexities of inter-temporal budget constraints and, instead, write it compactly as:

$$wL(g) + T^{C \rightarrow P}(g) = C + T^{P \rightarrow C}(g) \quad (1)$$

where  $w$  is the wage rate,  $L(\cdot)$  is parent's labor supply,  $T^{C \rightarrow P}(\cdot)$  are the financial transfers from child to a parent,  $C$  is parent's consumption (which we assume does not depend on the child's

gender),  $T^{P \rightarrow C}(\cdot)$  are the financial transfers from parent to child, and  $g$  is child's gender which is unity if it is a son and zero if it is a daughter. In this model, we do not make a distinction between labor supply at the intensive or the extensive margin so we view  $L(\cdot)$  as a measure of total lifetime hours of labor. Theoretically, this distinction should not make a difference. However, in the empirical section, we do test for effects at both margins. Finally, and as intimated above, for the ease of exposition, we only consider one child households.

We can re-write equation (1) as follows:

$$wL(g) = C + L^{P \rightarrow C}(g) - L^{C \rightarrow P}(g) \quad (2)$$

or

$$wL(g) = C + NetL^{P \rightarrow C}(g) \quad (3)$$

where  $NetT^{P \rightarrow C}(\cdot)$  are the net transfers from parent to child. If we difference equation (3) across genders then we obtain that

$$L(1) - L(0) = \frac{1}{w} (NetL^{P \rightarrow C}(1) - NetL^{P \rightarrow C}(0)). \quad (4)$$

Equation (4) shows quite clearly how the gender of the child affects parental labor supply. Specifically, if  $NetL^{P \rightarrow C}(1) - NetL^{P \rightarrow C}(0) > 0$ , then we obtain that  $L(1) - L(0) > 0$  so that parents must increase their labor supply to fund increased net transfers to their male children. Another implication of equation (4) is that the labor supply response needed to fund additional transfers to children will be dampened for higher wage parents *ceteris paribus*.

However, we typically do not know how the gender composition of the sibship affects net transfers within the household. Hence, we often do not know the sign of the quantity,  $NetL^{P \rightarrow C}(1) - NetL^{P \rightarrow C}(0)$ . To do this would require a comprehensive data set containing all lifetime transactions between parents and their children. As such comprehensive data sets are difficult to obtain, we instead look at various surveys, statistics, or related studies that enable us to reasonably determine the sign of  $NetL^{P \rightarrow C}(1) - NetL^{P \rightarrow C}(0)$  in the Korean context. We discuss this evidence in the next subsection.



## 2.2. Gender Preferences and Parental Transfers in Korea

Korea has a strong history of preferences for sons. One of the more unpleasant manifestations of this occurred with the advent of ultrasound technology in the year 1985. After this year, sex selective abortions become common and they remained common until ultrasounds were banned in 1995 (Lee and Smith, 2018). It is widely believed that the new technology widened the sex ratio at birth substantially with it reaching a peak of 116 boys to 100 girls in 1990. Subsequently, after ultrasounds were banned, sex ratios declined and returned to a biologically normal level of 105 boys to 100 girls in 2014. However, other factors such as the development of the Korean economy and the improvement of women's socio-economic status most likely contributed to this decline. The ban on ultrasounds was ruled unconstitutional in 2009 by Korea's Constitutional Court but, subsequent to the court's ruling, parents can still only learn the gender of their child after 32 weeks of pregnancy when abortions are very rare.

While the sex ratio at birth, one of the most prominent metrics of gender bias, is by-and-large normal in Korea currently, there are still many other important indications of differential investments in sons *vis-a-vis* daughters that suggest important gender differences. Among these are: (1) educational investments; (2) support for children's marriage expenses; (3) income transfers from adult children to elderly parents.<sup>3</sup> We now 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 parents in this study were primarily born in the late forties. The mean birth year of fathers and mothers in our data is 1947 and 1949. The children in our data were primarily born in the late seventies. So, the mean birth year of sons and daughters in our data is 1979 and 1977. Based on this, the majority of the children in our study were enrolled in secondary or tertiary school sometime in the eighties and nineties. These children most likely married between the mid-1990's and mid-2010's. Finally, income transfers from children to elderly parents most likely occurred in the period after 2000.

### 2.2.1. Parental Investments in Education

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<sup>3</sup>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).

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, respectively. In panel A, we see a higher secondary school enrollment rate for boys than for girls that persisted throughout the eighties.<sup>4</sup> Note that secondary enrollment rates were over five percentage points higher for sons than for daughters in 1981 which is substantial. During the nineties, we see in panel B that enrollments in tertiary education 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 across genders during the nineties.<sup>5</sup> Based on this, there were substantially higher educational investments in sons vis-à-vis daughters throughout the eighties and nineties. Choi and Hwang (2015) also found that monthly expenditures on private after-school education are higher for first-born boys than first-born girls and that this disparity persists to today.

### **2.2.2. Support for Children's Marriage Expenses**

Many studies have investigated gender 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 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. While it is true that many newlyweds rent apartments, this cost is still a burden due to

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<sup>4</sup>Secondary school was not mandatory during this time.

<sup>5</sup> In Korea, secondary school became compulsory in 2004. Prior to then, it was only compulsory in some parts of the country.

Korea's unique renting system, *jeonse*, which requires a large lump sum deposit upfront.<sup>6</sup> In Korea, the costs of marriage are typically higher for sons than 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 for 47.4 percent of this cost while 10.4 percent was financed by the bride's parents. 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) on marriage with 42.7 percent of the total cost being 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 being footed by her parents. In the same survey, 75 percent of male respondents replied that the bulk of their marital costs were housing. Related, Table 1 provides some calculations from Lee (2011) that show that the groom's side 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, this provides strong evidence that the costs of marriage are substantially higher for sons than for daughters.

### **2.2.3. Financial Transfers from Adult Children to Elderly Parents**

In countries with strong Confucian traditions such as Korea, intergenerational transfers in a household occur not only in a downward direction but also in an upward direction as adult children often support their retired parents. Traditionally, sons (especially the eldest) typically have larger responsibilities to support their parents than daughters. Given this traditional relationship, there is a common view that elderly parents with sons are usually better supported financially. However, there are few studies on this.

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<sup>6</sup> *Jeonse* requires the tenant to make a deposit of approximately two-thirds of the property price for key money, which is then refunded once the lease expires. The tenant pays no monthly rent for the duration of the contract, which typically lasts for two years. *Jeonse* was traditionally much more popular than a monthly payment system until recently.

One of the few studies on the topic available in the Korean context is Kim (2010).<sup>7</sup> 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 when compared to the effects of having relatively more sons on the parent's expenditures on education and marriage. Within the context of the exchange model of intra-household transfers, this suggests that, at least in the early 2000's, many parental investments in sons were not being fully paid back. A possible explanation for this small difference between sons and daughters are fading Confucian traditions among younger generation of Koreans.

Despite this, according to a survey conducted by the Korean government, elderly parents still expect more support from sons than daughters after retirement. Specifically, the survey asked the question (translated from Korean), "Who should primarily support elderly parents?" Figure 2 presents the percentage of respondents who answered: "the eldest son" in 1998 and 2002 by age group.

The figure shows two important phenomena. First, younger people are less likely to report that the oldest son bears the main responsibility of elder care indicating an erosion of a core Confucian value among younger people. Second, the profile from 2002 is substantially below the profile from 1998 indicating that cohorts that are just four years younger are less likely to adhere to this value.

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. Moreover, younger sons still inherited more than daughters. Since the revision, however, all children were entitled to an equal inheritance regardless of their gender or birth order. Additionally, 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-household resource allocation (*e.g.* Manser and Brown, 1980; McElroy

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<sup>7</sup> In this study, children are defined as adults aged 19 or over who do not live with their parents and are not students during the time of the survey. The average age of parents is 69.5 and that of their children is 41.5.

and Horney, 1981; Hoddinott and Haddad, 1995; Thomas, 1990; Chau *et al.*, 2007). This enhanced bargaining power for women may have increased daughters' financial transfers to their own elderly parents rather than to their parents-in-law.

### **2.2.5. Theoretical Predictions**

The evidence shown 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 seems to be accounted for by education and, especially, marriage expenses. Moreover, existing evidence suggests only a minor difference between sons and daughters when providing support for their elderly parents. This suggests that there has been an ostensible erosion of the implicit contract to some extent in recent years. Based on our simple theory, this suggests that having more sons should have positive effects on parental labor supply and that these effects should be smaller for richer households. For the remainder of the paper, we provide some rigorous tests of this hypothesis.

## **3. Data and Estimation Methods**

### **3.1. 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 respondent's job history. Focusing on a single KLoSA wave is important as the anecdotal evidence on the nature of net intra-household transfers that we presented earlier pertains to a particular cohort of adults who were mostly born in the forties and early fifties. This corresponds to 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 and so cohorts from earlier KLoSA waves may have been subjected to different norms governing intra-household transfers.

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 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 report to be currently working in 2014.<sup>8</sup> We exclude people from the sample who were never in the labor force, or those who have the intention to work, but do not work currently. The final sample consists of 4,375 individuals (2,596 males and 1,779 females). The mean birth year in the sample is 1947 with a standard deviation of 9.28 for males and 1949 with a standard deviation of 9.01 for females; 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.

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. The mean retirement year was 2003 among retired men. Note that the variable “work status” is dichotomous equaling one if the respondent is retired and zero if they are 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 retired women. Among those who were working, the average number of hours worked per week was 44 for men and 40 for women. On average, there are about 2.8-2.9 children for both the male and female samples. 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 (this is not reported in Table 2). Finally, we also report information on education, self-employment status, health, rural status, and assets in the table.

### 3.2. Estimation 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 gender composition of the sibship in the household, and  $X_i$  is a vector of potentially confounding variables. The outcomes that we

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<sup>8</sup> 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.

consider are indicators for working, weekly working hours, 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 gender 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. We compute robust standard errors for all estimations.

On the whole, we would argue that  $chgender_i$  is largely exogenous as it should mostly be determined by biological processes. Perhaps, the biggest threat to the identification of  $\beta_1$  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 as we focus on children who were born before the diffusion of ultrasound technology in the late-eighties.<sup>9</sup>

A final issue is that the gender 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). With a son preference, this implies that girls will tend to live in larger households. As we will see, this is the case in the KLoSA data. This underscores the importance of controlling for the total number of children in some capacity as this should be systematically correlated with measures of the gender composition of the sibship. However, failure to do so should result in an underestimation of  $\beta_1$  since having a higher percentage of boys would be correlated with smaller households which should be associated with fewer transfers from parent to child.

## 4. Results

### 4.1. Impact on Retirement Behavior

First, we consider the effects of the gender composition of the sibship on the decision to retire. For these estimations, we employ the variable *work status* from Table 2 which is a binary

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<sup>9</sup> In Korea, the sex selection technologies such as ultrasonic tests were introduced in the early 1980s and their diffusion was completed by the late 1980s (Lee and Lee, 2015).

variable that is unity if the respondent is retired and zero if they are 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 number of total 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 and we see that, conditional on the number of children in the household, moving from all daughters to all sons decreases the probability of 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 genders and so this constitutes 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 attenuated somewhat but still remain significant and economically meaningful. The point estimates move from 11.5 to 9.8 PP for men and 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. This interaction allows us to test the implication of the stripped down theory that the impact of the son ratio is dampened for wealthier households.<sup>10</sup> While the interaction terms are not individually significant, they are the opposite sign of the estimate of the coefficient on the son ratio. This indicates that the effects of the son ratio are stronger for poorer households.

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<sup>10</sup> Strictly speaking, the model says that the effects of the son ratio are lower for households that face higher wages. However, in the model, there is a one-to-one relationship between the wage and the household's lifetime wealth. Accordingly, using household wealth is an appropriate means of testing the theory.



Note that these interaction effects are substantially larger for mothers than they are fathers. This suggests that female labor supply is more important in offsetting the costs of sons in poorer households.

To rigorously test if the impacts 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 one and five percent levels for men and women, respectively. In the final two columns, the p-values on the F-statistic are 3.16% and 13.64% for men and women. Accordingly, the impact of sons on retirement behavior is larger for poorer households.

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 prior to 1985. The results are reported in Table A1. We see that the results are not affected which indicates that sex-selective abortions are not impacting our estimations.

In Table 4, we consider a slightly different specification in which we employ the total number of sons and daughters 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 point-estimate for men is significant at the one percent level and the estimate for women is significant at the ten percent level.

Next, we investigate if the effects of child gender on retirement behavior vary according to 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, or 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 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 retire later since their investments may not be fully repaid.

In Table 5, we report the effects of the gender of the child at each parity on the parent's retirement behavior. As with the previous table, we report one estimation for men and women each including all of the controls from columns three and four of Table 3. Note that all estimations include dummies for the total number of children. The results indicate that the largest effects on retirement behavior occur for the first born. Particularly, having a first born son reduces the probability of retirement by 4.1 and 4.9 PP for men and women, respectively; both estimates are significant at the ten percent level.

#### **4.2. Impact on Labor Supply at the Intensive Margin**

The theory is agnostic about whether parents will fund net transfers to their children by increasing labor supply at either the intensive or extensive margins. In the previous subsection, we provide evidence for the former. 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 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.

We present one set of results in Table 6 in which we use the ratio of sons to the total number of children as the measure of the gender composition of the sibship. The results 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 five percent level.

Next, in Table 7, we employ the total number of sons and daughters as our main explanatory variables. We 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 five percent level. Note that in contrast to the results at the extensive margin, the effects are stronger at the intensive margin for mothers. This is the case in both Tables 6 and 7.

### 4.3. Impact on Age at Retirement

Finally, we estimate a variant of equation (5) using the age at retirement as the dependent variable. In these estimations, we pool mothers and fathers due to smaller sample sizes for this dependent variable. We employ the three measures of  $chgender_i$  discussed earlier. The total number of observations for these estimations is 2,310 with 1,338 males and 972 females. 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 gender.

We report the results of three estimations each using a different measure of the gender composition of the sibship in Table 8. 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 1.5 years and that this effect is significant at the five 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 0.7 years; this estimate is significant at the one 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 gender of the child at each order of birth. We see that having a first born son increases the retirement age by 0.7 years. This estimate is larger than those for younger children, but the estimates for younger children still remain economically meaningful. Hence, as before, the largest effects are present for first born sons.

As already discussed, social mores concerning who should care for elderly parents appear to be changing in Korea. Evidence for this is provided earlier in Figure 2. This suggests that the effects of son ratios on retirement behavior might be muted in older cohorts if these cohorts receive more transfers from their adult sons than younger cohorts. To test this, we estimate the same models as in Table 8 except that we restrict the sample to parents born before 1940.<sup>11</sup>

We report the results in Table 9. The estimates are very similar to those in the previous table which indicates that the effects of son ratios on retirement behavior are not confined to younger

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<sup>11</sup> Note that this type of an exercise will not be effective with the specifications from Table 3 since cohorts born before 1940 are mostly retired. This lack of variation in the dependent variable for these cohorts results in an under-powered test. Accordingly, we use the specifications from Table 8 that rely on retrospective measurements of the individual's retirement age.

cohorts. Accordingly, while social mores do appear to be changing in Korea, at least according to some surveys, both the older and the younger households in our sample require later retirements to fund the costs of having sons. What this indicates is that, despite an ostensibly stronger belief that the oldest son should care for their elderly parents, there were still very strong impacts of son ratios on the retirement behavior of older cohorts.

## **5. Conclusions**

In this study, we investigated the relationship between the gender composition of a household's sibship and the retirement behavior of Korean parents. We argued that, in households with relatively more sons than daughters, net intra-household 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 of an eroding implicit contract in which sons, and particularly the eldest son, are expected to spend less time caring for their elderly parents. To fund these higher transfers, parents with relatively more sons will need to retire later and work longer hours.

Using the Korean Longitudinal Study of Aging and some simple econometric models, we provided strong evidence that, conditional on the total number of children, parents with relatively more sons work more at both margins. Having one additional son decreases the probability of retirement by seven percentage points for mothers and ten percentage points for fathers and increases 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 oldest son.

These findings indicate that long-standing preferences for sons in Korea in conjunction with few resources flowing from adult children to their parents impact the retirement behavior of elderly Koreans. Indeed, we provided evidence from surveys that fewer Koreans adhere to the Confucian belief that the oldest son bears the main responsibility of caring for their elderly parents. However, despite this evidence, we also showed that the effects of son ratios on retirement are equally strong for both older and younger cohorts which is not consistent with an erosion of the social contract. Rather, it indicates that for *all* of the cohorts in our sample, children and, especially sons, were not fully repaying their parents' investments from earlier in

the life-course. Thus, it appears as if there was a betrayal of all of the generations in this study, not just the youngest.

## References

- Arnold, F. (1997). Gender preferences for children. *Demographic and Health Surveys Comparative Studies*, 23, 1–56.
- Barcellos, S. H., Carvalho, L. S., and Lleras-Muney, A. (2014). Child gender and parental investments in India: are boys and girls treated differently? *American Economic Journal: Applied Economics*, 6(1), 157-189.
- Becker, G. S. (1974). A theory of social interactions. *Journal of Political Economy*, 82(6), 1063-1093.
- \_\_\_\_\_ and Tomes, N. (1976). Child endowments and the quantity and quality of children. *Journal of Political Economy*, 84(4, Part 2), S143-S162.
- Bernheim, B. D. (1991). How strong are bequest motives? Evidence based on estimates of the demand for life insurance and annuities. *Journal of Political Economy*, 99(5), 899-927.
- \_\_\_\_\_, Shleifer, A., and Summers, L. H. (1985). The strategic bequest motive. *Journal of Political Economy*, 93(6), 1045-1076.
- Black, S. E., Devereux, P. J., and Salvanes, K. G. (2005). The more the merrier? The effect of family size and birth order on children's education. *The Quarterly Journal of Economics*, 120(2), 669-700.
- Booth, A. L. and Kee, H. J. (2009). Birth order matters: the effect of family size and birth order on educational attainment. *Journal of Population Economics*, 22(2), 367-397.
- Brown, P. H., Bulte, E., and Zhang, X. (2011). Positional spending and status seeking in rural China. *Journal of Development Economics*, 96(1), 139-149.
- Bu, F. (2014). Sibling configurations, educational aspiration and attainment (No. 2014-11). ISER Working Paper Series.
- Chau, T. W., Hongbin, L., Liu, P. W., and Zhang, J. (2007). Testing the collective model of household labor supply: evidence from China. *China Economic Review* 18(4):389- 402.
- Chen, Y., Li, H., and Meng, L. (2013). Prenatal sex selection and missing girls in China: Evidence from the diffusion of diagnostic ultrasound. *Journal of Human Resources*, 48(1), 36-70.
- Coward, R. T. and Dwyer, J. (1990). The association of gender, sibling network composition, and patterns of parent care by adult children. *Research on Aging*, 12, 158-181.
- Choi, E. J. and Hwang, J. (2015). Child gender and parental inputs: No more son preference in Korea? *American Economic Review*, 105(5): 638-43.
- Cox, D. (1987). Motives for private income transfers. *Journal of Political Economy*, 95(3), 508-546.
- Dahl, G. and Moretti, E (2008). The demand for sons. *Review of Economic Studies* 75(4): 1085-1120.
- Das Gupta, M. (1987). Selective discrimination against female children in rural Punjab, India. *Population and Development Review*, 13(1) ,77-100.

- Dwyer, J. and Coward, R. T. (1991). A multivariate comparison of the involvement of adult sons versus daughters in the care of impaired parents. *Journal of Gerontology: Social Sciences*, 46, S259-269.
- Hauser, R. M. and Sewell, W. H. (1985). Birth order and educational attainment in full sibships. *American Educational Research Journal*, 22(1), 1-23.
- Hoddinott, J. and Haddad, L. (1995). Does female income share influence household expenditures? Evidence from Cote D'Ivoire. *Oxford Bulletin of Economics and Statistics*, 57(1), 77-96.
- Hotz, V. J. and Pantano, J. (2015). Strategic parenting, birth order, and school performance. *Journal of Population Economics*, 28(4), 911-936.
- Jayachandran, S. and Kuziemko, I. (2011). Why do mothers breastfeed girls less than boys? Evidence and implications for child health in India. *The Quarterly Journal of Economics*, 126(3), 1485-1538.
- Kessler, D. (1991). Birth order, family size, and achievement: Family structure and wage determination. *Journal of Labor Economics*, 9(4), 413-426.
- Kim, H. (2010). Intergenerational transfers and old-age security in Korea. *The Economic Consequences of Demographic Change in East Asia, NBER-EASE Volume 19*: 227-78.
- Kim, J. (2005). Sex selection and fertility in a dynamic model of conception and abortion. *Journal of Population Economics*, 18(1), 41-67.
- Kim, S. *et al.* (2012). The national survey on marriage and fertility dynamics. Ministry of Health and Welfare, KIHASA.
- Kim, Y. H., Lee, H. O., Lee, K. H., and Kim, J. H. (1994). The survey of marriage cost and consciousness. *Chung Ang Journal of Human Ecology*, 8, 183-202.
- Lee, C. and Lee, E. (2015). Son Preference, sex-selective abortion, and parental investment in girls in Korea: Evidence from the year of the white horse. *NBER Cohort Studies Meeting*.
- Lee, J. and Smith, J. P. (2018). Fertility behaviors in South Korea and their association with ultrasound prenatal sex screening. *SSM-Population Health*, 4, 10-16.
- Lee, S. H., Mason, A., and Park, D. (2011). Why does population aging matter so much for Asia? Population aging, economic security and economic growth in Asia. *ERIA Discussion Paper Series*, 4, 1-34.
- Lee, S. Y. (2011). A study of change in cost of housing at marriage by age group in terms of intergenerational transfers. *Journal of Korean Management Association*, 29(4), 205-16.
- Lillard, L. A. and Willis, R. J. (1997). Motives for intergenerational transfers: Evidence from Malaysia. *Demography*, 34(1), 115-134.
- Lin, I. F., Goldman, N., Weinstein, M., Lin, Y. H., Gorrindo, T., and Seeman, T. (2003). Gender differences in adult children's support of their parents in Taiwan. *Journal of Marriage and Family*, 65(1), 184-200.

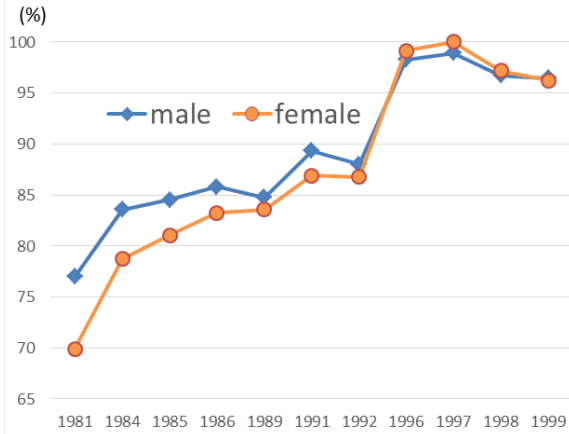
- Lundberg, S. (2005). The division of labor by new parents: does child gender matter?" Institute for the Study of Labor, Discussion Paper 1787.
- Lundberg, S. and Rose, E. (2002). The effects of sons and daughters on men's labor supply and wages, *The Review of Economics and Statistics* 84(2): 251-68.
- Lundborg, P., Nilsson, A., and Rooth, D. O. (2014). Adolescent health and adult labor market outcomes. *Journal of Health Economics*, 37, 25-40.
- Manser, M. and Brown, M. (1980). Marriage and household decision-making: A Bargaining Analysis. *International Economic Review* 21(2):31-44.
- McElroy, M. B. and Horney, M. J. (1981). Nash-bargained household decision: Toward a Generalization of the Theory of Demand. *International Economic Review* 22(2):333-49.
- OECD. (2017a). Labour force participation rate (indicator). doi: 10.1787/8a801325-en (Accessed on 11 April 2017)
- \_\_\_\_\_. (2017b). Poverty rate (indicator). doi: 10.1787/0fe1315d-en (Accessed on 11 April 2017)
- Pabilonia, S. W. and Ward-Batts, J. (2007). The effect of child gender on parents' labor supply: An examination of natives, immigrants, and their children, *The American Economic Review* 97(2): 402-406.
- Park, J. (2015). Consumption structure and the burden of education expense in a household with students. *Health and Welfare, Issue and Focus*, 1-8.
- Price, J. (2008). Parent-child quality time does birth order matter? *Journal of Human Resources*, 43(1), 240-265.
- Qian, N. (2008). Missing women and the price of tea in China: The effect of sex-specific earnings on sex imbalance. *The Quarterly Journal of Economics*, 123(3), 1251-1285.
- Shuey, K. and Hardy, M. A. (2003). Assistance to aging parents and parents-in-law: Does lineage affect family allocation decisions?. *Journal of Marriage and Family*, 65(2), 418-431.
- Stoller, E. P. (1990). Males as helpers: The role of sons, relatives and friends. *The Gerontologist*, 30, 228-235.
- Strauss, J. and Thomas, D. (1995). Human resources: Empirical modeling of household and family decisions. *Handbook of Development Economics*, 3, 1883-2023.
- Sun, R. (2002). Old age support in contemporary urban China from both parents' and children's perspectives. *Research on Aging*, 24(3), 337-359.
- Thomas, D. (1990). Intra-household resource allocation: an inferential approach. *Journal of Human Resources*, 25(4):635-64.
- Wang, H., Sekine, M., Chen, X., Kanayama, H., Yamagami, T., and Kagamimori, S. (2007). Sib-size, birth order and risk of overweight in junior high school students in Japan: results of the Toyama Birth Cohort Study. *Preventive Medicine*, 44(1), 45-51.
- Wei, S. J. and Zhang, X. (2011). The competitive saving motive: Evidence from rising sex ratios and savings rates in China. *Journal of Political Economy*, 119(3), 511-564.



- Wong, E. S. (2013). Gender preference and transfers from parents to children: an inter-regional comparison. *International Review of Applied Economics*, 27(1), 61-80.
- Xie, Y. and Zhu, H. (2009). Do sons or daughters give more money to parents in urban China? *Journal of Marriage and Family*, 71(1), 174-186.
- Yamaguchi, K. (1989). A formal theory for male-preferring stopping rules of childbearing: Sex differences in birth order and in the number of siblings. *Demography*, 26(3), 451-465.
- Yang, H. (1996). The distributive norm of monetary support to older parents: A look at a township in China. *Journal of Marriage and the Family*, 404-415.
- Zhang, W. (2000). Dynamics of marriage change in Chinese rural society in transition: A study of a northern Chinese village. *Population Studies*, 54(1), 57-69.

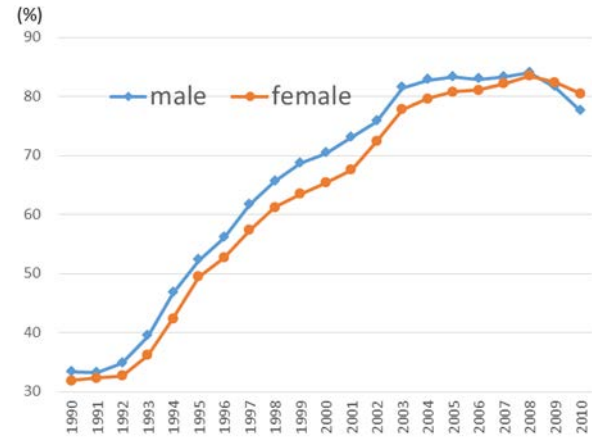
**Figure 1: School Enrollment Rates in Korea**

**Panel A. Secondary School**



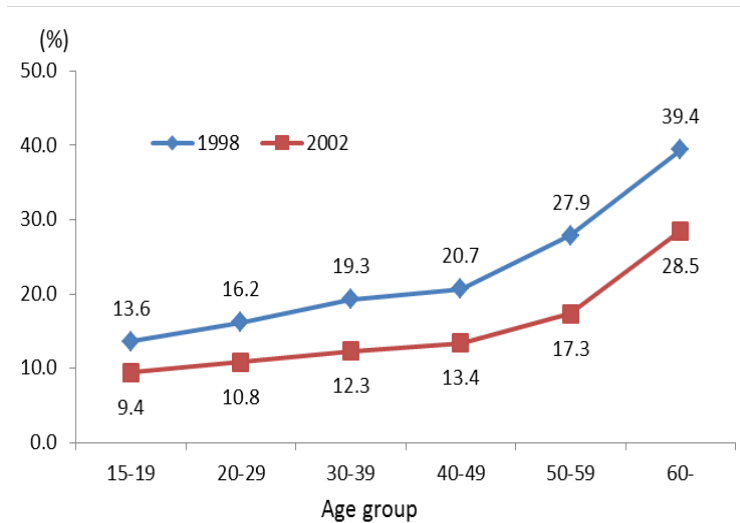
Source: World Development Indicators (<http://databank.worldbank.org/data/>)

**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 Percentage of People Who Believe that the Eldest Son Should Care for Elderly Parents**



Notes: The figure displays the percentage of people by age who responded, “the eldest son,” to the question, “Who should primarily support elderly parents?”

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

**Table 1** Share of Housing Expenses at Marriage

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.	Mean	S.D.
Work status (0=working, 1= retired)	0.41	0.49	0.38	0.49
Weekly working hours (if working)	44.03	15.60	39.76	17.53
Retirement year (if retired)	2003	9.19	2003	10.25
Age	67.48	9.28	65.22	9.01
Ratio of sons to children	0.52	0.29	0.52	0.29
Number of children	2.82	1.25	2.95	1.37
Age of the youngest child	35.14	8.67	36.42	8.49
Education (1=high school or more)	0.56	0.50	0.30	0.46
Health status (1=bad health)	0.30	0.46	0.33	0.47
Employment status (1=self-employed) <sup>a</sup>	0.47	0.50	0.49	0.50
Place of residence (1=rural)	0.25	0.43	0.31	0.46
Household net assets (US\$) <sup>b</sup>	316,885	391,724	258,666	346,414
Observations	2,596		1,779	

*Note:* Calculated by the author using the KLoSA data.

<sup>a</sup> For retirees, this is measured as the employment status of the most recent job.

<sup>b</sup> Korean won were converted into USD using OECD PPP exchange rates (870 Korean won=1 dollar, 2014).

**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*** (0.035)	-0.085** (0.041)	-0.098*** (0.037)	-0.071* (0.042)	-0.126 (0.122)	-0.253* (0.133)	-0.101 (0.012)	-0.237 (0.151)
Number of children	-0.059*** (0.011)	-0.054*** (0.012)	-0.017 (0.012)	-0.018 (0.013)	-0.059*** (0.011)	-0.054*** (0.012)	-0.017 (0.012)	-0.018 (0.013)
Age	0.039*** (0.002)	0.029*** (0.002)	0.034*** (0.003)	0.023*** (0.003)	0.039*** (0.002)	0.029*** (0.002)	0.034*** (0.003)	0.024*** (0.003)
Ratio of sons × HH net assets(logged)					0.001 (0.013)	0.018 (0.014)	0.001 (0.013)	0.018 (0.016)
Education (1=high school or more)			0.066*** (0.025)	0.055* (0.033)			0.066*** (0.025)	0.055* (0.033)
Health status (1=bad health)			0.229*** (0.026)	0.169*** (0.028)			0.229*** (0.026)	0.169*** (0.028)
Employment status (1=self-employed)			-0.268*** (0.024)	-0.106*** (0.028)			-0.267*** (0.024)	-0.106*** (0.028)
Place of residence (1=rural)			-0.192*** (0.030)	-0.216*** (0.032)			-0.192*** (0.030)	-0.216*** (0.032)
Age of the youngest child			0.007** (0.003)	0.005 (0.003)			0.007** (0.003)	0.005 (0.003)
Other characteristics	No	No	Yes <sup>a</sup>	Yes <sup>a</sup>	HH net assets	HH net assets	Yes <sup>a</sup>	Yes <sup>a</sup>
F-Test <sup>b</sup>					10.82 [0.0045]	6.27 [0.0435]	6.91 [0.0316]	3.98 [0.1364]
Obs.	2,596	1,779	2,596	1,779	2,596	1,779	2,596	2596

*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.

<sup>a</sup> Includes dummies for marital status and spousal work status, and logged household net assets.

<sup>b</sup>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): Number of Sons

	(1) Male	(2) Female
Number of sons	-0.034** (0.016)	-0.034* (0.018)
Number of daughters	-0.002 (0.012)	-0.005 (0.013)
Age	0.034*** (0.003)	0.024*** (0.003)
Education (1=high school or more)	0.065*** (0.025)	0.055* (0.033)
Health status (1=bad health)	0.228*** (0.026)	0.169*** (0.028)
Employment status (1=self-employed)	-0.267*** (0.024)	-0.106*** (0.028)
Place of residence (1=rural)	-0.192*** (0.030)	-0.214*** (0.027)
Age of the youngest child	0.007** (0.003)	0.005 (0.003)
Other characteristics	Yes	Yes
Obs.	2,596	1,779

Notes: Per Table 3.

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

**Table 5** Probit Estimations (Dependent Variable: 0=Working; 1=Retired): Gender Effects by Birth Order

	(1) Male	(2) Female
1 <sup>ST</sup> child's gender (1 if son, 0 otherwise)	-0.041* (0.023)	-0.049* (0.026)
2 <sup>nd</sup> child's gender (1 if son, 0 otherwise)	-0.012 (0.025)	-0.002 (0.027)
3 <sup>rd</sup> child's gender (1 if son, 0 otherwise)	-0.046 (0.033)	-0.016 (0.035)
4 <sup>th</sup> child's gender (1 if son, 0 otherwise)	-0.036 (0.048)	0.010 (0.048)
5 <sup>th</sup> child's gender (1 if son, 0 otherwise)	-0.088 (0.073)	-0.091 (0.068)
Age	0.034*** (0.003)	0.024*** (0.003)
Education (1=high school or more)	0.069*** (0.025)	0.055 (0.033)
Health status (1=bad health)	0.229*** (0.026)	0.173*** (0.028)
Employment status (1=self-employed)	-0.268*** (0.025)	-0.109*** (0.028)
Place of residence (1=rural)	-0.190*** (0.030)	-0.211*** (0.032)
Age of the youngest child	0.007** (0.003)	0.005* (0.003)
Other characteristics	Yes	Yes
Obs.	2,596	1,779

Notes: Per Table 3.

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

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

	(1) Male	(2) Female
Ratio of sons	4.983** (2.016)	5.318** (2.612)
Number of children	1.090 (0.751)	1.558* (0.886)
Age	-2.267*** (0.176)	-1.980*** (0.211)
Education (1=high school or more)	-4.041*** (1.471)	-0.910 (1.996)
Health status (1=bad health)	-14.602*** (1.633)	-10.527*** (1.926)
Employment status (1=self-employed)	16.686*** (1.298)	11.217*** (1.693)
Place of residence (1=rural)	9.792*** (1.537)	11.440*** (1.876)
Age of the youngest child	-0.335** (0.159)	-0.161 (0.190)
Other characteristics <sup>a</sup>	Yes	Yes
Obs.	2,589	1,760

*Notes:* Robust standard errors are reported in parentheses.

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

<sup>a</sup> Includes dummies for marital status and spousal work status, and logged household net assets.



**Table 7** Tobit Estimations (Dependent Variable: Weekly Working Hours): Number of Sons

	(1) Male	(2) Female
Number of sons	1.816** (0.936)	2.673** (1.164)
Number of daughters	0.312 (0.782)	0.632 (0.890)
Age	-2.280*** (0.176)	-1.994*** (0.210)
Education (1=high school or more)	-4.020*** (1.472)	-0.937 (1.996)
Health status (1=bad health)	-14.618*** (1.633)	-10.539*** (1.927)
Employment status (1=self-employed)	16.745*** (1.297)	11.214*** (1.694)
Residence (1=rural)	9.792*** (1.542)	11.351*** (1.878)
Age of the youngest child	-0.324** (0.159)	-0.160 (0.191)
Other characteristics	Yes	Yes
Obs.	2,589	1,760

Notes: Per Table 6.

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

**Table 8** OLS Estimations (Dependent Variable: Age at Retirement)

	(1)	(2)	(3)
Ratio of sons	1.474** (0.577)		
Number of sons		0.673*** (0.198)	
Number of daughters		0.201 (0.165)	
1 <sup>st</sup> child's gender (1 if son, 0 otherwise)			0.711** (0.356)
2 <sup>nd</sup> child's gender (1 if son, 0 otherwise)			0.591 <sup>†</sup> (0.365)
3 <sup>rd</sup> child's gender (1 if son, 0 otherwise)			0.521 (0.423)
4 <sup>th</sup> child's gender (1 if son, 0 otherwise)			0.185 (0.577)
5 <sup>th</sup> child's gender (1 if son, 0 otherwise)			-0.225 (0.833)
Number of children	0.426*** (0.153)		Dummies Included
Gender (1=male)	4.278*** (0.441)	4.296*** (0.441)	4.267*** (0.443)
Education (1=high school or more)	-0.700* (0.401)	-0.699* (0.401)	-0.770* (0.405)
Employment status (1=self-employed)	1.697*** (0.408)	1.703*** (0.408)	1.679*** (0.411)
Age gap between parent and youngest child	0.140*** (0.042)	0.140*** (0.042)	0.142*** (0.042)
Other characteristics <sup>a</sup>	Yes	Yes	Yes
Obs.	2,310	2,310	2,310
Adj. R-sq	0.406	0.406	0.409

Notes: Robust standard errors are reported in parentheses.

†, \*, \*\*, and \*\*\* indicate statistical significance at the 15, 10, 5, and 1 percent level, respectively.

<sup>a</sup> Dummies for public pension enrollment, occupation, marital status, spousal work status, and birth cohort, and logged labor income; All variables are measured at the time of retirement.

**Table 9** OLS Estimations (Dependent Variable: Age at Retirement), Parents born before 1940

	(1)	(2)	(3)
Ratio of sons	1.900 <sup>**</sup> (0.877)		
Number of sons		0.443 <sup>*</sup> (0.250)	
Number of daughters		-0.022 (0.214)	
1 <sup>st</sup> child's gender (1 if son, 0 otherwise)			0.741 <sup>†</sup> (0.508)
2 <sup>nd</sup> child's gender (1 if son, 0 otherwise)			0.188 (0.519)
3 <sup>rd</sup> child's gender (1 if son, 0 otherwise)			0.960 <sup>*</sup> (0.543)
4 <sup>th</sup> child's gender (1 if son, 0 otherwise)			0.265 (0.668)
5 <sup>th</sup> child's gender (1 if son, 0 otherwise)			-0.429 (0.906)
Number of children	0.223 (0.199)		Dummies Included
Gender (1=male)	4.660 <sup>***</sup> (0.648)	4.662 <sup>***</sup> (0.647)	4.733 <sup>***</sup> (0.443)
Education (1=high school or more)	-0.881 <sup>†</sup> (0.577)	-0.853 <sup>†</sup> (0.577)	-1.050 <sup>*</sup> (0.594)
Employment status (1=self-employed)	2.531 <sup>***</sup> (0.585)	2.560 <sup>***</sup> (0.584)	2.554 <sup>***</sup> (0.411)
Age gap between parent and youngest child	0.225 <sup>***</sup> (0.056)	0.227 <sup>***</sup> (0.057)	0.212 <sup>***</sup> (0.058)
Other characteristics <sup>a</sup>	Yes	Yes	Yes
Obs.	1,230	1,230	1,230
Adj. R-sq	0.275	0.275	0.283

Notes: Robust standard errors are reported in parentheses.

†, \*, \*\*, and \*\*\* indicate statistical significance at the 15, 10, 5, and 1 percent level, respectively.

<sup>a</sup> Dummies for public pension enrollment, occupation, marital status, spousal work status, and birth cohort, and logged labor income; All variables are measured at the time of retirement.

**Table A.1** Probit Estimations (Dependent Variable: 0=Working; 1= Retired): Son Ratio, Children born prior to 1985

	(1) Male	(2) Female	(3) Male	(4) Female
Ratio of sons	-0.161 <sup>***</sup> (0.042)	-0.105 <sup>**</sup> (0.048)	-0.138 <sup>***</sup> (0.045)	-0.080 <sup>†</sup> (0.050)
Number of children	-0.070 <sup>***</sup> (0.013)	-0.071 <sup>***</sup> (0.014)	-0.021 <sup>†</sup> (0.014)	-0.036 <sup>**</sup> (0.016)
Age	0.040 <sup>***</sup> (0.002)	0.029 <sup>***</sup> (0.002)	0.036 <sup>**</sup> (0.004)	0.027 <sup>***</sup> (0.004)
Education (1=high school or more)			0.094 <sup>***</sup> (0.029)	0.067 <sup>*</sup> (0.039)
Health status (1=bad health)			0.207 <sup>***</sup> (0.030)	0.163 <sup>***</sup> (0.032)
Employment status (1=self-employed)			-0.294 <sup>***</sup> (0.028)	-0.108 <sup>***</sup> (0.032)
Place of residence (1=rural)			-0.209 <sup>***</sup> (0.034)	-0.225 <sup>***</sup> (0.037)
Age of the youngest child			0.007 <sup>†</sup> (0.004)	0.001 (0.004)
Other characteristics <sup>a</sup>	No	No	Yes	Yes
Obs.	1,897	1,354	1,897	1,354

Notes: Per Table 3.

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