

The Effect of Child Gender on Children's Living Arrangements in China: Evidence from China Census Data*

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Abstract

Utilizing data from the 1982, 1990, 2000 and 2005 China Census, we find that children's gender affects their living arrangements and there are five related channels to interpret this phenomenon. Generally when unmarried, having a first-born son increases the probability of subsequent marriage. When married, having a first-born son decreases the probability of parent migration and decreases the probability of divorce. When divorced, having a first-born son increases the probability of father custody. Therefore, first-born sons are less likely to be living without father, mother or either parent compared to first-born daughters. One explanation for the above findings is that parents prefer sons over daughters. In addition, we find an increasing trend over time in son preference in China.

1. Introduction

There has long existed son preference in China, a traditionally patrilineal and patrilocal society (Chu 2001, Lavelly, Li, and Li 2001, Das Gupta et al. 2003, Ding and Hesketh 2006). This preference for sons is not innocuous and has strong implications on parental fertility behavior (Chang, Freedman, and Sun 1981; Tsay and Chu 2005; Lin, Liu, and Qian 2008). For example, in China, couples with a first-born daughter are more likely to violate the One-Child Policy and continue giving birth to a second child than couples with a first-born son, resulting in higher fertility in first-girl families (Arnold and Liu 1986). Also, Tu (1991) finds that 62% of women whose first two children are girls have a third birth, but only 29% of women who already have a son and a daughter go on to have a third birth. The existence of son preference can lead to grimmer consequences such as the missing women phenomenon. For instance, Sen (2003) found that the number of missing women in China to be 44 million in 1990s.

In this paper we examine the effect of child gender on children's living arrangements. We find that a first-born son is less likely to be living without a father, a mother or either parent. This might be an indication of son preference in China. The evolution of son preference over time will also be explored.

This paper has several contributions to the existing literature. First of all, most existing literature on son preference in China mainly focuses on parental fertility behavior and the imbalanced sex ratio problem. However, there are hardly any documentations of the relationship between child gender and an absentee father, mother, or either parent in China. This paper is the first study utilizing data from the China Census to explore these topics.

Second, most previous literature usually uses regional data and small samples to arrive at their conclusions. For instance, Zhang (1990), Tu (1991) and Zeng et al.(2002) all used the 1985 In-Depth Fertility Survey¹ to explore the effect of son preference. In addition, Ding and Hesketh (2006) utilized the 2001 National Family Planning and Reproductive Health Survey² to examine son preference. Our paper we take advantage of the data from the 1982, 1990, 2000 and 2005 China Census which better represents China as a whole. The China Census represents China's people on a national level with a time span of 23 years. This may help identify small effects which could not be identified with datasets done on a smaller scale.

The empirical results show that children's gender affects their living arrangements. First, a first-born son is less likely to be living without his father; second, a first-born son is less likely to be living without his mother; third, a first-born son is less likely to be living without either his parent. We investigate five channels: 1) Unmarried father with custody of kids; 2) Migrant father; 3) Migrant mother; 4) Divorced family; 5) Divorced and mother take custody.

For the unmarried father channel³, we find that a first-born son is less likely to live in a family in which the father never gets married. That might explain why a first-born son is less likely to be living without his mother and more likely to be living with both parents compared to a first-born daughter. For the migrant father channel, we find that a first-born son is significantly less likely to be living in a family with a migrant father. This channel can help explaining the phenomenon that a first-born son is less likely to be living without his father. For the migrant

¹ 1985 First China In-Depth Fertility Survey was conducted in Hebei Province, Shaanxi Province and Shanghai in April, 1985. It provides information on the basic characteristics of respondents, their personal histories of marriage, fertility, contraception, breastfeeding, their knowledge and use of contraceptive methods, as well as basic information about their husbands.

² Based on the 1997 national FP/RH survey, this survey was conducted by the Family Planning Commission in 31 mainland provinces, autonomous regions and municipalities from July to September 2001. Of the 39,586 women surveyed, 29,512 lived in rural areas (74.6% of total) and 10,074 in urban areas (25.4%).

³ For simplicity, throughout the paper, we ignore single, never-married mother with children. Their number is negligible because in virtually all cases of births out of wedlock, children stay with the father.

mother channel, similarly, we find that a first-born son is less likely to live with a migrant mother. Thus, this might help us understand why a son is more likely to live with their mother compared to a daughter. The two migration channels combined show that first-born sons are less likely to be living without either parent. For the divorced family channel, the results show that parents with first-born sons are less likely to get divorced. Thus, first-born sons are obviously more likely to be living with his father, mother, or either parent. For the mother custody channel, a first-born son is significantly less likely to be obtained by the mother and we can see in this channel that first-born sons are less likely to be living without his father.

Growing up without a father, mother or either parent can generate significant negative consequences on children. For example, growing up in a single-mother household is associated with higher probability of living in poverty, dropping out of high school, becoming a teenage parent, and experiencing unemployment (McLanahan and Sandefur, 1994; Haveman and Wolfe, 1994; Case and Paxson, 2001). Moreover, son preference also affects children's schooling especially in rural areas. For instance, Wang (2005) shows that boys are more likely to be enrolled in schools than girls, and will receive more years of education.

Understanding the magnitude of gender bias and the evolution over time plays an important role in policy implication. Rapid progress in sex selection technologies promises to make it increasingly possible for couples to choose the sex of their children. Although these techniques are used by a negligible number of couples due to their high cost, they are expected to become substantially cheaper and more reliable in the near future. High-tech sex selection poses a range of difficult policy dilemmas and is currently extremely controversial. It is obvious that the use of gender selection technologies will become a more pressing issue if parents have strong

preferences for one gender. As these technologies become more widely used, strong preferences for boys could lead to imbalances in the population gender ratio in the long run.

The paper proceeds as follows: Section 2 presents evidence on the differences between girls and boys in the probability of living without father, living without mother and living without either parent; Section 3 reviews the literature; Section 4 describes that data and variables; Section 5 presents an overview of the methods and provides the empirical findings; Section 6 concludes.

2. Literature Review

2.1 Existence and Consequences of Son Preference

There is extended literature on son preference. Here we only focus on those in China. Son preference in china can be classified into two lines of literature. One focuses on whether son preference exists in China; the other studies the consequences of son preference.

To prove that son preference exists in China, some studies use survey data to show directly that people prefer sons over daughters. For example, using self-conducted interviews in Hainan⁴, Lavelly, Li, and Li(2001) finds that when asked to choose ideal family composition from two extreme options (three girls and no boys; three boys and no girls), 98 of 101 respondents select three boys and no girls. On the other hand, there is also extensive literature in China discussing the existence of son preference from other aspects. For example, the differential compliance rate of the One-Child Policy for families with or without boys indicates the existence of son preference in China. Arnold and Liu (1986) find that couples with only one daughter are more likely than

⁴ This survey was conducted in Meifu Li community. The Li of Hainan Island are a southern minority. Although unique to Hainan, a great island in the South China Sea, the Li are related to numerous fragmented minority communities indigenous to China's southern frontier and the nations of Southeast Asia.

couples with only one son to accept the fine imposed by violating the One-Child Policy, and will opt to give birth to a second child. In addition, Li and Cooney (1993) find that when the firstborn is a girl, there is a negative effect on a woman's willingness to comply with the One-Child Policy.

Another way to show that son preference exists in China is to focus on the "missing girls" which can be regarded as another aspect of son preference. Hull (1990) finds that under pressure of the One-Child Policy, parents sometimes do not report "out-of-quota" births in time. For boys, parents may eventually report in order to obtain the benefit of schooling, and to secure official recognition for purposes of inheritance. Parents may not report girls' births, which prevent them from obtaining such benefits. In addition, Banister (2004) presents the missing women facts showing the lost of girls in China. He argues that this phenomenon is mainly driven by the combined factors such as son preference, low fertility and some other causes. Das Gupta (2007) finds that whether or not girls "go missing" is determined by the sex composition of children in the family, which suggests that son preference is the predominant underlying factor.

Another line of literature is devoted to show that the preference for sons will lead to serious consequences. For example, Zeng et al. (2002) shows that although son preference does not have significant effects on divorce among women who have only one or two children, the risk of divorce among women who have three or more daughters without a son is 2.2 times as high as the divorce rate for those women who have three or more children with at least one son. In addition, son preference affects children's schooling, especially in rural areas. Wang (2005) shows due to son preference, boys are more likely to be enrolled in schools than girls, and will receive longer years of education. Moreover, Ebenstein (2007) estimates a structural model of parental preferences using China's 2000 Census data. He shows that a son is worth 2.90 years of income

more than a daughter, and the premium is highest among less educated mothers and rural families.⁵

2.2 Evolution of Son Preference

There also lines of literature documenting the evolution of son preference. Among all the factors, two important ones might contribute to decreasing son preference over time. First, in agricultural societies, sons are often preferred to daughters because of their higher physical strength which indicates a higher ability in generating economic net utility. Therefore, their ability to contribute to labors is greater (Agarwal, 1998). However, in societies where agriculture does not dominate the other industries, there should be less son preference, at least in the perspective of labor contribution. In China, we can see that the percentage of people engaged in the agricultural section has decreased from 79.14% in 1990 to 68.01% in 2005⁶. Thus, we might expect son preference to decrease similarly.

Second, women in China have made great progress in education for the past three decades. To illustrate the extent of changes Chinese women have experienced between 1982 and 2005, we have included statistics in Table 1 showing an increase in women's education from an average of 4.47 years in 1982 to 7.97 years in 2005. Similarly, the percentage of women, who had graduated from college or above, increased from 0.29% to 5.36%; the percentage of women, who had graduated from high school or above, increased from 4.92% to 11.69%. There has long been literature documenting the causal relationship between wage and education. For example, Knight and Sabot (1981) estimates that each additional year of schooling leads (roughly) to an 8% increase in income, if postprimary education is taken as 10 years. Also, Byron and Takahashi

⁵ Ebenstein (2007) estimates the premium assigned by parents who had not yet had a son to having a boy rather than a girl which equals to 2.90 in the structural model he exploits in the paper.

⁶ Data Source: China Population Census 1990, 2000, 2005.

(1989) applied Mincer equation shows that relative to a male with no schooling, an individual who has completed 6 years of primary school experience a 55% increase in income. Therefore, we expect women's wage will increase in respect to their education levels. With an increased exposure to education and higher wages, women are gaining economic autonomy and may have a greater say in the household and society. Because of their growing influence, women are no longer as constrained from providing for their elderly parents. This may help daughters to become as valued as sons.

On the other hand, there are also reasons to expect son preference to remain high and even increase. First, the reason of son preference is deeply imbedded in Chinese traditional culture and anything that imbedded in culture is hard to change. For instance, if the main reason for preferring a son is his ability to carry on a family name, then son preference will continue to exist in despite of any economic and educational attainment women may have managed. Furthermore, if the fruits of a woman's labor are monopolized by her husband's family, then the daughter's parents cannot claim their share of their daughter's earnings. Therefore, due to a son's ability to carry on a family name versus the daughter's obligation to her husband's family, parents will prefer to have sons over daughters.

Second, the One-Child Policy which implemented in 1979 might also contribute to the increasing son preference. The decreasing fertility and increased availability of birth control in the last few decades have reduced the total fertility rate, but this progress is accompanied by a rising sex ratio at birth (Hull, 1990; Coale and Banister, 1994; Banister, 2004). With the implementation of the One-Child Policy, parents are more likely to expect have a son conditional on being able to have only one child in the family. For example, Ebenstein (2007) finds that sex ratios are found to

be higher among those anticipating lower fertility, such as those under stricter government fertility limits. According to the China Statistical Yearbooks (2005, 1982), the fertility rate⁷ in China declined sharply from 74.77‰ in 1989 to 38.29‰ in 2005. The female deficit observed in China is primarily the result of sex-selective abortion and neonatal infanticide. Naturally, since mothers are anticipating fewer births but still desiring at least one son, the deficit of females may continue to exist.

Third, with the development of technologies such as the ultrasonic diagnosis, people might choose to terminate a birth of girl if the sex of child is known before birth. The usage of ultrasound examinations of fetuses was first promoted to control to quality of the population, but one of its main uses today is to ensure parents of male offspring (Banister 1987; Das Gupta 1987; Royston and Armstrong 1989; Johansson and Nygren 1991; Li 1992; World Health Organization 1992; Zeng et al. 1993).⁸ However, China recently banned the use of detecting a child's gender with the ultrasound, but many parents still illegally use the ultrasound to determine gender and may decide to terminate the birth if the child is female. If these are largely the cases, then a high level of education and employment for women do not necessarily translate into a decline in son preference. The son preference in China might be even more serious over time and this is what we have found empirically.

To our knowledge, no literature studied the evolution of son preference over time in China.

This is the first paper that studies the impact of child gender on children's living arrangement and

⁷ Fertility Rate=Live Birth/Women of fertility age.(China Statistic Yearbook)

⁸ Since the early 1980s, the uses of ultrasound machines and surgery to induce abortion have been both cheap and widespread in rural areas. After 1982, a large number of ultrasound machines, manufactured both domestically and abroad, came into the Chinese market. It has long been indicated that the popularity of these machines is significantly related to the country's increasing SRB (Johansson and Nygren, 1991). To study pre-natal sex determination and sex-selective induced abortion, Chu (2001) conducted a small-scale survey in a dozen villages in central rural China, in which all respondents were women of reproductive age. It was claimed that, among 427 male fetuses and 279 female fetuses, over 25 per cent of the female fetuses were aborted, compared to just 1.6 per cent of the male fetuses (Chu, 2001).

the evolution of son preference over time.

3. Child Gender and Family Structure: Conceptual Framework

Child gender may affect the family structure through five channels. First, child gender may affect the probability that a mother or father remains unmarried but has kids. Second, child gender may affect the probability that a father migrates and does not live with their children, conditional on marriage. Third, child gender may affect the probability that a mother migrates and does not live with their children, conditional on marriage. Fourth, conditional on marriage, child gender may affect the probability of divorce. Fifth, conditional on divorce, child gender may affect custody arrangements. Next, we will decompose the three outcomes, living without father, living without mother, and living without either parent, into the above mentioned five channels.

3.1 Living without father

At any moment, parents can be married, divorced, or never married. The overall gender differential in the probability that a first-born child lives without his or her father can be written as:

$$\begin{aligned}
 \Pr(\text{No Dad}|B)-\Pr(\text{No Dad}|G) &= \omega_1[\Pr(NM|B)-\Pr(NM|G)] \\
 &+ \omega_2[\Pr(D|EM,B)-\Pr(D|EM, G)] \\
 &+ \omega_3[\Pr(MC|D,EM,B)-\Pr(MC|D,EM, G)] \\
 &+ \omega_4[\Pr(FMIG|EM, B)-\Pr(FMIG|EM, G)], \quad (1)
 \end{aligned}$$

Where G and B denote whether the first child is a girl or a boy, NM stands for never married, MC stands for mother custody, $FMIG$ stands for father migration, EM stands for ever

married and D stands for divorce. $\omega_1, \omega_2, \omega_3$ and ω_4 are weights equaling $1 - \Pr(D|EM, B) \times \Pr(MC|D, EM, G) - \Pr(FMIG|EM, G), \Pr(EM|G) \times \Pr(MC|D, EM, G), \Pr(EM|B) \times \Pr(D|EM, B)$ and $\Pr(EM|B)$ respectively. As before, equation (1) is simply an accounting identity that makes explicit that the overall difference between daughters and sons living without a father is the sum of four components. The first component is the difference in the probability of having a single mother who has never been married. The second component is the difference in the probability of divorce, conditional on ever having been married. The third component is the difference in the probability that, after divorce, custody of the children is assigned to the mother. The fourth component is the difference in the probability that conditional on being married, the father migrates and does not live with their children.

3.2 Living without mother

At any moment in time, parents can be married, divorced, or never married. The overall gender differential in the probability that a first-born child lives without his or her mother can be written as:

$$\begin{aligned} \Pr(\text{No Mom}|B) - \Pr(\text{No Mom}|G) = & \omega_1 [\Pr(NM|B) - \Pr(NM|G)] \\ & + \omega_2 [\Pr(D|EM, B) - \Pr(D|EM, G)] \\ & + \omega_3 [\Pr(FC|D, EM, B) - \Pr(FC|D, EM, G)] \\ & + \omega_4 [\Pr(MMIG|EM, B) - \Pr(MMIG|EM, G)], \end{aligned} \quad (2)$$

Where G and B denote whether the first child is a girl or a boy, NM stands for never married, FC stands for father custody, $MMIG$ stands for mother migration, EM stands for ever married and D stands for divorce. $\omega_1, \omega_2, \omega_3$ and ω_4 are weights equaling

$$1 - \Pr(D|EM, B) \times \Pr(MC|D, EM, G) - \Pr(MMIG|EM, G), \Pr(EM|G) \times \Pr(MC|D, EM, G),$$

$$\Pr(EM|B) \times \Pr(D|EM, B) \text{ and } \Pr(EM|B) \text{ respectively.}$$

3.3 Living without either parent

The overall gender differential in the probability that a first-born child lives without his or her father or mother can be written as:

$$\begin{aligned} \Pr(\text{No Dad or Mom}|B)-\Pr(\text{No Dad or Mom}|G) = & \omega_1[\Pr(NM|B)-\Pr(NM|G)] \\ & + \omega_2[\Pr(FMIG|EM, B)-\Pr(FMIG|EM, G)] \\ & + \omega_2[\Pr(MMIG|EM, B)-\Pr(MMIG|EM, G)] \\ & + \omega_2[\Pr(D|EM, B)-\Pr(D|EM, G)], \end{aligned} \quad (3)$$

Where G and B denote whether the first child is a girl or a boy, NM stands for never married, $FMIG$ stands for father migration, and $MMIG$ stands for mother migration. ω_1 and ω_2 are weights equaling $1-\Pr(D|EM,B)-\Pr(FMIG|EM,G)-\Pr(MMIG|EM,G)$ and $\Pr(EM|B)$ respectively.

4. Method

Before the analysis, it is essential to first show that the gender of the first-born child is exogenous in China. Only if the gender of the first-born child is random, can it be considered as a source of exogenous variation. Therefore, the gender of the first-born child offers as a powerful tool in identifying the causal effects of child gender on outcome variables we are interested in. Our way to examine whether the gender of first-born child in China is random is to see whether the sex ratio at birth is in the normal range.

Table 3 reports the calculated sex ratios for the China Census from year 1982, 1990, 2000 and 2005. The ratios are calculated using data on infants who were reported as age zero at the time of the census. Table 3 shows that the sex ratio of parity one in China was around

100.1-103.6 in the 1980, 1990, 2000 and 2005 censuses.⁹ The abnormally high sex ratio occurs in China for the second, third and fourth of the higher parity births. This can show that the gender of a first-born child is random in China.

To estimate the effects of child gender on various outcomes, we use the following OLS regression model:

$$Y_i = \alpha_0 + \alpha_1 B_i + \alpha_2 B_i \times Year1990 + \alpha_3 B_i \times Year2000 + \alpha_4 B_i \times Year2005 + \alpha_5 X_i + \alpha_6 Yeardummy + \delta_i + \varepsilon_i, \quad (7)$$

Where Y_i is the relevant outcome variable of interest, B_i is a dummy variable equals to 1 if the first-born child is son, $B_i \times Year1990$, $B_i \times Year2000$ and $B_i \times Year2005$ are B_i and year dummy interactions, X_i is a vector of individual characteristics that include parents' characteristics including dummies for race, education, region of residence and cohort of birth, *Yeardummy* is a **vector** of year dummies indicating whether the survey year was 1990, 2000 or 2005, δ_i is the region fixed effect, α_0 is a constant term and ε_i is the error term.

To assess the magnitude of the effects reported in the tables, we reported in Table 4 and Table 5 the "First Girl Baseline for 1982," which is the predicted probability of the dependent variable for first girl families in 1982. In each table, we also report the "Percent Effect," which is the increase in the probability of the outcome of interest for a first-born boy family compared to a first-born girl family; that is, it is the ratio of the coefficient for a first-born boy family to the first-born girl baseline.

5. Data and Variables

⁹ The sex ratio at birth (SRB) is defined as the number of live males to females born to a population within a given period, usually a year. This ratio has been observed to be nearly constant to 1.05 for many population of large size across countries and regions over the human evolution history. (Li et al., 2000; Poston et al., 1997)

We utilize the 1982, 1990, 2000 and 2005 Chinese Census to examine the effects of child gender on the probability of living without a father, living without a mother, living without either parent, through marriage, migration, divorce and custody arrangements. The effects of child gender on these outcomes are expected to be modest. For example, we only expect to find discernible effects for marginal marriages (i.e., marriages that are close to divorce), and not for strong marriages. Therefore, large samples are thus needed in order to get precise estimates.

Since the China Census does not track children across households, in order to minimize the probability that a given household no longer contains every child born to that family (due to a child having left for study or employment), the final sample includes all families with a mother and/or father between the ages of 18 and 40, with children younger than 15 years of age in the household. The unit of observation is the household.

Table 2 provides summary statistics for the key outcome variables by year from the Chinese censuses. Panel A shows three key variables: the probability of living without a father, living without a mother, and living without either parent. The first variable of interest is the probability that a family does not have a resident father. Column 1 shows that in the China, the percentage of children living without a father is 12% in 1982, decreases in 1990 and 2000 and then increases to 21% in 2005. While Column 2 shows that in the China, the percentage of children living without a mother is 1.2% in 1982, decreases in 1990 slightly and then increases to 19.3% in 2005. Summing up Column 1 and Column 2, Column 3 shows that in the China, the percentage of children living without either parent is 13.2% in 1982, decreases in 1990 and 2000 and then increases to 40.3% in 2005.

Panel B shows the channels through which a child's gender can affect the probability that a

child is living without a father, a mother or either parent.

The first channel is that of the unmarried father takes custody of kids. The first column in Panel B shows that the percentage of families with an unmarried father is very low in China. For example, in 1980, among all families with children, unmarried fathers made up only 0.1% of the whole sample. Migration represents the second channel through which a child's gender can affect the probability that a child is living without a father, a mother or either parent. The second and third column in Panel B shows that the percentage of families with a migrate father or migrate mother increase over time since 1990, and is 20.9% and 18.8% in 2005 respectively.

Divorce and separation represents the third channel through which a child's gender can affect the probability that a child is living without a father, a mother or either parent. In China, the percentage of divorced family is 0.4% in 1982 and 0.5% in 1990 and then increased to 1% in 2005.

Custodial living arrangements after divorce represent the fourth channel through which a child's gender can affect the probability that a child is living without a father, a mother or either parent. Among the divorced family, as shown in panel B, the percentage of mother custody is 27.7% in 1982, 32.7% in 1990, 35.3% in 2000 and is 38.2% in 2005, which increased over time, but is still less than 50%.

6. Empirical Findings

6.1 Evidence from Children's Living Arrangements

Table 4 and Table 5 report the effects from OLS regression. The coefficient in column 1 of Table 4 indicates that in 1982, a Chinese family with a first-born son is 0.27 percentage points less

likely to have an absentee father than a family with a first-born daughter. This translates to a 2.97% lower probability of living without a father for families with a first-born son. This estimate provides the total effect on the probability without a father when the first child is a boy as opposed to a girl, including any indirect effect that operates through subsequent fertility choices. Similarly, the coefficient in column 2 of Table 4 indicates that in 1982, a first-born son is 0.12 percentage points less likely to have an absentee mother than a first-born daughter in China. This also translates to a 4.38% lower probability of living without a mother for families with a first-born son. Finally, the coefficient in column 3 of Table 4 shows that a first-born son is also 0.39 percentage points less likely to live without either parent in 1982 which indicates a 3.29% lower probability of living without either parent.

6.2 Channels

For the three living arrangements outcomes, we investigate five related channels: 1) Unmarried father takes custody of kids; 2) Migrant father; 3) Migrant mother; 4) Divorce or Separation; 5) Mother custody.

Channel One: Unmarried Father Takes Custody of Kids

Column 1 of Table 5 investigates the relationship between child gender and the probability of an unmarried father. In 1982, Chinese fathers whose first-borns were sons were 0.01 percentage points less likely to be unmarried. In other words, fathers whose first-borns were daughters were 7.20 less likely to be unmarried than were fathers whose first-borns were sons.

Channel Two: Migrant Father

The migrant father channel is unique in China. Column 2 of Table 5 shows that the effect of a

first-born child's gender on father's migration decision. In 1982, fathers with first-born sons are 0.25 percentage points less likely to migrate than fathers with first-born daughters. This represents a 2.74% increase in the migration rate for father whose firstborn is a daughter relative to a son.

Channel Three: Migrant Mother

Migrant Mother represents a third channel through which child gender affects the probability of a child's living arrangement. Coefficient in column 3 of Table 5 investigates this relationship. In 1982, Chinese mothers whose first-borns were sons were 0.08 percentage points less likely to migrate than those with first-born daughters. In other words, mothers whose first-borns were daughters were 3.52% more likely to migrate than those whose first-borns were sons.

Channel Four: Divorce or Separation

Divorce or separation represents a fourth channel. Column 4 of Table 5 shows the effect of a first-born child's gender on parental divorce rates. In 1982, parents with first-born sons are 0.07 percentage points less likely to get divorced than parents with first-born daughters. This represents a 13.23% increase in the divorce rate for women whose firstborn is a daughter relative to a son.

Channel Five: Mother Custody

Custody arrangements for sons and daughters provide a fifth channel through which gender affects the probability of a child's living arrangement. In the analysis of divorced families, there is an assumption we need to make: when divorced, parents do not separate children. If this assumption does not hold, the oldest child observed in a divorced family might not be the first child, which might introduce bias into our analysis. Column 5 of Table 5 presents the effects of child gender composition on custodial arrangements for children with

divorced parents. As noted before, these effects are analyzed for divorced families only.

The coefficient in column 5 shows that the effect of parental custody is 32.3 percentage points higher when the first child is a boy as opposed to a girl. Given an average rate of 38 percentage points in families where the first child is a girl, the father is 8.6% more likely to obtain custody when the first child is a boy than when the first child is a girl.

6.3 Links Between Living Arrangements and Different Channels

Through the analysis of the five channels above, we have a deeper understanding of how child gender affects their living arrangements. Three of the channels contribute to explaining the fact that a first-born son is less likely to be living without his father. These three channels are: 1) Fathers with first-born sons are less likely to migrate; 2) Families with first-born sons are less likely to be divorced; and 3) After a divorce, fathers are much likely to obtain custody of sons instead of daughters.

Meanwhile, there are also three channels, which might help understanding the gap between son and daughter when regarding their probability of living without mother. 1) Fathers with first-born sons are more likely to get married; 2) Mothers with first-born sons are less likely to migrate; and 3) Families with first-born sons are less likely to be divorced than families with first-born daughters.

Additionally, also three channels to explain why a first-born son is more likely to be living with either parent: 1) Fathers with first-born sons are more likely to get married; 2) Parents with first-born sons are less likely to migrate; and 3) Families with first-born sons are less likely to be divorced.

6.4 Effects over Time

Having explored the effect of child gender on living arrangements and various outcomes we are interested in, we begin our analysis of the evolution over time. In order to determine whether or not the son preference in China has increased over time, we interact the "First-born is a Son" dummy with the 1990, 2000 and 2005 year dummies. Table 4 shows that from the regressions, most of the coefficients for the interaction of "First-born is a Son" and year dummies were negative and the coefficient in column 3 for year 2005 is significant. Generally we can see that the effects of child gender on children's living arrangements have increased in China.

Table 5 shows the effects of child gender on 1) the probability of father never married and takes kids, 2) the probability of migrant father, 3) the probability of living with migrant mother, 4) the probability of divorce, and 5) the probability of mother custody after a divorce, have largely increased over time. The coefficients of the interactions with 2005 year dummy are all negative which indicate an increasing trend in son preference. For example, the coefficient of the unmarried father channel is -0.0004 at 5% significance level. Also the coefficient of the divorced family channel is -0.002 at 5% significance level. These all show existence of increasing son preference in China. Therefore, we can conclude that from 1982 to 2005, the effects of a child's gender on his or her living arrangements have increased over time in China.

7. Conclusions

Utilizing China Census data from years 1982, 1990, 2000 and 2005, this study shows that having a first-born son increases the probability of subsequent marriage, decreases the probability

of parent migration, decreases the probability of divorce and in those marriages ending in divorce, increases the probability of father custody. Therefore, first-born sons are less likely to be living without father, mother or either parent compared to first-born daughters.

Though the socioeconomic status of Chinese women has increased for the past decades, reflected in the years of education, occupation in agricultural sector and participation in labor force, China's son preference still exist with an increasing trend. Therefore, the investigation as to why parents might have preferences over sons is essential.

In addition, if the gender of child affects their living arrangements, thus affecting family structure, then this might be an indicator of son preference, which in another way shows that parents treat sons and daughters differently. The small difference in nurturing in early stage will result in large gender gap in their later life. This is an issue that policy makers today should pay close attention to.

In sum, the empirical findings of this study show that son preference still exists and continues to affect children's living arrangements today. Policies should be implemented to lower the effect, and finally eliminate this phenomenon.

TABLE 1
SOCIOECONOMIC CHANGES FOR CHINESE WOMEN

Chinese Women (1982-2005)			
Year	Avg. Years of Schooling Completed	Percentage of College or Above	Percentage of High School or Above
1982	4.47	0.29	4.92
1990	5.85	0.79	6.57
2000	7.57	2.77	9.63
2005	7.97	5.36	11.69

Data Source: China Census 1982, 1990, 2000, 2005.

TABLE 2
Summary Statistics

Panel A: Children's Living Arrangements					
Year	Living Without Father	Living Without Mother	Living Without Either Parent		
1982	0.120	0.012	0.132		
1990	0.056	0.011	0.067		
2000	0.058	0.023	0.082		
2005	0.210	0.193	0.403		

Panel B: Channels					
Year	Umarried Father	Migrant Father	Migrant Mother	Divorce	Mother Custody
1982	0.001	0.119	0.009	0.004	0.277
1990	0.001	0.054	0.006	0.005	0.327
2000	0.000	0.055	0.016	0.011	0.353
2005	0.001	0.209	0.188	0.010	0.382

Notes: Data are from the 1982, 1990, 2000, 2005 China Census. The basic sample includes all households with parents who are between the ages 18 and 40, and who have children living at home between 0 and 15 years old. In Panel A, the variables are dummies equal to 1 if a family is without a resident father or mother or either parent at the time of the censuses. In Panel B, the variables are dummies equal to 1 if in the family, the father is never married, the father or mother is migrant, the parents are divorced or the children are in mother custody respectively at the time of the census.

TABLE 3
PARITY SPECIFIC SEX RATIO (BY YEAR AND COUNTRY)

	Parity 1	Parity 2	Parity 3	Parity 4
1982	103.6	107.9	112.9	115.1
1990	101.9	120.6	126.8	129.4
2000	100.1	154.5	177.3	112.5
2005	101.7	132.7	152.2	170.6

Note: Data are from the 1982, 1990, 2000, 2005 China Censuses. Sex ratio = (Num. of Boys / Num. of Girls)*100.

TABLE 4
First Child Gender and Children's Living Arrangements

	Live without father (with/without mother)	Live without mother (with/without father)	Live without either parent (without mother/without father)
First-born is a Son	-0.0027** [0.0007]	-0.0012** [0.0003]	-0.0039** [0.0007]
First-born is a Son*Year	-0.0003 [0.0008]	-0.0010** [0.0003]	-0.0013 [0.0009]
First-born is a Son*Year	0.0012 [0.0016]	-0.0010 [0.0009]	0.0003 [0.0018]
First-born is a Son*Year	-0.0038 [0.0020]	-0.0028 [0.0016]	-0.0066** [0.0023]
First Girl Baseline in 1982	0.09	0.03	0.12
Percent Effect	-2.97	-4.38	-3.29
Obs.	2140018	2140018	2140018

Notes: S.E. are given in parentheses. Data are from the 1982, 1990, 2000, 2005 China Census. The basic sample includes all households with parents who are between the ages 18 and 40, and who have children living at home between 0 and 15 years old. The dependent variable is a dummy equal to 1 if a family is living without a resident father or mother or either parent at the time of the census. Control variables include Hukou type, prefecture, and employment status, education, age, minority and residence of mother and father. The **first girl baseline in 1982** is calculated as the average predicted probability of the outcome variable of interest for first-born girl families using the estimated coefficients on the control variables in 1982. The **percent effect** is the increase in the probability of living without a father or a mother or either parent for a girl family to a boy family.

*Statistically significant from 0 at the 10% level; **statistically significant from 0 at the 5% level.

TABLE 5
First Child Gender and Children's Living Arrangements--Channels

	Unmarried Father	Migrant Father	Migrant Mother	Divorce	Mother Custody
First-born is a Son	-0.0001 [0.0001]	-0.0025** [0.0007]	-0.0008** [0.0002]	-0.0007** [0.0001]	-0.0323* [0.0159]
First-born is a Son*Year 1990	-0.0008** [0.0001]	0.0001 [0.0008]	-0.0002 [0.0003]	-0.0003 [0.0002]	-0.0410* [0.0201]
First-born is a Son*Year 2000	-0.0004** [0.0001]	0.0025 [0.0015]	-0.0008 [0.0008]	-0.0013 [0.0006]	-0.0267 [0.0280]
First-born is a Son*Year 2005	-0.0004** [0.0001]	-0.0030 [0.0020]	-0.0017 [0.0016]	-0.0020** [0.0005]	-0.0381 [0.0233]
First Girl Baseline in 1982	0.0011	0.09	0.02	0.01	0.38
Percent Effect	-7.20	-2.74	-3.52	-13.23	-8.60
Obs.	2127970	2126097	2126097	2138145	12048

Notes: S.E. are given in parentheses. Data are from the 1982, 1990, 2000, 2005 China Census. See notes to Table 4a for control variables. For column 1, the sample included all intact families and those that father is never married and takes custody of kids. For column 2 and 3, the sample includes all intact families. For column 4, the sample includes all intact families and divorced families. For column 5, the sample includes only the divorced families. The **first girl baseline in 1982** is calculated as the average predicted probability of the outcome variable of interest for first-born girl families using the estimated coefficients on the control variables. The **percent effect** is the increase in the probability of the outcome variable of interest for a girl family to a boy family.

*Statistically significant from 0 at the 10% level; **statistically significant from 0 at the 5% level.

Appendix:

This appendix shows the details of deriving the equations in Section 3.

For the outcome, living without father, the overall gender differential in the probability that a first-born child lives without his or her father can be written as:

$$\begin{aligned} \Pr(\text{No Dad}|B)-\Pr(\text{No Dad}|G) = & [\Pr(NM|B)-\Pr(NM|G)]+[\Pr(MC|B)-\Pr(MC|G)] \\ & +[\Pr(FMIG|B)-\Pr(FMIG|G)], \end{aligned} \quad (\text{A.1})$$

Where G and B denote whether the first child is a girl or a boy, NM stands for never married, MC stands for mother custody, and $FMIG$ stands for father migration. Equation (A.1) is simply an accounting identity and reflects the fact that children can live without their father because their mother never married, their mother is divorced and has custody of her children or because their father migrated.

Since custody arises only in the case of divorce, and likewise divorce arises only if a mother has ever been married, the second difference on the R.H.S. of equation (1) reflects a combination of three separate components: the ever-married rate (*i.e.* one minus the never-married rate), the divorce rate conditional on ever having been married, and the custody rate conditional on a divorce having occurred. Hence, an alternative way of writing equation (A.1) is:

$$\begin{aligned} \Pr(\text{No Dad}|B)-\Pr(\text{No Dad}|G) = & [\Pr(NM|B)-\Pr(NM|G)] \\ & +[\Pr(EM|B) \times \Pr(D|EM, B) \times \Pr(MC|D, EM, B) \\ & - \Pr(EM|G) \times \Pr(D|EM, G) \times \Pr(MC|D, EM, G)] \\ & +[\Pr(EM|B) \times \Pr(FMIG|EM, B)-\Pr(EM|G) \times \Pr(FMIG|EM, G)], \end{aligned} \quad (\text{A.2})$$

Where EM stands for ever married and D stands for divorce. Equation (A.2) makes clear that marriage, divorce, and custody rates all combine to influence the probability that a child

lives without his or her father. Equation (1), which identifies how these four channels impact the chances a son versus a daughter will live without their father, is a simple transformation of equation (A.2). We will show that equation (1) equals to equation (A.2) as follows.

Plug $\omega_1, \omega_2, \omega_3$ and ω_4 into equation (1), and we get:

$$\begin{aligned}
\Pr(\text{No Dad}|\text{B})-\Pr(\text{No Dad}|\text{G}) &= \Pr(\text{NM}|\text{B})-\Pr(\text{NM}|\text{G}) \\
&\quad -\Pr(\text{D}|\text{EM},\text{B}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{G}) \times [\Pr(\text{NM}|\text{B})-\Pr(\text{NM}|\text{G})] \\
&\quad -\Pr(\text{FMIG}|\text{EM},\text{G}) \times [\Pr(\text{NM}|\text{B})-\Pr(\text{NM}|\text{G})] \\
&\quad +\Pr(\text{EM}|\text{G}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{G}) \times [\Pr(\text{D}|\text{EM},\text{B})-\Pr(\text{D}|\text{EM},\text{G})] \\
&\quad +\Pr(\text{EM}|\text{B}) \times \Pr(\text{D}|\text{EM},\text{B}) \times [\Pr(\text{MC}|\text{D},\text{EM},\text{B})-\Pr(\text{MC}|\text{D},\text{EM},\text{G})] \\
&\quad +\Pr(\text{EM}|\text{B}) \times [\Pr(\text{FMIG}|\text{EM},\text{B})-\Pr(\text{FMIG}|\text{EM},\text{G})], \tag{A.3}
\end{aligned}$$

Note that $\Pr(\text{NM}|\text{B})=1-\Pr(\text{EM}|\text{B})$ and $\Pr(\text{NM}|\text{G})=1-\Pr(\text{EM}|\text{G})$, and after rearranging the terms, we can get the following equation.

$$\begin{aligned}
\Pr(\text{No Dad}|\text{B})-\Pr(\text{No Dad}|\text{G}) &= \Pr(\text{NM}|\text{B})-\Pr(\text{NM}|\text{G}) \\
&\quad +\Pr(\text{EM}|\text{B}) \times \Pr(\text{D}|\text{EM},\text{B}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{B}) \\
&\quad -\Pr(\text{EM}|\text{G}) \times \Pr(\text{D}|\text{EM},\text{G}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{G}) \\
&\quad +\Pr(\text{EM}|\text{B}) \times \Pr(\text{FMIG}|\text{EM},\text{B})-\Pr(\text{EM}|\text{G}) \times \Pr(\text{FMIG}|\text{EM},\text{G}) \\
&\quad +\Pr(\text{D}|\text{EM},\text{B}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{G})-\Pr(\text{D}|\text{EM},\text{B}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{G}) \\
&\quad +\Pr(\text{D}|\text{EM},\text{B}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{G}) \times \Pr(\text{EM}|\text{B}) \\
&\quad -\Pr(\text{EM}|\text{B}) \times \Pr(\text{D}|\text{EM},\text{B}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{G}) \\
&\quad +\Pr(\text{EM}|\text{G}) \times \Pr(\text{D}|\text{EM},\text{B}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{G}) \\
&\quad -\Pr(\text{D}|\text{EM},\text{B}) \times \Pr(\text{MC}|\text{D},\text{EM},\text{G}) \times \Pr(\text{EM}|\text{G}) \\
&\quad -\Pr(\text{FMIG}|\text{EM},\text{G})+\Pr(\text{FMIG}|\text{EM},\text{G}) \\
&\quad +\Pr(\text{FMIG}|\text{EM},\text{G}) \times \Pr(\text{EM}|\text{B})-\Pr(\text{EM}|\text{B}) \Pr(\text{FMIG}|\text{EM},\text{G}), \tag{A.4}
\end{aligned}$$

As we can see in equation (A.4), the first five terms are identical to equation (1), and the rest terms cancelled out. So equation (3) is the same as equation (A.2).

For living without mother and living without either parent, the derivation of equation (2) and (3) is similar to the above.

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