

# **The Effects of Child Gender on Children's Living Arrangements in Taiwan**

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### **Abstract**

Utilizing Taiwanese and U.S. census data from 1980 to 2000, we find that having a daughter decreases the probability of subsequent marriage, increases the probability of divorce, and in those marriages ending in divorce, decreases the probability that the father obtains custody. First-born sons are thus more likely than first-born daughters to live with their fathers and moreover, living with the father only. One natural explanation for the above findings is that parents prefer sons more than daughters. Furthermore, we discover that parental gender bias in Taiwan is significantly more marked than it is in the U.S.. While son preference seems to have decreased over time in the United States, in Taiwan it affects parental behavior even today. These findings are essential because as Taiwan transforms to a low-fertility nation, we might see its population skew heavily toward males as a result of continuing son preference.

## 1. Introduction

Do parents have preferences over the gender of their children? This paper examines the effects of child gender on children's living arrangements in Taiwan from 1980 to 2000. We find that, compared to a first-born daughter, a first-born son is significantly more likely to be living with his father. There are two cases in which a child is able to live with his father; one is the case of an intact family, where a child is able to live with both his parents, and the other is the case of divorce and father custody, where a child is able to live with only his father.<sup>1</sup> When looking at the second case in which children live with fathers only, we also find that a first-born son is significantly more likely to be living with his father only.

Three factors are important in explaining the differential affects of child gender on their living arrangements. First, for couples who are not married, fathers with first-born sons are more likely to get married. Second, if married, parents with first-born sons are less likely to get divorced. Third, if divorced, fathers are more likely to take custody of their sons.

What explains these findings? One natural explanation is that parents have a preference for living and spending time with sons over daughters. This could persuade unmarried couples near the margin to get married if they have sons since married fathers are more likely to have significantly more interaction with their sons. In divorce cases, if parents prefer sons over daughters, parents might be more likely to stay in a marginal marriage (rather than divorce) since no parents want to lose day-to-day access to their sons after a divorce. In custody cases, if fathers

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<sup>1</sup> For simplicity, throughout the paper, we ignore single, never-married fathers with children. Their number is negligible because virtually all cases of births out of wedlock, children stay with their mother.

are gender-biased toward sons, they might insist more on retaining custody of sons. Taken together, these findings support the notion that parents in Taiwan favor sons over daughters.

Since the lives of Taiwanese women encompassed great economic and demographic transitions over the past two decades, in this paper, we further examine whether the shift away from agriculture and the advances in women's socioeconomic situation lead to the weakening of son preferences over time.

There are two main reasons that might contribute to a decrease in son preference in Taiwan over time. One reason that son preferences may be weakened can be associated with the decrease of the agriculture sector. Sons are often preferred to daughters because their ability to contribute to labor is greater. For example, in rice cultivation, tasks such as land preparation and crop reaping are traditionally performed by men, because high physical strength is needed in the process (Agarwal 1998). Agriculture and manual labor puts a premium on physical strength which means that sons are particularly prized (Almond et al. 2009). However, as shown in table 1, the percentage of households in the agricultural sector in Taiwan has decreased from 17.75% in 1980 to 5.48% in 2000. With the decrease in manual labor (usually performed by men), we can expect son preference to decrease similarly.

Another reason that son preferences may be weakened can be related to the socioeconomic progress made by women in recent years. Panel 1 of table 1 shows that years of education for Taiwanese women have increased from an average of 7.04 years in 1980 to 12.29 years in 2000. In addition, labor force participation for women aged 25 to 40 increased from 38.95% in 1980 to

58.23% in 2000.

Taiwanese women's increased exposure to education and presence in the labor force may erode son preference through three mechanisms. First, if one origin of the bias against daughters is rooted from a tight family budget, improved financial conditions may reduce this bias. Parish and Willis (1993) noted that sons offer higher pay-off to parental investment as they stay with their natal families while daughters leave upon marriages, therefore parents may sacrifice daughters for sons when they cannot provide sufficient resources for both. If both parents earn sufficient income, the financial conditions of that family would be much better than those who solely depend on the father as the only breadwinner. In this way, with mothers earning more in the labor market, the family budget will be expanded and families no longer need to sacrifice daughters due to a tight budget.

Second, son preference may be weakened if there is an increase in financial return in raising daughters in the future. Under the common preference model, where income is pooled and allocated to maximize a common household utility function, Rosenzweig and Schultz (1982) argued that an increase in the expected economic return of daughters will lead to more provision of goods to daughters in order to reduce female mortality and harvest future returns from daughters. Therefore, because of the growing economic autonomy of women, in addition to providing for their husband's family, daughters are no longer as constrained from providing for their own parents (Lee et al. 1994). When parents think that daughters are more likely to give them old-age support and will have a better chance in the future labor markets, they will treat daughters

and sons more equally. This may help daughters to become as valued as sons.

Third, mothers' increased control on intrafamily allocation of resources may improve daughters' conditions. The bargaining model implies that a higher status of women will give them more power in the household decision making, thus, women's preferences are better reflected in the outcome (Browning et al. 1994; Browning and Chiappori 1998). As fathers are shown to prefer allocating more resources to sons while mothers to daughters, it is likely that the increased income of females relative to males will lead to more equitable treatment towards sons and daughters (Thomas 1990; Qian 2008).

Due to the combination of the shrinking agricultural sector of Taiwan where sons are preferred to daughters for their ability to contribute in labor, and the increase in women's education and labor force participation, there are reasons to suspect that son preferences might decrease. However, a question still lies in whether or not these advances are large enough to weaken son preferences or even allow it to disappear completely.

Table 1 compares the socioeconomic changes between Taiwanese and U.S. women. Comparing Taiwan to the U.S., Taiwanese women's years of education and labor force participation in 2000 are similar to U.S. women's years of education and labor force participation in 1980. Overall, we can see that the socioeconomic status of Taiwanese women is about two decades behind that of the U.S. women. In addition to this data, research also showed that son preference in the U.S. existed in earlier decades but has greatly attenuated.<sup>2</sup> Since gender bias in

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<sup>2</sup> For example, Pollard and Morgan (2002) showed that, after 1985, mothers with two girls were less likely to progress to a third child in the hope of a boy than before.

the U.S. is more evident in earlier decades and the socioeconomic status of Taiwanese women is about two decades behind that of the U.S. women, we may need to wait a couple more years before we can see a decrease in son preference in Taiwan.

Conversely, there are reasons to expect the preference for sons will still remain as these preferences do not solely depend on higher economic returns of sons but from the cultural value attached to a son's position. For example, if sons are preferred because they can carry on a family name, then son preference will continue to exist despite any economic and educational advancement women have attained (Goodkind 1996). Moreover, as temporary members of their natal family, daughters not only leave the family after marriage, but are customarily excluded in rituals to ancestors (Asis et al. 1995; Guilmoto 2009). As a result, parents will continue to prefer sons over daughters. In the presence of such impediments, a high level of education and employment for women does not necessarily translate to a decline in son preference. Thus, the question of whether or not son preference in Taiwan has decreased becomes an empirical one.

To analyze whether or not the son preference in Taiwan exists and if it does, whether the son preference has decreased, this paper contributes to existing literature in two ways. First, this is the first study using Taiwanese census data to document that, compared to a first-born daughter, a first-born son is significantly more likely to be living with the father, and moreover, living with the father only. In the past, existing literature on son preference in Taiwan focuses mainly on parental fertility behavior and the imbalanced sex ratio problem; however, the relationship between child gender and children's living arrangements has not yet been explored on a large

scope for Taiwan.

Second, this paper takes advantage of a unique feature of Taiwan's custody practice to distinguish the Son Preference Hypothesis from Role Model Hypothesis.<sup>3</sup> According to Article 1051 in Taiwanese Civil Code, court rulings favor the father with the child's custody.<sup>4</sup> That is, in the case that fathers want the custody of their children, mothers stand no chance of attaining her children's custody; however, the opposite is true in the U.S.. In the U.S., in most cases of divorce, it is the fathers who lose day-to-day access to their sons. Therefore, one cannot distinguish between the Son Preference Hypothesis and the Role Model Hypothesis because both predict that the divorce rates are lower in families with first-born sons. However, due to Taiwan's favoring towards the father in custody battles, the Son Preference Hypothesis predicts a lower divorce rate for families with first-born sons, whereas the Role Model Hypothesis predicts a *higher* rate. Since the empirical finding in Taiwan shows that families with first-born sons have lower divorce rates, which is inconsistent with the prediction given by the Role Model Hypothesis, we conclude that Son Preference Hypothesis is more likely to be the driving force underlying the empirical findings. This point will be further illustrated in Section 6.

The paper proceeds as follows: Section 2 reviews the literature; Section 3 describes the data and variables; Section 4 presents an overview of the methods; Section 5 provides the empirical findings; Section 6 provides possible explanations for those findings; Section 7 concludes.

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<sup>3</sup> The Role Model Hypothesis argues that the presence of a father is relatively more important for boys while the presence of a mother is relatively more important for girls.

<sup>4</sup> In 1996, Article 1051 has been ruled unconstitutional. Thus, the custody law changed in 1996, which repealed the priority of fathers to the child's custody and judged the child's custody depending on who will be more beneficial to the child.

## 2. Literature Review

Son preferences are prevalent in many Asian countries, and the results are devastating. According to Sen (1990), in China alone, there are 49.98 million “missing women.” That figure rises to 100 million when India, Pakistan and other Asian countries are included. Son preferences are not innocuous.

There are three main consequences of son preferences documented in the literature. First, sex selective abortion and infanticides result in sex imbalance and “missing women”. This phenomenon exists not only in low-income Asian countries such as India and China, but also in high-income countries like South Korea and Taiwan.<sup>5</sup> With the widespread of sex-selective technologies in 1980s, sex ratios rose sharply to over 113 in Korea, 113 in China, and 111 in India in 1990 (Goodkind 1996; Miller 2001).<sup>6</sup> The surge was less pronounced in Taiwan. The overall sex ratio in Taiwan is about 109 in 1990 (Goodkind 1996). An imbalance in sex ratio can have serious consequences. For example, previous studies have found that a deficit in women may result in marriage squeeze or increases in sex-related crimes - a cost which the whole society has to pay (Ullman and Fidell 1989; Park and Cho 1995).

Secondly, on a smaller scale, son preference can also affect differential resources invested on sons versus daughters within a household (Rosenzweig and Schultz 1982). The study of Greenhalgh (1985) showed that during post-World War II in Taiwan, parents invested minimal resources on their daughters and, in turn, recycled daughters' wages to support a better education for their sons. In addition, Parish and Willis (1993) found that in Taiwan, older daughters suffer in the form of losing education and taking less desirable mates in order to support younger siblings. However, older sons do not suffer as much as older daughters. These differential decisions made in educational investment in the early years of a child's life might result in a greater gender gap in the future labor market.

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<sup>5</sup> GDP (PPP) per capita in 2007: Taiwan 30,322 USD, South Korea 24,803 USD, China 5,325 USD, India 2,563 USD. Their rankings out of 37 Asia countries are 8, 10, 17, and 28, respectively. ( *available at [http://en.wikipedia.org/wiki/List\\_of\\_Asian\\_countries\\_by\\_GDP\\_per\\_capita](http://en.wikipedia.org/wiki/List_of_Asian_countries_by_GDP_per_capita)* )

<sup>6</sup> Sex ratio is defined as (Num. of Boys / Num. of Girls)\*100

Finally, a more recent line of research shows that son preferences also affect fathers' living arrangement decisions in the U.S.. Existing research in the U.S. shows that a first-born son is significantly more likely to be living with his father compared to a first-born daughter (Dahl and Moretti 2008; Lundberg et al. 2007). Literature has documented several channels that result in this phenomenon in the U.S.: 1) When unmarried, a couple is more likely to get married after a non-marital birth if the child is a son (Lundberg and Rose 2003; Dahl and Moretti 2008); 2) When married, having daughters is associated with a higher divorce rate (Spanier and Glick 1981; Morgan et al. 1988; Teachman and Schollaert 1989); and 3) When divorced, fathers are relatively more likely to seek custody for their children when one or more of them are sons (Fox and Kelly 1995; Cancian and Meyer 1998; Dahl and Moretti 2008). Though there has been much research documenting children's living arrangements in the U.S., no research has been done on children's living arrangements in Taiwan.

This is the first work in Taiwan documenting the differential children's living arrangements by child gender using Taiwanese censuses. After observing the great economic and demographic transitions of Taiwanese women over the past two decades, this paper will further examine whether the effects of child gender on children's residence arrangements have dissipated over time.

### **3. Data and Variables**

This research utilizes the Taiwanese and U.S. censuses from 1980, 1990 and 2000 to examine the effects of child gender on the probability of living without a father, through marriage, 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. Large samples are thus needed in order to get precise estimates.

Since censuses do 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 12 years old in the household.<sup>7,8</sup> The unit of observation is the household.

Table 2 provides summary statistics for the five key outcome variables by country and year. The top panel shows results from the Taiwanese censuses, and the bottom panel shows results from the U.S. censuses. The first variable of interest is the probability that a family lives with a resident father. Column 1 shows that the percentage of children living with a father in the U.S. is lower than the percentage in Taiwan. For example, in 1980, 98.3% of Taiwanese families live with a resident father, while only 80.8% of families were with one resident father in the U.S.. When we further separate children who live with both their parents and those who live with their father only, we find that there are a lower percentage of children live with their father only. Column 2 shows that in 1980, 0.9% of Taiwanese families, and 2.3% of U.S. families live with fathers only.

The probability of a child living with a father (with or without the mother) and moreover, living with the father only, can be affected by a child's gender through three channels. The first channel is through an unmarried mother. Column 3 of table 2 shows that the percentage of families with an unmarried mother is very low in Taiwan. For example, in 1980, among all families with children, unmarried mothers contribute to only 0.2% of the total sample. This percentage had increased to 0.9% by 2000. The percentage of unmarried mothers is much higher in the United States. In 1980, 8% of U.S. families had mothers who never married, and that number had

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<sup>7</sup> The 12-year cutoff was chosen conservatively to minimize the probability that a child from any given household has left home. If we examine the spacing between the first and second child for mothers aged 18 to 40 and whose first child is younger than 8 years old (and therefore more certain to be at home), we find that for 97.81% of mothers, the spacing between the first and second child is 5 years or less. In addition, the "Women's Marriage, Fertility and Employment Survey" from various years between 1980 and 2000 is used. This dataset includes a complete fertility history, so we can be certain that all children are counted. When examining birth spacing between the first and second child for mothers between 18 and 40 years of age, we find that for 96.73% of mothers, the spacing between the first and second child is 5 years or less. If a majority of children do not leave home until the age of seventeen or later, using our 12-year cutoff, we are including virtually all children ever born to a mother. Alternate cutoff ages for children (8 and 10 years of age) have been experimented with and yielded similar results.

<sup>8</sup> An alternative would be to use children of any age and restrict the sample to mothers whose "number of children ever born" is equal to the number of children observed in the household. However, this cannot be done consistently over multiple years. In Taiwan, only the 1980 census includes this information. In addition, the "number of children ever born" variable is not available for fathers, so fathers will need to be dropped if we want to use this alternative definition. Using this alternative definition for the 1980 Taiwanese census for mothers yields similar results to the definition used in the paper (when compared to results based on mothers only.)

increased more than two times in the following 20 years, reaching 16.2% by 2000.

Divorce and separation represent the second channel. In Taiwan, the probability of divorce increased 1.6 times between 1980 and 2000. The average divorce rate is higher in the U.S. than in Taiwan. For example, in the U.S., the probability of a divorce in 2000 was 3.7 times that of Taiwan.

Custodial living arrangements after divorce represent the third channel. Here the sample is limited to divorced mothers and fathers; intact families are not included. There is a very distinctive pattern of custody arrangements in the U.S. and Taiwan.<sup>9</sup> Because custody laws in Taiwan favor fathers, a significantly higher proportion of Taiwanese children live with their fathers in the event of divorce. For example, in 1980, among divorced families, 36.4% of cases ended in paternal custody, while that figure is only 12.5% for the U.S.. It is worth noting that the probability of paternal custody had been increasing in both countries over time.

#### 4. Methods

This analysis begins by first showing that the sex of the *first* child is exogenous in both Taiwan and the United States. This step is essential, because if the sex of the first child is random, it can be considered a source of exogenous variation. Thus, the sex of the first child provides a powerful tool in identifying the causal effects of child gender on outcome variables of interest.

One way to examine whether the gender of a child is random is to see whether the sex ratio at birth is in the normal range.<sup>10</sup> Figure 1A graphs the sex ratio by year and parity in the U.S.. Sex ratios are approximately equal to the natural sex ratio of 105-106 for all parities.

Figure 1B reports sex ratios by year and parity in Taiwan. Studies by Freedman, Chang and Sun (1994), Gu and Roy (1995) and Lin and Luoh (2008) have documented that the sex ratio

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<sup>9</sup> The variable “father custody after divorce” takes a value of 1 if the children from divorced families are living with their father at the time of the censuses. The variable “father custody after divorce” is therefore a broad measure of a father’s relative access to children and the time spent with them, which is likely to reflect a father’s right to visit his children in the case of joint custody.

<sup>10</sup> Drew et al. (1978) and Davis, Gottlieb, and Stampnitzky (1998) argued that the natural sex ratio at birth is 105, but between 103 and 107 can also be considered normal.

range of 106-107 for parity one can be considered the natural sex ratio range in Taiwan. Consistent with the sex ratios reported by previous literature, figure 1B shows that since 1978, the sex ratio in Taiwan for parity one has been in the range of 106-107.

Two additional pieces of evidence show that the above range of 106-107 is the natural sex ratio for parity one in Taiwan. First, ultrasound technology, which can reveal the sex of a fetus beginning in the 16<sup>th</sup> week of gestation, was not available in Taiwan until the early 1980s (Ebenstein 2007; Lin et al. 2008). Before the introduction of ultrasound technology, there was no other safe way to detect the sex of a fetus (Lin, Liu and Qian 2008); we can therefore conclude that the sex ratio before the early 1980s was the natural sex ratio.<sup>11,12</sup>

Second, Taiwan legalized abortion in 1986. As a result, we see a dramatic jump in sex ratio for parities three and above in subsequent years. For example, figure 1B shows that from 1986 to 1987, the sex ratio of parity three had jumped from 106 to 110, and the sex ratio for parity four had jumped from 109 to 112. It is important to note that even after abortion was legalized, the sex ratios for parities one and two remained constant. This suggests the majority of Taiwanese parents do not employ sex selective technologies on their first two children; otherwise, we would see similar jumps in sex ratios for the first two parities after the legalization of abortion in 1986.

Table 3 reports the calculated sex ratios for both the Taiwanese and U.S. censuses. The ratios are calculated using data on infants who were reported as age zero at the time of the censuses. Table 3 shows that the sex ratio of parity one in both Taiwan and the U.S. was around 105-106 in the 1980, 1990, and 2000 censuses. The abnormally high sex ratio only occurs in Taiwan for the second or the higher parity births. Together, Figure 1 and table 3 show that the sex of a firstborn can be taken as random in both countries.<sup>13</sup>

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<sup>11</sup> Though amniocentesis can be used to reveal the gender of a fetus, and was available in Taiwan in mid-1970s. Its administration is painful and may result in an infection or even a miscarriage (Miller 2001). Thus, the use of amniocentesis was very limited.

<sup>12</sup> Recent medical literature has documented that natural methods based on the timing of intercourse have no significant effects on offspring sex (Wilcox et al. 1995). Amniocentesis can be used to reveal the gender of a fetus, and was available in Taiwan in mid 1970s (Miller 2001). As the administration is painful and may result in infection or even miscarriage, parents may not resort to it unless they want a boy badly, which makes this measure plausible in the case of parity 4, but not parity 1.

<sup>13</sup> Note that the sex ratios indicated by the censuses are lower than the sex ratio calculated using the Vital Statistics.

To estimate the effect of child gender on children’s living arrangements, we use the following logit regression model:<sup>14</sup>

$$P_{it} = \alpha_0 + \alpha_1 B_{it} + \alpha_2 [B_{it} * year1990] + \alpha_3 [B_{it} * year2000] + \varepsilon_{it}$$

Where  $P_{it}$  is the outcome of interest,  $B_{it}$  is a dummy variable equal to 1 if the first child is a son,  $year1990$  is a dummy variable equal to 1 if the observation is from year 1990,  $year2000$  is a dummy variable equal to 1 if the observation is from 2000,  $X_i$  is a vector of individual characteristics that include parents’ characteristics, a cubic in age, dummies for races<sup>15</sup>, education, region of residence and cohort of birth,  $\alpha_0$  is a constant term and  $\varepsilon_i$  is the error term.

To assess the magnitude of the marginal effects reported in the tables, table 4 represents the “1980 First Girl Baseline,” which is the predicted probability of the dependent variable for first-born daughter families in year 1980. In each table, the "Percent Effect" is also reported, which is the increase in the probability of the outcome of interest for a first-born son family in year 1980 compared to a first-born daughter family in year 1980; that is, the ratio of the coefficient for a first-born son family to the first-born daughter baseline.

## 5. Empirical Findings: Evidence from Children’s Living Arrangements

Table 4 reports the average marginal effects from logit regression.<sup>16</sup> The coefficient in column 1 indicates that in 1980, in Taiwan, first-born sons are 0.33 percentage points more likely to live with their fathers compared to first-born daughters. When looking at the probability of living with a father only, column 2 shows that in 1980 Taiwan, first-born sons are 0.11 percentage points more likely to live with their fathers only. This translates to an 8.07% higher probability of

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The reason is that boys are more likely than girls to die as infants, and these births are not accounted for in the censuses if death occurs before leaving the hospital.

<sup>14</sup> Although some interesting patterns emerge when considering families with only one child or only two children, I focus mainly on the effects of gender of the first child on families with at least one child. This is because, as discussed above, the sex of the first child is random. However, the sex of a second or higher parity child is not random. The sex ratios for higher parities are endogenous for two reasons. First, parents can influence the sexes of their children through sex-selection technology, and second, fertility, marriage, divorce, and custody decisions are likely to be correlated with child gender as will be shown in the following section.

<sup>15</sup> They are Minnan, Hakka, Mainlander and 14 indigenous tribes (i.e., Amis, Atayal, Bunun, Kavalan, Paiwan, Puyuma, Rukai, Saisiyat, Sakizaya, Sediq, Thao, Truku, Tsou, Yami).

<sup>16</sup> Average marginal effects are computed as means of marginal effects evaluated at each observation.

living with a father only for families with a first-born son compared to families with a first-born daughter. Overall, columns 1 and 2 of table 4 show that, in Taiwan and in the U.S., the probability of living with a father is higher in families where the firstborn child is a son rather than a daughter. This is true no matter whether or not we look at families with a mother present or not.

### **5.1 Channel One: Mothers Who Never Marry**

Column 3 of table 4 investigates the relationship between child gender and the probability that a mother never gets married. In 1980, Taiwanese mothers whose first-borns were sons were 0.05 percentage points more likely to get married. In other words, mothers whose first-borns were daughters were 10.19% less likely to get married than mothers whose first-borns were sons.

### **5.2 Channel Two: Current Divorce or Separation**

Divorce or separation represents a second channel through which child gender affects the probability of a child living with a father (with or without the mother) and moreover, living with the father only. Column 4 of table 4 shows the effect of a first-born child's gender on parental divorce rates. In 1980 Taiwan, parents with first-born sons are 0.10 percentage points less likely to get divorced than parents with first-born daughters. This represents a 3.18% increase in the divorce rate for women whose firstborn is a daughter relative to a son, given an average divorce rate of 2% in families with first-born daughters. The effects of child gender on divorce are not significant in the U.S.

### **5.3 Channel Three: Paternal Custody**

Custody arrangements for sons and daughters provide a third channel through which gender affects the probability of a child living with a father. In the analysis of divorced family, we need to assume that when divorced the parents do not separate children.<sup>17</sup> 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 4 presents the effects of child gender composition on custodial arrangements for children with divorced parents. As noted before, these effects are

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<sup>17</sup> Using administrative data on divorce from 1989 Vital Statistics records, Dahl and Moretti (2007) find that the children are divided in only 2% of cases.

analyzed for divorced families only.

The coefficient in column 5 shows that the marginal effect of paternal custody is 8.20 percentage points higher when the first child is a boy as opposed to a girl. Given an average rate of 32 percentage points in families where the first child is a girl, the father is 22.19% more likely to obtain custody when the first child is a boy, than when the first child is a girl.

#### **5.4 Effects over Time**

In order to determine whether or not the son preferences in Taiwan and in the U.S. have decreased over time, we interact the “First-born is a Son” dummy with the 1990 year dummy and 2000 year dummy. Panel A of table 4 shows that from the Taiwanese regressions, none of the coefficients for the interaction of “First-born is a Son” and “year 2000” dummy were significant with one exception. The effects of child gender on the probability of mother never married decreased over time. We, therefore, conclude that the effects of child gender on children’s living arrangements have remained mostly unchanged in Taiwan over the past two decades.

Panel B of table 4 shows the effects of child gender on 1) the probability of living with father, 2) the probability of living with father only and 3) the probability of father custody after a divorce, have largely decreased over time. Overall, we conclude that the effects of a child’s gender on his or her living arrangements have decreased over time in the U.S..

## **6. Interpretation**

### **6.1 Son Preference Hypothesis**

The empirical finding presented in Section 5 can be explained by the fact that parents prefer to have sons over daughters. We call this the Son Preference Hypothesis.

A Son Preference Hypothesis predicts higher marriage rates, lower divorce rates, and higher father custody in all-boy families. One natural explanation is that parents, and perhaps fathers in particular, have a preference for living and spending time with sons over daughters. This could persuade unmarried couples near the margin to get married if they have boys since married fathers

are likely to have significantly more interaction with their sons, compared to fathers who remain unmarried.

In divorce cases, a Son Preference Hypothesis also implies that, all other things being equal, families with a first-born son have a lower divorce rate than families with a first-born daughter. If a couple prefers sons over daughters, the combined utility loss that occurs with a divorce is larger for families with first-born sons compared to families with first-born daughters. Therefore, if parents have a preference for sons, they might be more likely to stay in a marginal marriage (rather than divorce) since no parents want to lose day-to-day access to their sons.

In custody cases, if fathers are gender-biased towards sons, they might strongly insist on retaining custody of sons as opposed to daughters. We should therefore expect higher rates of paternal custody in families with a first-born son rather than in families with a first-born daughter.

## **6.2 Role Model Hypothesis**

Alternatively, it is possible that parents are unbiased, but are aware that each has a comparative advantage in raising a child of their own gender. Child psychologists argue that the presence of a father is relatively more important for boys while the presence of a mother is relatively more important for girls. We call this the Role Model Hypothesis. According to this hypothesis, parents care about the well-being of their children, and when deciding whether to marry, divorce, or bargain over custody arrangements, take into account the asymmetric beneficial impacts of a father's presence on sons and the same asymmetric beneficial impacts of a mother's presence on daughters.

When deciding upon marriage, it is possible that an unbiased father decides to marry his partner if she has sons, not because he prefers boys over girls but because he believes that an absentee father hurts sons more than daughters so that the surplus associated with getting married is larger for sons. Therefore couples with a first-born son may choose to get married acknowledging the Role Model Hypothesis, which suggests that a father's presence better benefits a first-born son, rather than a first-born daughter.

When deciding children's custody arrangements after divorce, unbiased fathers who care about serving as a role model have a higher possibility in fighting for the custody of sons. Similarly, unbiased mothers who care about serving as a role model for daughters might fight harder for the custody of daughters. Thus, the Role Model Hypothesis predicts that after divorce, paternal custody is more likely in families with a first-born son, while maternal custody is more likely in families with a first-born daughter.

As for divorces, the Role Model Hypothesis generates different predictions depending on whether it is fathers or mothers who lose day-to-day access to their children in the case of a divorce. In the U.S., fathers who care about serving as a role model for their sons, may be more likely to stay in a marginal marriage (rather than divorce) if they have first-born sons because historically, in most divorce cases in the U.S., fathers lose day-to-day access to his children. Therefore, the Role Model Hypothesis predicts a lower divorce rate for families with a first-born son under the U.S. custody practice.

Under Taiwan's custody practice, the Role Model Hypothesis, on the other hand, predicts a higher divorce rate for families with a first-born son. Unlike the U.S., the Taiwanese legal system actually grants fathers, rather than mothers, greater power in claiming child custody. In most of the divorce cases in Taiwan, if fathers desire the custody of their children, they can easily attain this custody. As a result, in the case of a divorce in Taiwan, it is the mothers who lose the day-to-day access to their children.

If Taiwanese mothers want to serve as a role model for their daughters, we would expect that in the event of divorce, some mothers will recognize that the possible harm to their daughters will be greater than the harm done to their sons. Therefore, mothers with daughters might stay in their marginal marriage (rather than divorce) because mothers are afraid that in the case of a divorce, their daughters would lose them as their role model. However, if a mother has sons, her divorce decisions may not be affected by the Role Model Hypothesis. For instance, in most cases of a divorce, where the father gets custody, the mother may not be as concerned since fathers serve

well as a role model for sons. As a result, under Taiwan's custody practice, the Role Model Hypothesis will only prevent mothers who have daughters from getting divorced but will not affect a mother's divorce decisions if she has sons. Thus, the Role Model Hypothesis predicts a lower divorce rate for families with first-born daughters. In Section 5 however, we find that divorce rates for families with first-born sons are lower than those for families with first-born sons in Taiwan, therefore, we know that previous empirical findings on divorce in Taiwan contradict the predictions of the Role Model Hypothesis and support the Son Preference Hypothesis.

### **6.3 Differential Cost Hypothesis**

The third possible explanation is that the monetary and time costs of raising girls are higher than raising boys. For example, Olson (1983) estimates that for one-child families, compared to raising a son, raising a daughter to the age of eighteen costs around \$900 USD more per year. There is also literature on India documenting the idea that daughters are liabilities to parents, as marriages cost the daughter's parents a large dowry and then the daughter typically moves to the husband's home. We call this the Differential Cost Hypothesis.

If parents are unbiased and if they do not care about the Role Model Hypothesis, some fathers may be more willing to marry their partner if she has sons since they are less expensive to raise compared to daughters. The possible interpretation for divorce finding is similar. It is possible that unbiased fathers in marginal marriages decide to divorce if they have daughters rather than sons because daughters cost more time and money to raise. The custody outcome follows a similar logic.

One should notice that the Differential Cost Hypothesis however, is *not* consistent with extensive literature documenting higher fertility for families with only girls (Ex: Larsen et al (1998)). In the case that parents are not gender biased, and girls are more expensive to raise than boys, couples who have only girls are less likely to have another child compared to couples who have only boys. The reason is that, as long as children are normal goods and all other things being equal, all-girl families are poorer than all-boy families. Due to a pure income effect, couples with

girls will have fewer children.

So far, this paper has provided the intuition for each of the outcomes for the three hypotheses above. In summary, fertility evidence shows that the Differential Cost Hypothesis is unlikely. Moreover, the divorce findings in Taiwan are not consistent with the Role Model Hypothesis due to the particular custody practice in Taiwan. The Son Preference Hypothesis, on the other hand, can consistently explain the marriage rate, divorce rate, custody and fertility results. Taken together, the empirical findings are better explained by a parental gender bias than by the Differential Cost Hypothesis or the Role Model Hypothesis.

## **7. Conclusion**

This study shows that having a first-born son rather than a first-born daughter increases the probability of marriage, decreases the probability of divorce, and in the case of divorce, increases the probability of paternal custody. Consequently, a first-born son is significantly more likely to be living with his father compared to a first-born daughter. We also find that the severity of such parental gender bias is significantly higher in Taiwan than in the U.S.. Moreover, son preference has not declined over time in Taiwan. Having a son still affects various aspects of Taiwanese parents' behaviors to this day.

The investigation as to why parents might have preferences toward sons is important for several reasons. Since Taiwan currently lacks laws controlling the use of sex-selection technology, understanding parental gender-bias is necessary in crafting policies concerning the regulation of this technology. Over the past twenty years, Taiwan has experienced a rapid decline in fertility. According to a Central Intelligence Agency report, the overall fertility rate in Taiwan declined from 1.7 in 1990 to 1.13 in 2008, giving the country the fourth lowest fertility rate in the world.<sup>18,19</sup> In a low fertility society such as Taiwan, investigation on son preference becomes a very important tool for future regulation of sex-selection technology.

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<sup>18</sup> <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2127rank.html>

<sup>19</sup> The overall fertility rate is lower only in Macau, Hong Kong and Singapore.

When parents have fewer children, they often prefer to limit the number of daughters they raise. For example, if a couple wishes to have no more than two children, when the first child is a girl, they will try to ensure that the second is a son. With the growing prevalence of sex-selection technology, fertility can be lowered and the sex ratio distorted. This 'excess male surplus' may result in a marriage squeeze, an increase in sex-related crimes, and in some cases, become an international security problem (Ullman and Fidell 1989; Park and Cho 1995; Hudson and den Boer 2004).

Furthermore, if there is evidence of parental sex bias in marriage, divorce and custody arrangements, this may be indicative of other ways in which parents treat boys and girls unequally. For instance, even in families where the parents are married, parents who prefer sons may give less attention and nurture to their daughters from an early age. These differences may be small at first, but may eventually result in a larger gender gap than we have today. These unfair decisions made by parents with gender preference should be of major concern to present policy makers.

Taken together, the empirical findings of this study suggest that the age-old preference for sons is not confined to the past. The observed gender gaps between men and women begin long before adulthood, and therefore the idea of son preference should be changed early on. To eliminate this preference, public attitudes and expectations towards women must change—a difficult, but not impossible task and one in which government policy must continue to play a role.

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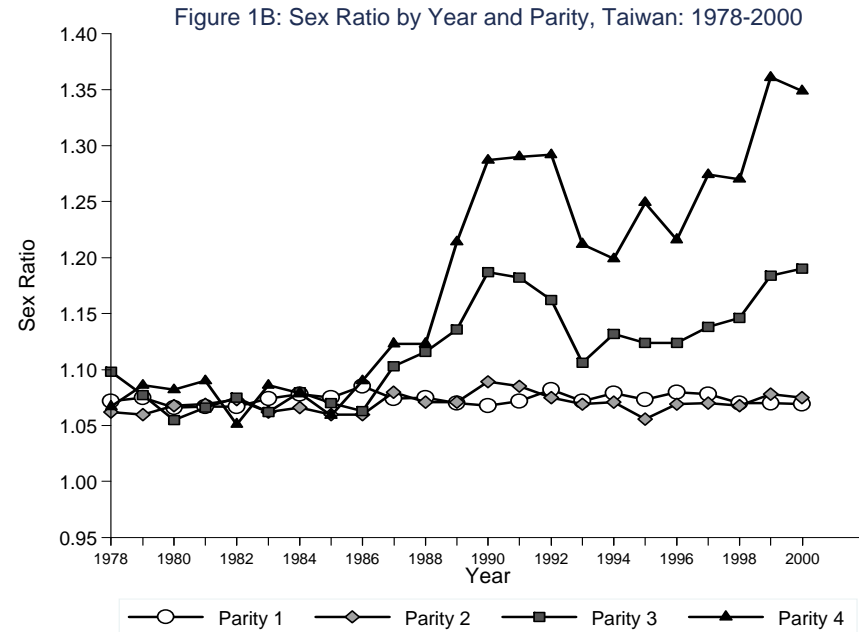
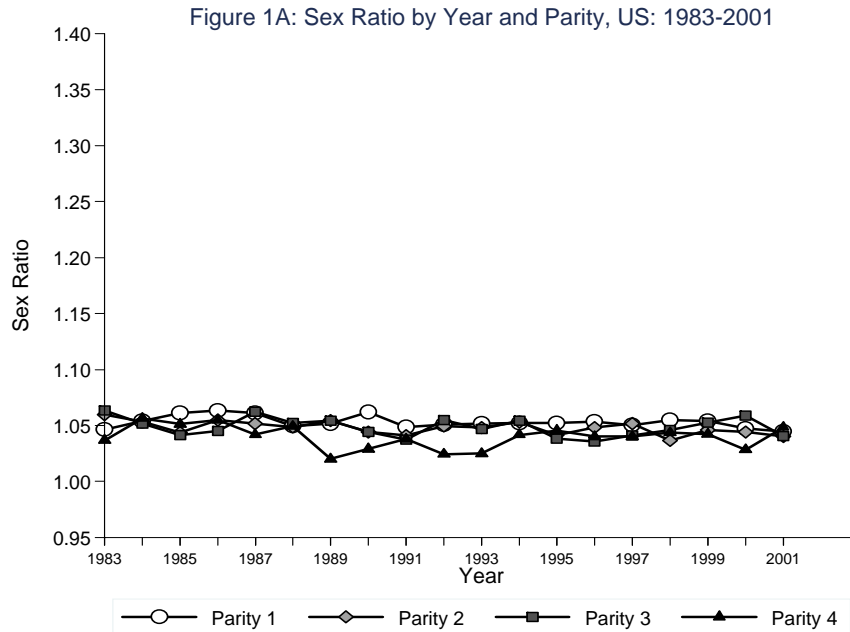
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Figure 1. Sex Ratio by Year and Parity



Sex Ratio = (Number of Boys/Number of Girls)\*100 Source: Figure 1A: US Vital Statistics. Figure 1B: Taiwanese Vital Statistics

**TABLE 1**  
**SOCIOECONOMIC CHANGES FOR TAIWANESE AND U.S. WOMEN**

A. Taiwanese Women (1980-2000)			
Year	Percentage of Households Engaged in Agricultural	Avg. Years of Schooling Completed	Percentage of Women in Labor Force
1980	17.75	7.04	38.95
1981	17.09	7.35	36.77
1982	16.58	7.67	36.79
1983	15.56	7.92	42.29
1984	15.02	8.22	45.97
1985	13.85	8.33	46.23
1986	12.19	8.69	50.25
1987	11.81	8.98	52.20
1988	11.12	9.23	50.33
1990	8.92	9.83	50.76
1993	8.25	10.72	53.63
2000	5.48	12.29	58.23
B. U.S. Women (1980-2000)			
Year	Percentage of Households Engaged in Agricultural	Avg. Years of Schooling Completed	Percentage of Women in Labor Force
1960	6.86	10.23	30.51
1970	4.56	11.04	39.92
1980	3.99	12.02	58.65
1990	4.13	12.54	71.15
2000	3.50	12.82	69.06

**Source.** Panel A- Taiwanese Women's Marriage, Fertility and Employment Survey. Panel B- U.S. 1960-2000 Census. Sample includes women aged 25 to 40.

**TABLE 2**  
**MEAN STATISTICS: 5 KEY OUTCOME VARIABLES BY YEAR AND COUNTRY**

	Living with Father ( w or w/o Mother)	Living with Father Only	Mother Never Married	Divorce or Seperation	Father Custody After Divorce
<b>A. Taiwanese Census</b>					
1980	0.983 [0.129]	0.009 [0.096]	0.002 [0.048]	0.023 [0.149]	0.364 [0.481]
1990	0.978 [0.146]	0.014 [0.119]	0.004 [0.060]	0.031 [0.174]	0.426 [0.494]
2000	0.969 [0.173]	0.018 [0.134]	0.009 [0.093]	0.037 [0.190]	0.413 [0.492]
<b>B. U.S. Census</b>					
1980	0.808 [0.394]	0.023 [0.151]	0.080 [0.271]	0.129 [0.335]	0.125 [0.331]
1990	0.771 [0.420]	0.041 [0.198]	0.112 [0.316]	0.139 [0.346]	0.162 [0.369]
2000	0.732 [0.443]	0.076 [0.264]	0.162 [0.369]	0.138 [0.345]	0.236 [0.424]

**Notes.** Standard deviations are in brackets. Sample includes all families with a mother and/or father

**TABLE 3**  
**PARITY SPECIFIC SEX RATIO\* BY YEAR AND COUNTRY**

	Parity 1	Parity 2	Parity 3	Parity 4
A. Taiwanese Census				
1980	106.1	106.1	106.1	114.0
1990	106.8	108.7	118.7	128.5
2000	105.3	107.6	118.2	138.1
B. U.S. Census				
1980	104.1	104.8	104.7	102.2
1990	106.5	105.1	103.9	103.3
2000	104.8	103.3	103.5	103.2

\* Sex ratio = (Num. of Boys / Num. of Girls)\*100

**TABLE 4**  
**FIRST-CHILD GENDER AND CHILDREN'S LIVING ARRANGMENTS ( LOGISTIC REGRESSION)**

A. Taiwan

	Living with Father ( w or w/o Mother)	Living with Father Only	Mother Never Married	Divorce or Separation	Father Custody After Divorce
First-born is a Son	0.0033** [0.0003]	0.0011** [0.0002]	-0.0005** [0.0002]	-0.0010** [0.0003]	0.0820** [0.0080]
First-born is a Son * year1990	-0.0007 [0.0004]	-0.0004* [0.0002]	0.0004* [0.0002]	0.0002 [0.0004]	-0.0187 [0.0096]
First-born is a Son * year2000	-0.0004 [0.0004]	-0.0003 [0.0002]	0.0004* [0.0002]	-0.0001 [0.0004]	0.0006 [0.0095]
Observations	3,012,307	3,012,307	3,012,307	3,012,307	94,549
1980 First Girl Baseline	0.98	0.01	0.003	0.02	0.32
Percent Effect	0.33	8.07	-10.19	-3.18	22.19

B. U.S.

	Living with Father ( w or w/o Mother)	Living with Father Only	Mother Never Married	Divorce or Separation	Father Custody After Divorce
First-born is a Son	0.0050** [0.0006]	0.0047** [0.0003]	-0.0006* [0.0003]	-0.0009 [0.0005]	0.0345** [0.0018]
First-born is a Son * year1990	0.0004 [0.0009]	-0.0008* [0.0004]	0.0000 [0.0004]	0.0011 [0.0007]	-0.0021 [0.0024]
First-born is a Son * year2000	-0.0018* [0.0009]	-0.0028** [0.0004]	0.0004 [0.0004]	0.0008 [0.0007]	-0.0177** [0.0023]
Observations	4,467,189	4,467,189	4,467,189	4,467,189	545,061
1980 First Girl Baseline	0.80	0.02	0.08	0.13	0.11
Percent Effect	0.63	12.75	-0.64	-0.75	23.35

**Notes.** Average marginal effects of the logistic estimation are reported. Data are from the 1980 to 2000 Taiwanese and U.S. Censuses. "First Girl Baseline" is the predicted probability of the dependent variable for first girl families. "Percent Effect" 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. In column 1, the dependent variable "Living with Father" is a dummy with a value of one if a family is living with a resident father at the time of the census. In column 2, the dependent variable "Living with Father Only" is a dummy variable with a value of 1 if a family is living with a resident father but doesn't have a resident mother because the parents are divorced and with father custody. In column 3, the dependent variable "Mother Never Married" is a dummy equal to 1 if the mother is not married at the time of census. In column 4, the dependent variable "Divorce or Separation" equals 1 if the children currently reside with a divorced or separated parent at the time of the census, and 0 if the children live with married parents. In column 5, the variable "Father Custody After Divorce" takes a value of 1 if the children from divorced families are living with their father at the time of the census. Control variables include a cubic in age, and dummies for race, education, region of residence and cohort of birth. The First Girl Baseline is calculated as the average predicted probability of the outcome variable of interest for first-born daughter families using the estimated coefficients on

\* Significant at 5%

\*\* Significant at 1%.