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Fertility Intention, Son Preference, and Second Childbirth: Survey Findings from Shaanxi Province of China

Quanbao Jiang, Ph.D.,
Institute for Population and Development Studies Xi'an Jiaotong University (China)

Ying Li [Ph.D. candidate], and
Institute for Population and Development Studies Xi'an Jiaotong, University (China)

Jesús J. Sanchez-Barricarte, Ph.D.
Carlos III University of Madrid (Spain)

Abstract

China is characterized by a low fertility intention, a strong preference for sons, as well as a stringent birth control policy. In this study, we used data from a Fertility Intention and Behavior Survey of 2101 questionnaires conducted in 2013 in Shaanxi Province of northwestern China, and event history analysis methods to examine the effect of fertility intention and preference for sons on the probability of having a second child. The results not only validate the correlation of fertility intention with having a second child empirically, even in the low fertility intention and stringent birth control context of China, but also show that women with a preference for sons were less likely to have a second child. Women with son preference turn to sex-selective abortion to ensure that their first child is a son, thus reducing the likelihood of a second child and decreasing the fertility rate. Our findings also shed light on China's potential fertility policy adjustment.

Keywords

Fertility intention; intended number of children; son preference; event history analysis; Cox proportional hazard model1

Introduction

China's fertility has declined dramatically during the past few decades, and currently the total fertility rate is estimated between 1.4 and 1.6 (Morgan et al., 2009; Zhao and Chen, 2011). The low fertility rate is no longer mainly driven by the fertility policy, but reflects people's low fertility intentions under the current social and economic context (Gu *et al.*, 2007; Zheng *et al.*, 2009; Cai, 2010). Surveys of fertility intention indicated that the respondents' ideal number of children was 1.45 in the developed eastern province of Jiangsu, China (RTJS, 2008) and 1.8 in the western province of Shaanxi, China (Jiang *et al.*, 2013a). Another nationwide survey of 63417 questionnaires conducted by National Health and Family Planning Commission of China reported that the average ideal number of children was 1.93 (CPA, 2013).

As for son preference, the effect of son preference on the number of childbirths and fertility behavior remains a controversial topic. Some studies hold the view that a strong preference for sons in China would increase the total fertility rate (Morgan *et al.*, 2009), while others thought son preference, via sex-selective abortion, would decrease children number and subsequently the fertility level in China (Yang and Wang, 2006; Guo, 2008; Cai, 2011). In terms of sex composition, more than 70% of the women of childbearing age in Shaanxi Province indicated their desire to have one son and one daughter (Jiang *et al.*, 2013a), and the nationwide survey showed that 81.70% of people had this intention (CPA, 2013). However, if limited to only one child, 30.04% of survey respondents intended to have a son, 16.04% intended to have a daughter, and 53.92% expressed no preference (Jiang *et al.*, 2013a).

It is well documented that the intention to have another child is strongly correlated with future fertility behavior (Schoen *et al.*, 1999; Islam and Bairagi, 2003). Chinese people generally intend to have two children, and would prefer one son and one daughter; however, if this is not possible, they would rather have sons than daughters. In China's context of both a low fertility intention as listed above and a stringent birth control, does individual's intended number of children affect considerably second childbirth of women with one child? And how does son preference affect the fertility behavior of parents with one child? In this paper, using the data from a survey of 2101 questionnaires on fertility intention and behavior in Shaanxi Province in Northwest China, we apply event history analysis to explore the effect of the intended number of children and son preference on second childbirth among women with a child. Using new survey data from an averagely developed province in China, and event history analysis - two different statistical models from previous studies (Hou et al., 2008; Zheng et al., 2009; Luo and Mao, 2014) - our study not only validates empirically the effect of fertility intention on having a second child, even in the Chinese context of low fertility intention and stringent birth control, but also yields the surprising fact that women with son preference are less likely to go on to have a second child if their first child is a boy. To our knowledge, this paper is the first to analyze behavior regarding the choice to have a second child on the basis of recent survey data from China. Our study clarifies empirically the disputes as to whether son preference increases or decreases the number of families having a second child, and how this affects the fertility rate. Our findings shed light on China's potential fertility policy adjustment, which still maintains an only child policy, despite a low yet declining fertility intention and a decades-long distorted sex ratio at birth.

Below we first review the literature about reproductive behavior, including its correlation with the intended number of children and preference for sons, and then we introduce the survey data and statistical methods used in this paper. Next we present our results, including descriptive statistics about the sample, the Kaplan-Meier survival analysis, and Cox regression results. Finally we draw some conclusions, and discuss limitations to the research.

2. Literature Review

2.1 Intended number of children and reproductive behavior

Women who intend to have more children are more likely to have a greater number of children than those without this intention. Morgan (2003) and Morgan *et al.* (2009) expressed the theoretical model and formulas used by Bongaarts (2001, 2002) in a study on low fertility rate as a decomposition of total fertility rate (TFR)[1]. The formula was expressed as $TFR=F_u \times F_s \times F_r \times F_t \times F_i \times F_c \times IP$, with IP, intended parity, representing the intended number of children. This model showed that a greater intended number of children was associated with higher actual fertility levels. Islam and Bairagi (2003) showed that women who intended to have additional children were more likely to have an additional childbirth within 5 years compared to women who did not desire additional children.

Although a large number of women desired a second child, only those with a high socio-economic status bore two children. Rinesi *et al.* (2011) discovered that only approximately 60% of women who reported the intention to have a second child achieved their fertility intentions despite a strong preference for a two-child family in Italy. In China, a survey on fertility intention and behavior conducted in the Jiangsu Province of China indicated that, although young couples listed a variety of benefits of having two children, such as the facilitation of the children's social and psychological development to avoid self-centeredness, they often chose not to have a second childbirth due to the cost and effort required to raise two children and their economic conditions (Zheng *et al.*, 2009). Attitudes towards fertility, subjective norms and other factors all contribute significantly to the discrepancy between fertility intention and behavior (Luo and Mao, 2014).

2.2 Son preference and reproductive behaviors

A strong son preference has long existed in China. With the current low fertility level, people prefer a mixed-gender composition but also have a stronger preference for sons.

Some studies suggested that son preference increases the individual fertility and total fertility rate. Morgan's (2003) decomposition formula of total fertility rate indicated that son preference increases the total fertility rate. Morgan *et al.* (2009) also claimed that son preference leads to a higher actual fertility level. In an environment with a son preference, to achieve the desired sex composition, parents might continue to give birth until the desired gender composition or intended number of sons is reached. Thus, a son preference increases the number of childbirths and fertility levels (Park and Cho, 1995; Chen and Jin, 2011). Evidence from Vietnam, Albania, and India showed that the preference for sons improved the fertility level. In Vietnam, people who intend to have at least one son increase the parity progression ratio, thereby enhance the fertility level (Guilmoto, 2012a). In Albania, if the first two children were not sons, 47% of the households chose to give birth to an additional child. However, when there was at least one son among the first two children, only 23% of the parents chose to give birth to an additional child (Guilmoto, 2012b). In India, women with two daughters had a 90% chance of giving birth to a third child. However, there was

[1]TFR, the abbreviation of total fertility rate, is the average number of children a woman would bear if she survived through the end of the reproductive age span and experienced at each age a particular set of age-specific fertility rates (Preston et al., 2001).

only a 45% chance to give birth to a third child for women who had two children and at least one son (UNFPA, 2012). Thus, the preference for sons is often considered to be a major obstacle to fertility decline.

However, some other studies suggest that the preference to bear a son reduces the number of childbirths and fertility levels, via sex identification technology. In the early birth control studies, sociologists urged biologists to discover methods for sex identification to help people have offspring of the desired gender through human intervention in fertility and thereby reduce the fertility levels (Cohen *et al.*, 1967). In his influential and controversial book "The Population Bomb," Ehrlich (1968) appealed for a simple method to determine the sex of a fetus to ensure the birth of a boy and thereby reduce the fertility level and population growth. Keyfitz and Caswell (2005) attempt to estimate how much the ability to manipulate the sex of children would lower the birth rate.

In China, families traditionally prefer to have at least one boy to continue the family name and to provide elderly care, the families in which the first born is a girl are more likely to express a willingness to have additional children (Cai *et al.*, 2010). A second childbirth is more likely to occur in rural families in which the first born is a girl (Qian, 1997). However, contrary to the fact that people previously achieved son preference mainly through giving birth to additional children, with the popularity of fetal sex determination technology since the 1980s, people have been able to satisfy their son preferences via sex-selective abortions. As a result, the measures to achieve son preference have changed from high parity to sex-selective abortions, which reduce the fertility level (Guo, 2008; Cai, 2011). Yang and Wang (2006) also indicated that human intervention in offspring gender decreased the number of additional children, leading to a decline in the fertility rate.

Given the economic pressure due to the rapid transition, it has been shown that those Chinese who are eligible to have two children under the current birth control policy would voluntarily choose to have only one child in prosperous areas (Zheng et al., 2009), but little is known about those women in areas which have only undergone average development. Is fertility intention still a strong predictor of a second child? Does son preference mean that families go on to have a second child, and so increase the macro fertility rate? Unlike other studies, we use recently collected data in a northwestern province and event history analysis to examine correlations between having a second child and fertility intention, as well as son preference.

3. Data and Methods

3.1 Survey

The data were from the "Survey of Fertility Intentions and Behaviors in Shaanxi Province", which was conducted in 2013 jointly by the Institute for Population and Development Studies at Xi'an Jiaotong University and the Population and Information Center under Shaanxi Provincial Population and Family Planning Committee (China). Shaanxi Province is located in northwestern China; within it there are three regions: namely central Shaanxi, northern Shaanxi and southern Shaanxi, which have different geographic, historic, cultural, language features. By 2012, Shaanxi had a population of 37.61 million, and was the most

prosperous provincial capital in the northwestern provinces in terms of economic, political and cultural development. The GNP of Shaanxi Province ranks 16th among the 31 provinces, and the GDP per capita is roughly the national average. Ever since 2010, the crude birth rate and natural growth rate have been slightly lower than national rates, the sex ratio is higher than normal but below the national level. In 2012, the total fertility rate was estimated at 1.6, far below replacement level. The ideal number of children averages 1.8 (Jiang et al., 2013a), slightly lower than national average of 1.93 (CPA, 2013) but higher than that of 1.45 in the much more prosperous Jiangsu Province (RTJS, 2008). The birth control policy is largely representative of most provinces in China, namely urban couples have one child, and rural couples have one son or two children (they are permitted to have a second child if the first child is a girl). Middle-ranked economic development, a fertility rate close to the national average, average fertility intention, and representative birth control policy all make Shaanxi Province a suitable site to examine the correlations between having a second child, son preference and fertility intention.

The objective of this cross-sectional survey was to comprehensively investigate fertility intention and behaviors of women of childbearing age in Shaanxi Province, and we included both urban and rural women aged 20 to 44 years. The data we collected included individual characteristics, characteristics of the husband and his family, pregnancy history, outcomes of every pregnancy, and fertility intention. The survey adopted stratified probability sampling. In the first stage, the sampling units were the district and the county. The neighborhood committee and village committee were the sampling units in the second stage. In the third stage, the sampling unit was women of childbearing age within a household. A total of 3000 individuals were interviewed in this survey, with 2920 valid questionnaires recovered. To ensure reliability, the survey was implemented through face-to-face interviews. The main variables in this paper came from data on pregnancy history and outcomes. In the survey, respondents were asked to look back on their reproductive history.

The subjects of this study are women of childbearing age who had given birth to at least one child. The final sample size of this study is 2101 after eliminating those who had never given birth or whose data were incomplete.

3.2 Variables

Dependent Variables—We estimated the probability of second childbirth over time in an event history analysis. Though the dependent variable in an event history analysis like the Cox model is the hazard rate, for the Stata statistical software version 12 we used in the analysis, we actually provided two variables. One is the time from first childbirth to second childbirth. In the survey, we asked interviewees to look back at their childbearing history, including the ending time and outcomes of every pregnancy, and this information enabled us to calculate the survival time, which was structured in person-months format. The other is an indicator variable to show whether the second childbirth event occurred: giving birth to a second child was defined as the occurrence of the event, and the value of this variable was set to one. For those who had not given birth to a second childbirth by the end of survey, we did not know whether they would give birth, and if they did, when they would give birth, so the data for these were censored.

Independent Variables—The primary independent variables of this study are the intended number of children and son preference. Researchers have generally considered that the ideal number of children reflects personal values and views on fertility and often used the ideal number of children as the intended number of children (Zheng, 2011a, 2011b). In this study, the question "What is your ideal number of children if you do not consider the family planning policy?" was used to measure the intended number of children of a woman. And for son preference, how to measure son preference is controversial. In China, we have observed a higher than normal sex ratio at birth, then in most literature this phenomenon is attributed to strong son preference due to China's traditional patriarchal, patrilineal, and patrilocal systems. But as the ideal composition of children is one son and one daughter, it shows no son preference in the "ideal" indicator. So we used the question "If you could only have one child, would you prefer a boy or a girl, or is there no preference?" to measure whether women of childbearing age had son preference. If a respondent reported a preference for a boy, then was labeled with son preference, otherwise was labeled without son preference.

Control Variables—There are four kinds of control variables in this study. The first kind is the individual characteristics of the childbearing-age women, which includes age, the square root of age, age at first childbirth, year of the first childbirth, Hukou type, and education level. As age is a strong predictor of fertility, and there is an inverted U-shaped curve between age and fertility rate (Brass, 1968, 1974), so the square root of age is still included in the regression, as in other influential studies (Ward and Butz, 1980; Fay et al., 2002; Liu et al., 2014). Age at first childbirth is associated with fertility behavior and fertility rate (Kohler at al., 2001). China's family planning policy varies according to household registration types, labeled as Hukou in China (Chan and Zhang, 1999; Zhang, 2012)[2]. Hukou can be divided into two categories, rural type and non-rural type. Couples with non-rural Hukou type are permitted to have one child, and those with rural Hukou type are permitted a second child if the first is a girl. Rural people are more inclined to have a second child (Zheng et al., 2009). Educational attainment is also a factor affecting people's childbearing behavior (Qian, 1997; Drèze and Murthi, 2001). The second kind of control variable is the existing childbearing status of the childbearing-age women, which includes the gender of the first child and whether the woman has had abortions in the past. In low fertility countries, the sex of children born affects the next childbirth (Jiang et al., 2013b), and the gender of the first child is a strong predictor of a second child (Qian, 1997). The third kind of control variable involves family environment factors, including the number of siblings the husband has, whether the in-laws are still living, and the interaction term between living in-laws and the age of the childbearing woman. China's patrilineal and patrilocal system makes women susceptible to in-laws' influence, and help from parents-in-law may facilitate the rearing of children (Choe et al., 2004). The fourth kind of control variable is a regional factor. Shaanxi province is divided into three regions, central, northern and southern Shaanxi. There are great differences in geographic location, natural environment, social and economic development and education and cultural background

[2]For a detailed discussion, please refer to Chan and Zhang (1999), and Zhang (2012).

between the regions. These differences affect fertility too. The definition and measurement of the variables are shown in table 1.

3.3 Statistical methods

The current study used the event history analysis (EHA) methods to analyze the probability of a second child among women of childbearing age in Shaanxi Province. The EHA methods not only focus on the outcome but also analyze the time to an event. Unlike conventional statistical models, EHA methods allow for censored data, with the assumption that censoring is random and that the processes governing censoring and occurrence of events are independent of one another (Tsiatis, 1975). In this study, we applied two EHA methods, Kaplan-Meier survival analysis to estimate the survival time from the first childbirth to the second childbirth, and multivariate Cox hazard regression models to analyze how the various factors affect the probability of having a second child (Blossfeld et al., 2007). Kaplan-Meier survival analysis is a non-parametric model, which has no assumption about the shape of the hazard function or about how covariates may affect the shape. Multivariate Cox hazard regression model is a semi-parametric model which is particularly flexible since it makes no assumption about the shape of the hazard but makes a strong assumption about how the covariates affect the shape of the hazard function between groups over time.

Cox (1972) proposed the proportional hazard model below:

$$\ln h(t)=a(t)+b_1X_1+b_2X_2(t) \quad (1)$$

$h(t)$ represents hazard rate, $a(t)$ denotes the baseline hazard function, X_1 are time-constant variables, and $X_2(t)$ are time-varying covariates. When both sides of the formula (1) were exponent, then the risk function can be expressed as:

$$h_i(t)=h_0(t)\exp(\beta_1x_{i1}+\beta_2x_{i2}+...+\beta_kx_{ik}) \quad (2)$$

Where $h_i(t)$ stands for the hazard rate, $h_0(t)$ is the baseline hazard function, x_{ik} are covariates influencing event occurrence. $\beta_j(j=1,2,...,k)$ are regression coefficients to be determined in the model.

When both sides of the risk function were divided by $h_0(t)$ and the logarithm of the results was taken, the Cox regression model was obtained:

$$\log\frac{h_i(t)}{h_0(t)}=\beta_1x_{i1}+\beta_2x_{i2}+...+\beta_kx_{ik} \quad (3)$$

As we mentioned before, in the dataset we provided the survival time from first childbirth to second childbirth, and an indicator variable to show whether the second childbirth event

occurs. With Stata 12, we ran the Kaplan-Meier survival analysis and multivariate Cox hazard regression.

4. Results

4.1 Descriptive results

By the time this survey was completed, among the women whose first child was a girl, 40.73% of them had already given birth to a second child. This percentage is significantly higher than that of 25.60% for women whose first child is a boy and have since given birth to a second child. The survival time from first childbirth to second childbirth is 69 months. For those whose first child is a boy, the survival time is 75 months, significantly more than 65 months for those whose first child is a girl.

There is no clear difference in childbearing-age women's intended number of children regardless of whether the first child is a boy or a girl. We found that 22.57% of childbearing-age women whose first child is a girl show a characteristic son preference. This percentage is lower when the first child is a boy. Data for these results are shown in Table 2.

4.2 Results of Kaplan-Meier survival analysis

Prior to the analysis using the Cox proportional hazards model, the Kaplan-Meier survival analysis was employed to delineate the status of second childbirths among women of childbearing age in Shaanxi Province, as shown in Figure 1. Because a sufficient time interval is required between the birth of the first child and the birth of the second child, the survival probability in the first few months was 1, representing no second childbirths during this time. With the elongation of the time interval between childbirths, a decline was observed in the proportion of women who did not give birth to a second child. When the mean interval reached approximately 60 months, nearly 75% of the surveyed individuals had not given birth to a second child. When the mean interval reachedapproximately180 months, approximately half of the surveyed individuals had given birth to a second child. Figure 2 presents the status of the second childbirths among women of childbearing age in Shaanxi Province based on the gender of the first child. The results showed a significant effect of the gender of the first child on the status of the second childbirth (Log-rank test: p value<0.001). The probability of a second childbirth was significantly reduced when the first child was a boy compared to when the first child was a girl. The mean childbirth interval among women whose first child was a boy was longer than that among women whose first child was a girl.

The status of the second childbirths among women of childbearing age in Shaanxi Province was compared according to prior abortion, age, region and residence (urban or rural area), and the Kaplan-Meier survival curves are shown in Figures 3, 4, 5 and 6. As shown in the figures, some factors, such as abortion and age, were closely correlated with the reproductive behaviors of women of childbearing age, exhibiting significant differences in their effect on the second childbirths (Log-rank test: p values<0.001). In addition, macroscopic factors, such as regional differences and differences between urban and rural areas, showed significantly different effects on second childbirths (Log-rank test: p value<0.001).

Therefore, these influential factors must be controlled when examining the effect of fertility intentions and son preference on the second childbirths in this study.

4.3 Results of Cox regression

Table 3 shows the Cox regression results of second childbirths among women of childbearing age in Shaanxi Province. With the three models in Table 3 we examine the effect of intended number of children and son preference as well as control variables on the probability of second childbirth. Model 1 primarily studies the effect of variables such as individual characteristics, existing childbirth status, family environment factors and regional factors on the dependent variables. The significance of both the variables and the model demonstrates the importance of including these variables in the study. Then, the primary independent variables in this study are gradually added into Model 2 and Model 3. The variables in model 1 are also added as control variables to better study the impact of the primary independent variables on the dependent variables.

As observed in Model 1, the older the childbearing women and the higher the age of the first child, the lower the likelihood of giving birth to a second child. In comparison with non-rural Hukou, rural Hukou have an increased likelihood of second births in childbearing-age women. However, as the educational level goes up, the likelihood of a second birth goes down. Family factors also play a role in the likelihood of a second birth. For example, if there are more siblings in the husband's family, then the likelihood of a second birth is higher. If the in-laws are still living, the likelihood of a second birth is also increased. When comparing the scenario where the first child is a girl, the likelihood of having a second birth is lower when the first birth is a boy. In addition, women who have had an abortion before are less likely to consider having a second birth compared with women who have never had an abortion before.

When we add the intended number of children into Model 2, we are able to see significant improvements in the model fit compared with Model 1. As reflected in the models, despite the strict birth control policy currently enforced in China as well as a relatively low intended number of children, the intended number of children still has a significant effect on the behavior related to having a second birth. The higher the intended number of children, the higher the likelihood that the childbearing-age women will have a second birth. We then add son preference as a variable to Model 3. The results indicate that childbearing-age women who have a son preference are surprisingly less likely to have a second child than women without a son preference.

The results presented in Table 3 indicate that childbearing-age women whose first child is a boy are less likely to have a second child compared with women whose first child is a girl. Furthermore, we divided the sample based on the gender of the first child to separately study the effect of the intended number of children and son preference on having a second child. The results are as shown in Table 4.

As observed in Table 4, regardless of whether the first child is a boy or a girl, the results show that the higher the intended number of children, the higher the likelihood those childbearing-age women will have a second child. However, depending on the gender of the

first child, son preference impacts differently on having a second child. The probability of a second childbirth increased with son preference if the first child was a girl, but this effect was not statistically significant. When the first child was a boy, the probability of a second childbirth was statistically significant lower for women with son preference than for those without this preference.

5. Conclusions and Discussion

With data from a Fertility Intention and Behavior Survey of 2101 questionnaires conducted in 2013 in Shaanxi Province of northwestern China, we examined the effect of fertility intention and son preference on the probability of a second child. Our findings validated the effect of fertility intention on proceeding to a second childbirth, and elucidated the fertility behavior for women with son preference.

Firstly, we validated the hypothesis that the intended number of children still significantly impacts the likelihood of childbearing-age women having a second birth despite the strict birth control policy currently enforced in China, and the relatively low fertility intention. This is generally consistent with the well-established principle of fertility intentions being a strong predictor of fertility behavior, shown by previous studies. As the actual fertility number is usually lower than fertility intention, it is predictable that the total fertility rate in Shaanxi Province, which now faces a fertility intention of 1.84 children per women, may continue to decline. Given the average level of socioeconomic development, the probable representativeness of low fertility intention (at least, the surveyed intention is very close to the national level), and the assertion of a discrepancy between fertility intention and fertility behavior, it may be prudent to forecast a further decline in the national fertility rate.

Secondly, our findings indicate that women with son preference were less likely to proceed to have a second child. This contradicts conclusions from studies in other countries (Guilmoto, 2012a; Guilmoto, 2012b; UNFPA, 2012). Further analysis found that when the first child is a boy, women with son preference show a lower likelihood of having a second child. When various constraints are present, in the form of birth control policy, the increased costs of childbearing, or a low intended number of children, women’s willingness to have a second birth decreases. At the same time, some parents who want to avoid having a second child while fulfilling their preference fora son will possibly turn to sex identification and sex-selective abortion to ensure that the first child is a boy. Individual behavior at the micro level is consistent with the observed increase in sex ratio for the first birth at the macro level, which was 107.12 male newborns for every 100 female newborns in the 2000 census, but increased to 113.73 for 100 in the 2010 census (PCO, 2002, 2012). This indicated that as far as son preference in concerned, a transition from extra births to sex-selective abortion is making it less likely for women to have a second child, and exacerbating the decrease in the fertility rate. Both Qian (1997) and Cai et al. (2010) confirmed that son preference increases the likelihood that a family whose first child is a girl will have a second child. This is consistent with our general understanding, but our result is not statistically significant.

One limitation of the paper is that some independent variables are not time-varying variables in this event history analysis. Another limitation is, when we measure the socioeconomic

status (SES) of respondents, we found the response rate on annual income, which is a good index for SES measurement, is too low and there are too many missing data. Moreover, people are inclined to underestimate their income. For those who did provide the data on income, they may provide a lower figure. So we did not include annual income in our analysis. And the measure of son preference may be controversial.

Despite these limitations, our study not only contributes to the literature on fertility intention, son preference and fertility behavior, but also sheds light on possible adjustments to the Chinese birth control policy. After three decades of stringent birth control policy, China is now characterized by a low fertility intention as well as a strong preference for sons in the context of a total fertility rate of around 1.5 (Cai, 2013), well below replacement level. The intended number of children in the future will not rebound but instead may continue to go down. Son preference will continue to exist and negatively impact the number of second births, hence reducing the fertility rate. China's current fertility level is already very low; and may fall into a low fertility trap (Jiang et al. 2013a). However, the Chinese government and some scholars still worry that allowing the general public to have second births will lead to a large rebound in China's fertility rate and put excessive pressure on public resources (Zhai et al., 2014). A recent relaxation of birth control policy was initiated in 2013 to permit a couple where either spouse is an only child to have two children, but little effect on fertility level rebound has been observed (Basten and Jiang, 2014). The results of this study perhaps indicate that timely adjustment of the birth control policy such as an immediate policy switch from an anti-natalist to a pro-natalist position could be the best approach for today's China.

Appendix The relevant survey questions and how to derive the main variables

101 Your date of birth? Year/Month

103 Your Hukou belongs to?

1 Agricultural Hukou 2 Non-agricultural Hukou 3 Other (please indicate)

104 Your Education level is?

1 illiterate 2 primary school 3 middle school 4 high school/intermediate vocational education 4 higher vocational education B college or above

115 How many siblings do you have (not including self but include siblings who had passed away)?

217 Information about your parents-in-law

	(1) still alive 1 yeas 2no(jump to the other parent)

a father in law	
b mother in law	

303Your pregnancy situation

Parity (twins are in the same parity)	First pregnancy	Second pregnancy	Third pregnancy	Fourth pregnancy	Fifth pregnancy
(1)the terminal time of the pregnancy	Year/month	Year/month	Year/month	Year/month	Year/month
(2)pregnancy outcome 1 live birth 2 abortion 3misscarry/dead birth/dead foetus 4 in pregnancy	☐	☐	☐	☐	☐
Answer if the outcome of pregnancy is live birth					
(7) sex of the child 1male 2female	☐	☐	☐	☐	☐

401 What is your ideal number of children if you do not consider the family planning policy?

403 If you could only have one child, would you prefer a boy or a girl, or is there no preference?

1 boy 2 girl 3 no preference

References

Basten S, Jiang Q. Fertility in China: An uncertain future. Population Studies. 2014 In press.

Blossfeld, HP., Golsch, K., Rohwer, G. Event History Analysis with Stata Mahwah. New Jersey: Lawrence Erlbaum Associates, Inc.; 2007.

Bongaarts J. Fertility and reproductive preferences in post-transitional societies. Population and Development Review. 2001; 27:260–281. (Supplement: Global Fertility Transition).

Bongaarts J. The end of fertility transition in the developed world. Population and Development Review. 2002; 28(3):419–443.

Brass, W. Note on Brass method of fertility estimation, Appendix A to Chapter 3. In: Brass, W., et al., editors. The Demography of Tropical Africa. Princeton University Press; Princeton: 1968.

Brass W. Perspective in population prediction: illustrated by the statistics of England and Wales. Journal of the Royal Statistical Society. 1974; 137(4):532–583.

Cai Y. China's below-replacement fertility: Government policy or socioeconomic development. Population and Development Review. 2010; 36(3):419–440. [PubMed: 20882701]

Cai, Y. China's lowest low fertility in the global context: Opportunities and challenges. In: Wang, FengPeng, Xizhe, Gu, Baochang, editors. Globalization and Low Fertility: China's Choice. Shanghai: Fudan University Press; 2011.

Cai Y. China's new demographic reality-Learning from the 2010 Census. Population and Development Review. 2013; 39(3):371–396. [PubMed: 25620818]

Cai, Y., Wang, F., Zheng, Z., Gu, B. Fertility intention and fertility behavior: Why stop at one? – Factors behind China‘s below replacement fertility. Paper prepared for Population Association of America Annual Meeting Dallas-Fort Worth; April 15–17, 2010; 2010.

Chan KW, Zhang L. The hukou system and rural-urban migration in China: Processes and changes. The China Quarterly. 1999; 160:818–855.

Chen W, Jin Y. Gaps between fertility intentions and fertility outcomes in China: Patterns and determinants. Population Journal. 2011; 33(2):3–13.

China Population Association (CPA). Chinese Fertility Intention. A report presented at the 2013 Annual Meeting of China Population Association; Beijing. December 22–23, 2013; 2013.

Choe, MK., Bumpass, LL., Tsuya, NO. Employment. In: Tsuya, NO., Bumpass, LL., editors. Marriage, Work, and Family Life in Comparative Perspective: Japan, South Korea, and the United States. Honolulu, HI: East-West Center; 2004.

Cohen WJ, Freedman R, Snyder M. The behavioral sciences and family planning programs: report on a conference (National Institutes of Health, June 1967). Studies in Family Planning. 1967; 1(23): 1–12.

Cox DR. Regression models and life tables. Journal of the Royal Statistical Society. 1972; 34(2):187–220.

Drèze J, Murthi M. Fertility, education, and development: evidence from India. Population and Development Review. 2001; 27(1):33–63.

Ehrlich, PR. The Population Bomb. New York: Ballantine Books; 1968.

Fay S, Hurst E, White MJ. The household bankruptcy decision. American Economic Review. 2002; 92(3):706–718.

Gu B, Wang F, Guo Z, Zhang E. China’s local and national fertility policies at the end of the twentieth century. Population and Development Review. 2007; 33(1):129–147.

Guilmoto CZ. Son preference, sex selection, and kinship in Vietnam. Population and Development Review. 2012a; 38(1):31–54. [PubMed: 22833863]

Guilmoto, CZ. Sex imbalances at birth in Albania. UNFPA. 2012b. http://www.demographie.net/guilmoto/pdf/UNFPA%20report%20Albania%202012.pdf

Guo Z. China’s low fertility and its determinants. Population Research. 2008; 32(4):1–12.

Hou Y, Ma X, Huang K. Research on the fertility desire and behavior of Beijing urban women from only-child families. Population and Development. 2008; 14(1):47–54.

Islam MM, Bairagi R. Fertility intentions and subsequent fertility behavior in Matlab: Do fertility intentions matter? Journal of Biosocial Science. 2003; 35(04):615–619. DOI: 10.1017/S0021932003006072 [PubMed: 14621256]

Jiang Q, Li Y, Li X. A Study on Fertility Intention in Shaanxi Province. A report to Shaanxi Provincial Population and Family Planning Commission. 2013a

Jiang, Q., Li, Y., Tai, X., Basten, S. Effect of children composition on the sex of next birth in the context of low fertility in rural China. Paper presented at the XXVII IUSSP International Population Conference; 26–31 August 2013; Busan, Korea. 2013b.

Keyfitz, N., Caswell, H. Applied Mathematical Demography. New York: Springer; 2005.

Kohler HP, Skytthe A, Christensen K. The age at first birth and completed fertility reconsidered: Findings from a sample of identical twins. MPIDR Working Paper WP 2001–006. 2001

Liu L, Jin X, Brown MJ, Feldman MW. Involuntary bachelorhood in rural China: A social network perspective. Population-E. 2014; 69(1):103–126.

Luo H, Mao Z. From fertility intention to fertility behavior. Asian Population Studies. 2014; 10(2): 195–207.

Morgan SP. Is low fertility a twenty-first-century demographic crisis? Demography. 2003; 40(4):589–603. [PubMed: 14686132]

Morgan SP, Guo Z, Hayford SR. China’s below-replacement fertility: Recent trends and future prospects. Population and Development Review. 2009; 35(3):605–629. [PubMed: 20376285]

Park CB, Cho N. Consequences of son preference in a low-fertility society: Imbalance of the sex ratio at birth in Korea. Population and Development Review. 1995; 21(1):59–84.

Population Census Office under the State Council (PCO). Tabulation on the 2000 Population Census of the People's Republic of China. Beijing, China: China Statistics Press; 2002.

Population Census Office under the State Council (PCO). Tabulation on the 2010 Population Census of the People's Republic of China. Beijing: China Statistics Press; 2012.

Preston, SH., Heuveline, P., Guillot, M. Demography: Measuring and Modeling Population Processes. Blackwell Publishers; 2001.

Qian Z. Progression to second birth in China: A study of four rural counties. Population Studies. 1997; 51(2):221–228.

Rinesi F, Pinnelli A, Prati S, Castagnaro C, Iaccarino C. The transition to second child in Italy: Expectations and realization. Population-E. 2011; 66(2):391–406.

Schoen R, Astone NM, Kim YJ, Nathanson CA, Fields JM. Do fertility intentions affect fertility behavior? Journal of Marriage and Family. 1999; 61(3):790–799.

The Research Team of "Child-Bearing Desire and Behavior in Jiangsu" (RTJS). A study of the child-bearing desire with a low fertility. Jiangsu Social Sciences. 2008; 19(2):170–177.

Tsiatis A. A nonidentifiability aspect of the problem of competing risks. Proceedings of the National Academy of Sciences. 1975; 72(1):20–22.

UNFPA. Sex imbalances at birth: Current trends, consequences and policy implications. 2012. http://www.unfpa.org/public/cache/offonce/home/publications/pid/12405

Ward MP, Butz WP. Completed fertility and its timing. Journal of Political Economy. 1980; 88(5):917–940.

Yang S, Wang G. Fertility decline and imbalance of sex ratio under birth control. Market & Demographic Analysis. 2006; 12(4):18–28.

Zhai Z, Zhang X, Jin Y. Demographic consequences of an immediate transition to a universal two-child policy. Population Research. 2014; 38(2):3–17.

Zhang L. Economic migration and urban citizenship in China: The role of points system. Population and Development Review. 2012; 38(3):503–533.

Zhao Z, Chen W. China's far below-replacement fertility and its long-term impact: Comments on the preliminary results of the 2010 census. Demographic Research. 2011; 25(26):819–836.

Zheng Z. Fertility intention, fertility behavior and fertility level. Population Research. 2011a; 35(2): 44–47.

Zheng, Z. Low fertility and fertility intention-Evidence from Jiangsu Survey. In: Wang, FengPeng, Xizhe, Gu, Baochang, editors. Globalization and Low Fertility: China's Choice. Shanghai: Fudan University Press; 2011b.

Zheng Z, Cai Y, Feng W, Gu B. Below replacement fertility and childbearing intention in Jiangsu Province, China. Asian Population Studies. 2009; 5(3):329–347.

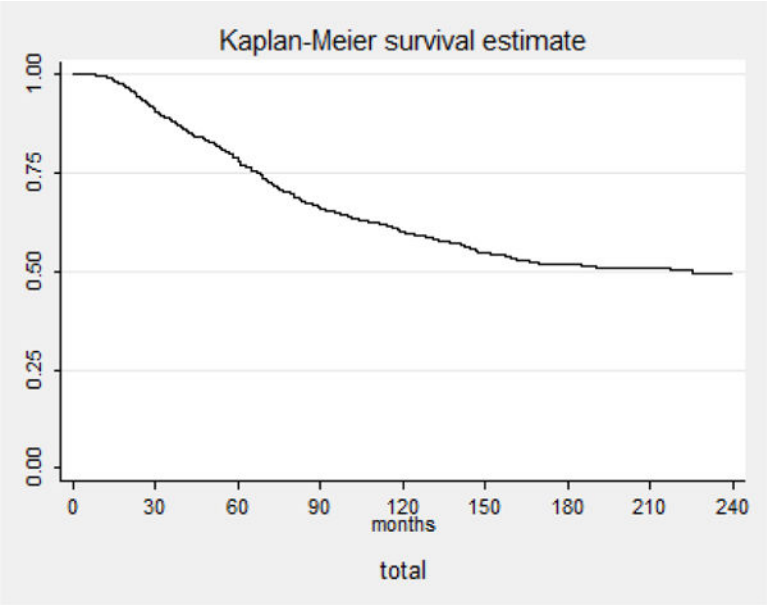

Figure 1.
Kaplan-Meier survival curve of second childbirths in Shaanxi Province

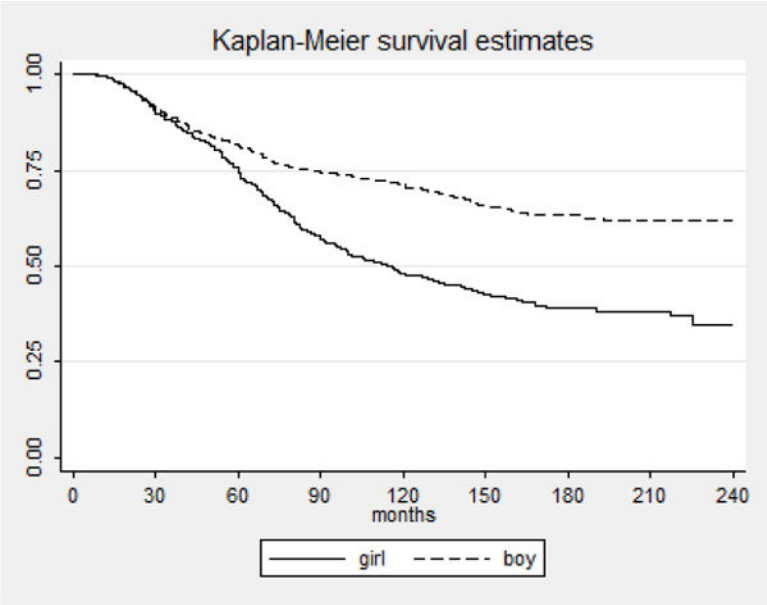

Figure 2.
Kaplan-Meier survival curve of second childbirths by the gender of the first child (Log-rank test: p value<0.001)

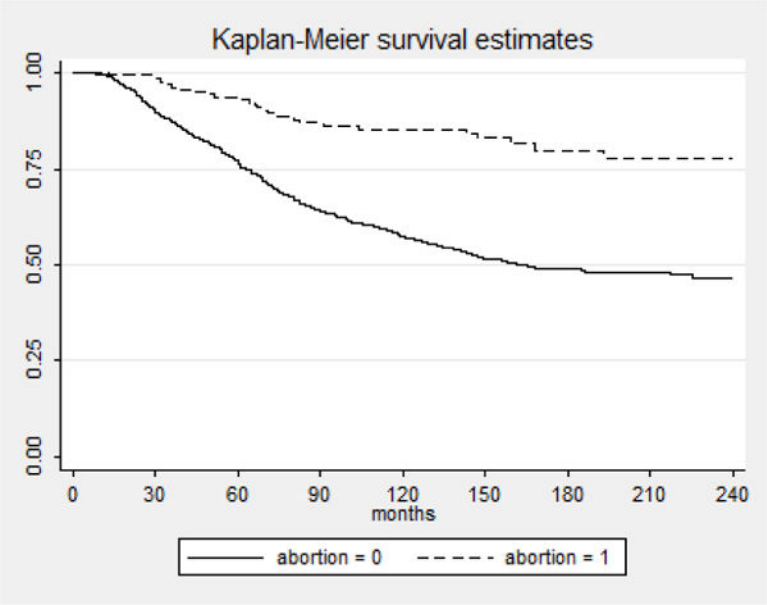

Figure 3.
Kaplan-Meier survival curve of second childbirths by according to prior abortion (Log-rank test: p value<0.001)

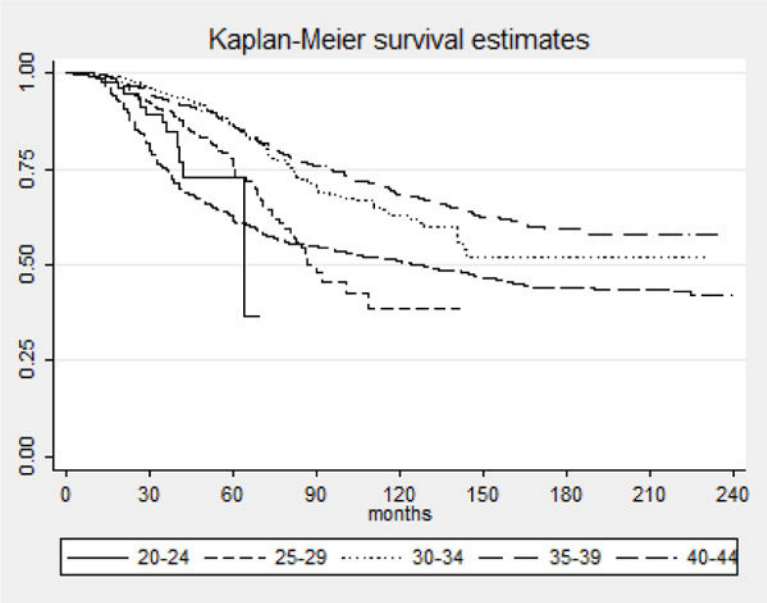

Figure 4.
Kaplan-Meier survival curve of second childbirths by age (Log-rank test: p value<0.001)

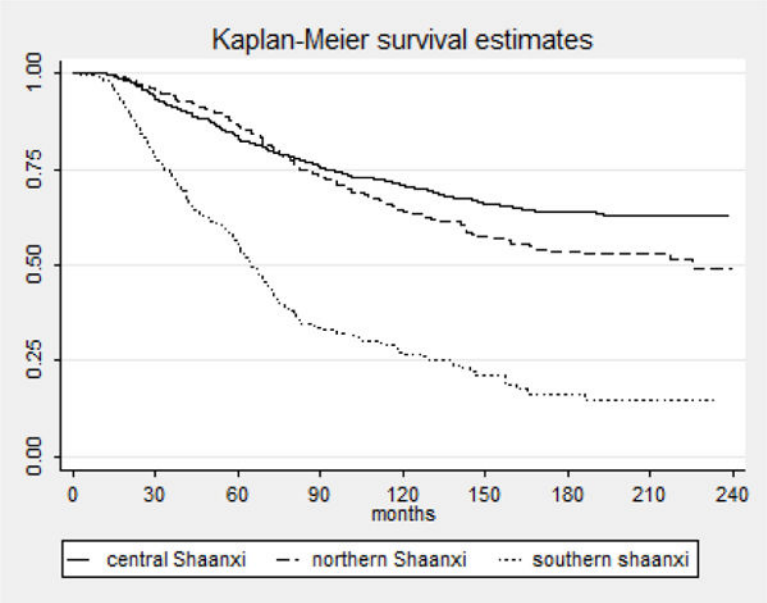

Figure 5.
Kaplan-Meier survival curve of second childbirths by region (Log-rank test: p value<0.001)

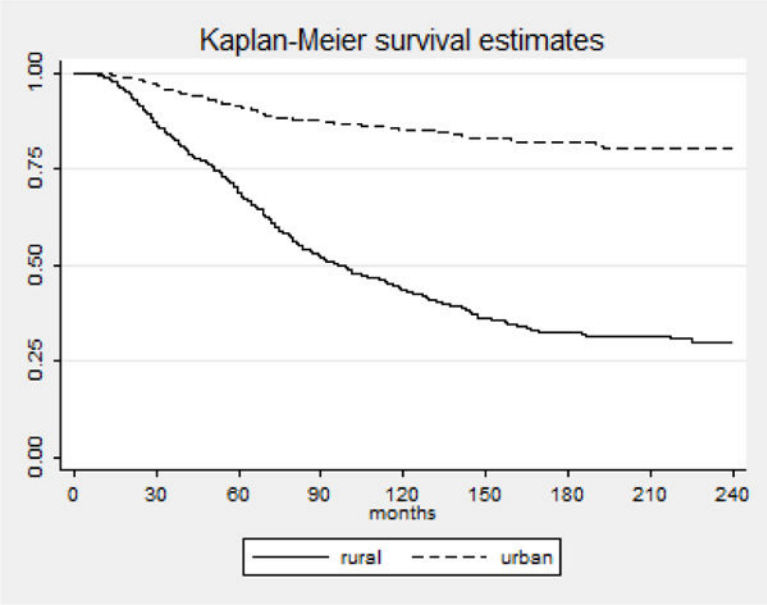

Figure 6.
Kaplan-Meier survival curve of second childbirths by Hukou type (Log-rank test: p value<0.001)

Table 1

Definition and measurement of variables

Variable	Definition and measurement
Whether having given birth to a second birth	whether the second childbirth event occurs
Survival time	the survival time from first childbirth to second childbirth
Fertility intention	
Intended number of children	the ideal number of offspring
Presence of son preference	dummy variable: 1= with son preference, 0= without son preference
Individual characteristics	
Age	woman's age at the end of the survey
Age at first childbirth	woman's age at their first childbirth
Year of first childbirth	dummy variable: 1=1980s and 1990s, 0=2000 and after
Hukou type	dummy variable: 1=rural type, 0= non-rural type
Education	reference category: elementary school and below
Middle school	1=middle school, 0=else
High school/technical secondary school	1=high school/technical secondary school, 0=else
Junior college	1=junior college, 0=else
College and above	1=college and above, 0=else
Existing childbirth status	
Gender of first child	dummy variable: 1=male, 0=female
Prior abortion	dummy variable: 1=yes, 0=no
Family environment	
Number of paternal siblings	number of paternal siblings,not including self but include siblings who had passed away
Presence of parents-in-law	dummy variable: 1=yes, 0 = no
Regional factor	
Region	reference category: Central Shaanxi
Southern Shaanxi	1= Southern Shaanxi, 0=else
Northern Shaanxi	1= Northern Shaanxi, 0=else

Table 2

Descriptive statistics of variables

Variable	Total		First child-Girl		First child-Boy		P value
	N	% or Mean	N	% or Mean	N	% or Mean	
Second birth							0.000[a]
No	1409	67.06	604	59.27	805	74.40	
Yes	692	32.94	415	40.73	277	25.60	
Survival time	2101	69.00[3]	1019	65.00[3]	1082	75.00[3]	0.000[b]
Fertility intention							
Intended number of children	2101	1.84	1019	1.87	1082	1.81	0.004[b]
Presence of son preference							0.000[a]
No	1468	69.87	789	77.43	679	62.75	
Yes	633	30.13	230	22.57	403	37.25	
Individual characteristics							
Age	2101	33.68	1019	33.37	1082	33.97	0.479[b]
Age at first childbirth	2101	23.69	1019	23.77	1082	23.61	0.054[b]
Year of first childbirth							0.522[a]
2000 and after	1349	64.21	671	65.85	678	62.66	
1980s and 1990s	752	35.79	348	34.15	404	37.34	
Hukou type							0.308[a]
Non-rural type	809	38.51	381	37.39	428	39.56	
Rural type	1292	61.49	638	62.61	654	60.44	
Education							0.001[a]
Elementary school and below	86	4.10	24	2.36	63	5.74	
Middle school	1094	52.10	543	53.29	551	50.97	
High school/technical secondary school	450	21.43	223	21.88	227	21.00	
Junior college	289	13.76	150	14.72	139	12.86	
College and above	181	8.62	79	7.75	102	9.44	
Existing childbirth status							

Variable	Total		First child-Girl		First child-Boy		P value
	N	% or Mean	N	% or Mean	N	% or Mean	
Prior abortion							0.004[a]
No	1934	92.05	956	93.82	978	90.39	
Yes	167	7.95	63	6.18	104	9.61	
Family environment							
Number of paternal siblings	2101	2.03	1019	2.02	1082	2.03	0.900[b]
Presence of parents-in-law							0.291[a]
No	230	10.95	104	10.21	126	11.65	
Yes	1871	89.05	915	89.79	956	88.35	
Regional factor							0.115[a]
Central Shaanxi	1120	53.31	549	53.88	571	52.77	
Southern Shaanxi	537	25.56	273	26.79	264	24.40	
Northern Shaanxi	444	21.13	197	19.33	247	22.83	

[3] Different than other means in Table 2, these values are medians for asymmetrically distributed continuous data of survival time.

[a] Pearson's chi-squared test of independence between a certain variable and the sex of first child.

[b] One-way analysis of variance (ANOVA) to compare means of the two samples by sex of first child.

Table 3

Cox regression results of second childbirth

Variable	Model 1	Model 2	Model 3
	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
Fertility intention			
Intended number of children		0.615***	0.632***
		(0.107)	(0.109)
Presence of son preference (reference category: No)			
Yes			−0.162+
			(0.091)
Individual characteristics			
Age	−0.252**	−0.261**	−0.251*
	(0.098)	(0.097)	(0.098)
Age squared	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)
Age at first childbirth	−0.188***	−0.187***	−0.187***
	(0.019)	(0.020)	(0.020)
Year of first childbirth (reference category: 2000 and after)			
1980s and 1990s	−0.710***	−0.736***	−0.738***
	(0.147)	(0.148)	(0.147)
Hukou type (reference category: non-rural type)			
Rural type	0.827***	0.812***	0.822***
	(0.123)	(0.124)	(0.124)
Education (reference category: elementary school and below)			
Middle school	−0.311*	−0.145	−0.164
	(0.137)	(0.141)	(0.142)
High school/technical secondary school	−0.499**	−0.350+	−0.373*
	(0.175)	(0.179)	(0.180)
Junior college	−2.059***	−1.908***	−1.942***
	(0.374)	(0.376)	(0.377)
College and above	−3.355***	−3.337**	−3.372***
	(1.016)	(1.016)	(1.016)
Existing childbirth status			
Gender of first child (reference category: Female)			
Male	−0.718***	−0.678***	−0.658***
	(0.079)	(0.080)	(0.081)
Prior abortion (reference category: No)			
Yes	−0.916***	−0.939***	−0.937***
	(0.215)	(0.215)	(0.215)

Variable	Model 1	Model 2	Model 3
	Coefficient (SE)	Coefficient (SE)	Coefficient (SE)
Family environment			
Number of paternal siblings	0.086**	0.076**	0.073*
	(0.029)	(0.030)	(0.030)
Presence of parents-in-law (reference category: No)			
Yes	3.614**	3.337**	3.384**
	(1.284)	(1.256)	(1.261)
Presence of parents-in-law * Age	−0.087**	−0.080**	−0.081**
	(0.032)	(0.031)	(0.031)
Regional factor			
Region (reference category: Central Shaanxi)			
Southern Shaanxi	−0.151	−0.202*	−0.197*
	(0.100)	(0.100)	(0.100)
Northern Shaanxi	0.746***	0.654***	0.727***
	(0.100)	(0.101)	(0.110)
Sample size	2,101	2,101	2,101
−2LL	871.57***	906.53***	909.71***

*** p<0.001;

** p<0.01;

* p<0.05;

+p<0.1

Table 4

Cox regression results by gender of first child

Variable	First child - Girl	First child - Boy
	Coefficient (SE)	Coefficient (SE)
Fertility intention		
Intended number of children	0.710***	0.557***
	(0.165)	(0.150)
Presence of son preference (reference category: No)		
Yes	−0.079	−0.294*
	(0.121)	(0.140)
Individual characteristics		
Age	−0.027	−0.510***
	(0.137)	(0.151)
Age squared	0.004*	0.009***
	(0.002)	(0.002)
Age at first childbirth	−0.155***	−0.238***
	(0.025)	(0.032)
Year of first childbirth (reference category: 2000 and after)		
1980s and 1990s	−0.785***	−0.683**
	(0.183)	(0.258)
Hukou (reference category: non-rural type)		
Rural type	0.852***	0.807***
	(0.160)	(0.199)
Education (reference category: elementary school and below)		
Middle school	0.034	−0.217
	(0.244)	(0.178)
High school/technical secondary school	0.022	−0.692*
	(0.276)	(0.275)
Junior college	−2.125***	−1.649**
	(0.573)	(0.504)
College and above	−2.846**	−31.21
	(1.038)	(1.845e+06)
Existing childbirth status		
Prior abortion (reference category: No)		
Yes	−1.198***	−0.751*
	(0.324)	(0.288)
Family environment		
Number of paternal siblings	0.086*	0.069
	(0.039)	(0.047)

Variable	First child - Girl	First child - Boy
	Coefficient (SE)	Coefficient (SE)
Presence of parents-in-law (reference category: No)		
Yes	6.090**	1.097
	(2.065)	(1.545)
Presence of parents-in-law * Age	−0.150**	−0.021
	(0.051)	(0.038)
Regional factor		
Region (reference category: Central Shaanxi)		
Southern Shaanxi	−0.089	−0.296+
	(0.123)	(0.173)
Northern Shaanxi	0.592***	0.914***
	(0.146)	(0.169)
Sample size	1,019	1,082
−2LL	432.03***	453.60***

*** p<0.001;

** p<0.01;

* p<0.05;

+p<0.1