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Son Preference and Second Birth in China

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Abstract: Preference for bearing sons is a common social custom and cultural tradition in China. In 1979, China installed the stringent one-child policy which firmly controls second and higher order birth, although with a few exceptions which allow couples to have two children. Thus to explore son preference value and its connection with second order birth is of great interest. With birth history data of 2412 women between 18 to 52 years old from 2006 China Health and Nutrition Survey (CHNS) conducted in 9 provinces, this paper examines son preference from the effects of sex of the first child on women's second birth risks from 1972 -2006 through multivariate analysis. Second birth risks are estimated by multiplicative intensity regression model. Sex of the first child is the major covariate in this paper, together with control variables of women's age, educational level, calendar year, household registration (Hukou), urban/rural residence, number of women's siblings and second birth interval. Structures of the effects of son preference in second birth rates are explored through interactions between sex of the first child and other covariates. Results show that rather than policy eligibility, son preference has strong impacts on risks of having another child, independent of individual demographic and socio-economic factors. When fertility is low, such as below-replacement fertility period from early 1990s, older ages in women's fertility career and last few years during the second birth spacing, motives to have a son plays an increasingly important role in women's second birth decisions. This paper also finds that the number of women's male siblings has positive effect on risks to bear a second child.

Introduction

China's fertility declined from about 6 children per woman in early 1970s to about 1.5 children in 2010 (Zhao and Guo 2010). Accompanying this dramatic fertility transition, study showed that parity progression ratios for first to second birth were declining in China from 1979 to 2000 (Chen et al. 2009). With this shift, second birth progression will very likely be affected by one's sex preference, in terms of the sex of the previous birth. The prevalent son preference is longstanding in Chinese culture and social life (Arnold and Liu 1986), and second birth is the critical birth order under strict control of China's one child policy implemented in 1979. Couples who want to have second births should meet certain conditions set by the government. Therefore, to study the effects of son preference on second birth progression in China is of great interest. From the same time, with the social and economic reform, China has experienced rapid socio-economic developments, such as transition from central-planned economy to market economy, economic diversification in rural areas, relaxed government control of individual life (including weakened intervention of family planning program), rapid urbanization and so on (Wang and Mason 2004). As other Asian countries (e.g., South Korea, Japan and Singapore) without aggressive government population control experienced sharp fertility decline during economic development (Merli 2010), I also expect individual socio-economic backgrounds to have measurable effects on son preference and second birth in China.

Focusing on second order birth, the aim of this paper is to investigate effects of women's son preference in its relation to second birth, and dimensions of this relationship. The study endeavors to provide some information about the role of son preference in shaping fertility behaviors and demographic consequences in China. In this paper, son preference is inferred from the effects of sex of the first child on women's second birth risks. With retrospective fertility data from 2006 China Health and Nutrition Survey (CHNS) of 9 Chinese provinces, this paper will examine the impact of the sex of first child and other socio-economic factors on the probability of a woman to have a second birth during calendar period of 1972-2006. Using event-history models, I will pay particular attention to the effects of sex of the first child on risks of women to progress to another birth. Influences of women's socio-economic backgrounds on second births will be treated as control variables. Interactions of these socio-economic factors with the gender variable of first child will also be explored.

China's One Child Policy and Its Implementation

In 1979, China issued the draconian one child policy which strongly promoted one child per couple and its enforcement directly dictated the progression from first to second births (Luther et al. 1990; Feeney and Wang 1993). One child policy was relatively lenient in 1980-81. It hardened in 1982-83 with large scale campaigns of mandatory sterilization and abortion (Greenhalgh 1986). The strict policy met strong resistance especially in rural areas where son preference was strong and family remained important in old age support (Gu et al. 2007; Greenhalgh 1986). In 1984 Chinese leadership issued Central Document 7 in response to the backlash, and introduced the beginning of a period of policy relaxation. Following the "spirit of document", provinces began to expand the conditions allowable for couples to have two children. For example, exceptions for bearing another child doubled from 8 to 16 in Liaoning Province (Greenhalgh 1986). The policy of permitting women with a daughter to bear another child in rural areas was introduced in limited areas in 1984, but it was officially extended to nearly all rural areas in China in 1988 (Zeng 1989). In early 1990s, evidence showed tightening enforcement, including it becoming less likely to allow exceptions for second births, decrease in incentives for couples with only child and substantial increases in fines imposed on second births without permission (Short and Zhai 1998). Afterwards, while China government still emphasized the importance of holding rapid population growth down, with its increasing inability to control individual private life, policy implementation was suggested to rely more on socio-economic development for its success (Attané 2001).

One child policy has been different in its policy making and implementation across different administrative levels and geographic places (Gu et al. 2007; Short and Zhai 1998). Throughout 1980s, most Chinese provinces made their own birth control regulations (Gu et al. 2007). Based on fertility policy information of 420 prefectures¹ from 1990 and 2000 censuses, Gu and his colleagues calculated that at the turn of the 21st century, if all couples bear children according to various local fertility policies, different provinces would have different fertility levels (Gu et al. 2007). One-child fertility policy also applies differently to people with different social, economic and demographic backgrounds. Urban areas are always under greater fertility control from government than rural areas. The policy implicitly considers accommodating China's son preference culture, especially in vast rural areas (Zeng 2007). Thus for people with non-agricultural household registration, one child per couple is the basic rule, but for agricultural household registration holders, usually those without a son could have a second birth (Gu et al. 2007;

¹ Prefecture is the administrative level directly below the province.

Greenhalgh 1986). Besides that, the policy has been more lenient to remote and poor areas, ethnic minorities, couples who themselves are only children, overseas Chinese and people involved in risky occupation such as miners, fisherman, etc (Gu et al. 2007; Greenhalgh 1986).

Son Preference and Second Birth

Although female status has been greatly improved in socialist China in aspects such as equality in marriage, education and job opportunities, desires for having at least one boy are amply documented (Whyte and Gu 1987; Greenhalgh et al. 1994; Arnold and Liu 1986). Son preference is a common cultural and social tradition rooted in Chinese Confucian thoughts. Emperor Wu of Han Dynasty in historical China saw Confucianism as useful for his reign and strongly encouraged the study of this school of thinking. From then on, Confucianism became the mainstream philosophical thought in society and gradually developed into a heart value of Chinese culture. Confucian tradition greatly supports patriarchal family system, and stresses the importance of carrying on family line and surname. And this task can only be accomplished through male progeny. According to Confucian culture, one of the three unfilial acts done to the family is failing to bear a son (Chen and Chen 1979). Thus having a son is a proud thing for Chinese women, especially in her husband's family. In feudal times, sonlessness could even be the reason for a man to divorce his wife.

Besides, economically-based benefits might be the practical reason for parents' preference to bear sons. Agricultural economy was dominated in China historically, and sons were preferred as important labor force in agricultural production. In current times, with industrialization and urbanization, the productive utility of bearing sons is not equally much valued. But as social welfare has not been well installed, especially in rural China, a major practical aspect of son preference is that sons are usually expected to look after parents in their old age, not only financially, but also physically and emotionally. Because of this, patrilocal marriage pattern still exists in China and sons are generally put to more expectations from their parents than girls, especially in rural areas (Wang 2005). According to a Chinese saying, "Girls marry out, but boys marry in." To come home frequently and see your parents is a virtue to be praised in Chinese society. And boys are obviously more required than girls to be in close attachment with the natal family after they grow up and marry.

Son preference as determinant of second birth behavior is of main interest in this study. We infer son preference from realized second birth progressions by sex of the first child. The sex of the first child has been found to be an important factor influencing progression to second birth in China.

Earlier studies applied a variety of analytical models on different datasets, and discovered that women with a daughter were much more likely to have another child (Poston 2002; Larsen 1990; Ahn 1994; Li and Cooney 1993). Other researchers investigated the connection of son preference with second birth in other ways. Using information from 1985 in-depth fertility survey in Hebei and Shaanxi provinces, Wen found extraordinarily high sex ratios among one child families and suggested that much more couples complied with one child policy when their first child is a boy than those with a girl (Wen 1993). Zheng and her colleagues studied fertility intentions in six counties of Jiangsu province and discovered that among women with one child qualified to have another one, those with a girl had much higher intention to bear the second child (Zheng et al. 2009).

Interactive effects of son preference with socio-economic and individual factors explored by previous studies were not very straightforward. Son preference was shown to be lower in urban areas, societies dominated by non-agricultural economy, and among more educated women (Arnold and Liu 1986). Individual socio-economic factors such as education level and income were discovered to be more effective in controlling son preference in urban than in rural areas, which revealed that son preference might be influenced by socio-economic development and be more deep-rooted among peasants (Larsen 1990). But since government control is usually more relaxed in rural areas, for example, peasant women with one girl are commonly allowed to bear a second child. And urban economy and higher educated women are usually concentrated in cities. It thus could be argued that different son preference levels could be the results of different extent of government control. However, in a study of son preference and compliance with one child policy, Li and Cooney found that son preference was independent of household registration type (the indicator of policy enforcement), urbanization, education, and farm or non-farm occupation (Li and Cooney 1993). As to period trends, the gap of second birth risks between sonless women and those with a son was shown to be widened after one child policy was issued (Ahn 1994). And preference for bearing sons was likely to regain power with the economic reform in rural areas which encouraged households to be responsible for their own profits and losses (Attané 2001).² But more optimistic view suggested that strict one-child policy and government propaganda might help people with daughters to have more favorable views to girls in the future (Greenhalgh et al. 1994).

Many previous researches studying Chinese fertility have addressed the demographic effects of son

² China's rural areas were organized into People's Communes before the economic reform in late 1970s. The commune managed nearly all aspects of peasants' lives, including allocation of food, work, health care and so on. During early 1980s, the communes disbanded one after another and rural household began to be responsible for agricultural production and economic activities independently.

preference, such as probabilities of second and third birth progression, fertility behaviors like one child certificate acceptance, contraceptive uses after the first birth etc, under the one child policy regime, high sex ratio at birth and so on.³ However, a deeper insight into the structure of the relationship between son preference and second birth rates, the critical birth order under the stringent one child policy, has not been sufficiently explored. This paper will try to fill this void.

Research Question

Does sex of the first child has its own impact on women's second birth behavior or does it vary by other factors? With multivariate analysis of demographic, socio-economic, calendar period and policy control factors associated with second birth progression, the paper investigates the impact of sex of the first child on women's second birth risks. From this relationship, we try to infer son preference, a typical cultural phenomenon in China, and its connection to second order birth. If having a girl is found to increase the probability of a woman to have another child, then effects of son preference is indicated to work in Chinese reproductive behavior. What is the specific structure of sex of the first child and second birth, and how strong is the role of first-born girl relative to that of first-born boy in second birth progression? These questions will be addressed in interaction models. Since some couples, for example, rural household registration (Hukou) couples who have a first-born daughter, are entitled to have another child by exceptions of the one child policy, thus, do differentials in second birth risks by sex of the first child entirely stem from son preference, or policy eligibilities play a major role? If eligibility for two children matters more, we would expect higher second birth propensities among those who are likely to be allowed to have another child, and vice versa, for example, depending on whether the woman has rural Hukou, lives in rural area, etc. This will also be tested through interactions

Data and Method

Data

Data for this study is from China Health and Nutrition Survey (CHNS),⁴ which was conducted in

³ To help implement the one child policy, government introduced the one child certificate program. After pledging not to have another child and applying for the one child certificate, the family was eligible for various benefits, such as monthly cash benefits until the child reaching a certain age, preferential allocation of housing and job, prior school admission for the child, free medical care, etc (see Chen and Chen 1979). Although China has undergone rapid economic development, some of the incentives would still have certain effects today.

⁴ China Health and Nutrition Survey is a collaboration project between Carolina Population Center at University of North Carolina and National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and

2006 in 9 Chinese provinces. The first round of CHNS survey was conducted in 1989. Additional panels were collected in 1991, 1993, 1997, 2000, 2004 and 2006. Having used by numerous previous studies, this series of survey data is proved to be of high quality. Similar to other studies about parity progression, this paper relies on retrospective data. 2006 CHNS survey is an ideal dataset for the event-history analysis in this paper. Detailed birth history information for female respondents above 18 years old is available in the adult questionnaire of 2006 CHNS. Female respondents included in this study are women born after 1954 and who were married, divorced or widowed, and who had already given birth to a child. The birth history of them began with the first birth until the most recent parity before the interview on 2006. And I follow them from first to second birth. Socio-demographic backgrounds, such as women's age, educational level, place of residence, household registration (Hukou) type etc., are all available from the questionnaire. Thus it is easy for us to link women's second birth history to their other life areas. Women who bear twins at their first parity are excluded from the event-history analysis, together with some illogical cases and missing values. The final usable respondents are 2412 women. Among the first births they bore, 1223 are boys and 1189 are girls. Thus the sex ratio of first births for my sample is within the normal range. It was noted that the death of previous children could have substantial effects on subsequent parity progression (Ahn 1994). Women are usually exempt from one child rule if their first child dies before second birth. But first child mortality is very low in the data, and it does not affect the research much.⁵

2006 CHNS survey covered 9 Chinese provinces which vary in geography, economic development and other socio-demographic situations. Jiangsu province is the most economically developed, and Guizhou and Guangxi are less well off. Policy fertility i.e., the fertility level achieved if the number of children born per woman are all according to policy requirement, would be 1-1.3 children for Jiangsu, 1.3-1.5 for Heilongjiang, Liaoning, Shangdong, Henan, Hubei and Hunan, and 1.5-2 for Henan, Guangxi and Guizhou (Gu et al. 2007). Geographic distribution of the 9 provinces is shown in Figure 1. A multi-stage, random cluster process was used to draw the samples, which are diverse according to socioeconomic and demographic measures. In each province, 2 cities and 4 counties were randomly selected by a weighted sampling method. Then township and villages within the county, and urban or suburban neighborhoods within the city were selected randomly. Since the 2000 CHNS wave, total number of primary sampling units are 216, which include 36 urban

Prevention. It aims to examine China's social-economic transformations and governmental programs' effects on people's health, economic, and demographic situations.

⁵ In the sample of 2412 women, there are totally 21 first children mortality before the interview. Specifically, 6 children died after the arrival of women's second parity, and 3 children died without leading their mothers to have a second birth. As for the rest cases, considering the period of pregnancy, 11 children died 9 months before the second birth, and 1 child died within 9 months before the second birth.

neighborhoods, 36 suburban neighborhoods, 36 towns and 108 villages. Households of the women I study are randomly selected in these primary sampling units.



Figure 1. Participating Provinces in the 2006 China Health and Nutrition Survey (CHNS)

Covariates

The sex of the first child is the main variable of interest in this study. It is divided into boy and girl. And according to common findings of strong son preference in China, female first birth is assumed to increase the risks of second birth in my research. Other factors are control variables. The analysis will initially be based on the following control covariates: woman's age, woman's educational level, calendar year, household registration (Hukou), place of residence, duration since the first birth. Calendar year, woman's age and duration since the first birth are time-varying covariates, which mean that they change over women's life history. Other covariates are regarded as time-constant. In order to separate the effects of one child policy from other factors in determining second birth behavior, I include household registration (Hukou) in the analysis because one child policy, like many other social policies in China, applies to individuals mainly based on their type of Hukou. Region is also related to policy enforcement. But because province factor in the dataset is distinguished according to one's place of residence, rather than place of household registration

(Hukou), we choose to not include geographical discussion in this paper.

Woman's age

The youngest age of first child-bearing in our sample is 14, so I divide this factor into 14-20, 21-25, 26-30, 31-35 and 36 plus. It is often found that the older the woman's age at first birth, the less likely she were to bear the second child (Poston 2002). This was supported by a finding that mother's age was positively related to acceptance of one-child certificate (You 1993). Women's age was also negatively associated with the intention to bear the second child (Zheng et al. 2009). Thus, in this study, I expect that woman's age is negatively associated with second birth progression.

Woman's Education

Women's educational level is grouped into 6 categories: no schooling, primary school, junior middle school, senior middle school, technical school and university. As education system is quite rigid in China and majority of Chinese women marry and bear children after their education career, I take a woman's educational level at the interview as representation of her educational level at the second birth interval for my analysis. Education generally has negative effects on fertility. Before family planning programs, the general picture of China's fertility transition was similar to those of other countries that higher educated women adopted birth control first, and then lower educated ones (Lavelly and Freedman 1990). As to second birth, study found that more educated women were more likely to comply with one child policy after first births (Li and Cooney 1993; Cooney and Li 1994; Ahn 1994). And the negative relationship between education and second birth probabilities was particularly strong in urban areas (Choe et al. 1992). This paper thus expects that education would decrease women's second birth likelihood.

Calendar Year

Calendar year is an important time-varying factor in my study since it can control for total fertility variation, population policy and socio-economic development over time. As the first child-bearing occurred in 1972 in my sample, period effects of second birth are studied from 1972. Calendar years are aggregated into 10 groups: 1972-80, 1981-82, 1983-84, 1985-86, 1987-88, 1989-90, 1991-92, 1993-95, 1996-00 and 2001-06. Since one child policy actually began to harden after 1980, the year group of 1972-80 is treated as the pre-one-child policy period. Total fertility stayed above replacement level with ups and downs throughout 1980s (Cai 2010), in order to see second birth

trends more specifically, the years of 1981 to 1992 are categorized into 2-year groups. More years are grouped together afterwards because total fertility remained below-replacement level without much change (Cai 2008; Retherford et al. 2005; Zhang and Zhao 2006; Zhao and Guo 2010). I expect that period trends of second birth would decline after one child policy was issued (Poston 2002), fluctuated with varying policy enforcement in 1980s (Luther et al. 1990), and further declined during below-replacement fertility from 1990s.

Household Registration (Hukou)

Household registration is divided into 2 categories, urban type and rural type. China's household registration system was established in 1950s as a major tool by government to perform population registration and social management. According to whether or not a person is depending on agricultural production for living, it is usually divided into urban Hukou and rural Hukou. And one's Hukou status is determined at birth. It is managed by police office (Paichu Suo) at urban community or rural township level subordinated to Public Security Bureau (Gongan Ju). With the political and economic reform from 1979, Hukou has been less influential on individual life in China, for example, rural-urban migration and job finding is no longer strictly controlled by one's Hukou status. Hukou still plays an important role in social and economic life of every Chinese today (Zhang and Zhao 2006). To change one's type of Hukou (usually from rural Hukou to urban Hukou) is still very difficult in China. One possible way of change for rural Hukou holders is by finishing college education.

Study showed that progression to second birth dropped earlier, even before the introduction of one child policy, for women with urban Hukou (Feeney and Wang 1993). And urban Hukou background strongly and independently increased women's compliance with the policy (Li and Cooney 1993; Cooney and Li 1994). Moreover, type of Hukou was discovered to mediate socio-economic influence on one's acceptance of single child family size, which meant that the reluctant second birth behaviors by women with higher education, urban residence and non-agricultural occupation were resulted from stricter birth control from government (Li and Cooney 1993). To sum up, urban registered women are supposed to have lower second birth risks.

Place of Residence

In a background of relaxed government control of rural-urban migration, this variable of urban/rural residence is slightly problematic because it is measured at the interview time. But even if

urbanization is an interesting factor associated with fertility behaviors, we assume that effects of migration are not so large and include this variable in the analysis. According to 2006 CHNS survey, people living in urban or suburban neighborhoods are regarded as urban residents, and people living in towns and villages are classified as rural residents. Previous studies showed that urbanization was negatively associated with second birth likelihood, and urban residents were more likely to follow one child policy (Choe et al. 1992; Li and Cooney 1993; Cooney and Li 1994). Urban areas are always under greater government fertility control than rural areas. Family planning in Chinese urban areas could date back to 1963, nearly 10 years before the official reproductive control was taken place in the rural regions (Lavelly and Freedman 1990). And urban residents normally engage in non-agricultural economic activities. Evidence indicated that women involved in non-farming industry were shown to be more likely to follow one child policy (Li and Cooney 1993; Poston 2002). Generally, urban resident women are expected to exhibit lower risks of second birth than rural female residents.

Duration since the First Birth

Duration since first birth is the basic time variable in this study. Women's second birth risks are calculated within 10 years after the first birth, if they are not censored by other situations i.e., bearing the second child, reaching 50 years old, or reaching the interview date of 2006. It is divided into 5 categories: 1-2 years, 3-4 years, 5-6 years, 7-8 years and 9-10 years, corresponding to 0-24 months, 25-48 months, 49-72 months, 73-96 months and 97-120 months. Intensities of second birth usually present an inverted U-shape trend over the whole period after the first birth. Although there are many variations across the country, required birth spacing between the first two parities under one child policy is 4-5 years on average (personal communication with a Chinese family planning official). Thus I expect that 3-4 years or 5-6 years will be the peak of second birth risks for women in this study.

Later in the extended model, I will add two more variables, one is woman's number of brothers, and the other is woman's number of sisters. They are all classified into 6 categories: 0, 1, 2, 3, 4, and 5 or more. Sibling is a useful family background factor from which we can explore the intergenerational transmission of one's fertility patterns. Whether the number of women's male or female siblings has any effect on second birth progression and son preference will be explored in the extended regression model. Generally, the size of one's sibling group is positively associated with one's fertility (for a review, see Kolk 2011). Thus the study anticipates that the more siblings a woman have, no matter brothers or sisters, the more likely she will be to move on to have another

child.

Table 1: Total Exposures of Covariates: Woman-months as one-child mother (N=2412)

<i>Women's Age</i>		<i>%</i>	<i>Education Level</i>		<i>%</i>
14-20	3842	2.1	No school	8973	4.9
21-25	52767	29.0	Primary	41808	23.0
26-30	80898	44.4	Junior Middle	78165	42.9
31-35	39293	21.6	Senior Middle	29393	16.1
36+	5258	2.9	Technical	12956	7.1
			University	10763	5.9
<i>Calendar Year</i>		<i>%</i>	<i>Household Registration Type</i>		<i>%</i>
1972-1980	3615	2.0	Urban	84615	46.5
1981-1982	5380	3.0	Rural	97443	53.5
1983-1984	9249	5.1			
1985-1986	12997	7.1			
1987-1988	15481	8.5			
1989-1990	16294	8.9			
1991-1992	17341	9.5			
1993-1995	25949	14.3			
1996-2000	40559	22.3			
2001-2006	35193	19.3			
<i>Place of Residence</i>		<i>%</i>	<i>Sex of the 1st Child</i>		<i>%</i>
Urban	64138	35.2	Boy	98345	54.0
Rural	117920	64.8	Girl	83713	46.0
<i>Duration since the 1st Birth</i>		<i>%</i>			
1-2 years	55275	30.4			
3-4 years	41714	22.9			
5-6 years	33375	18.3			
7-8 years	28025	15.4			
9-10 years	23669	13.0			

Note: Total occurrences of second births are 1066, among them 434 are girls (40.7%) and 632 boys (59.3%).

Method

Multiplicative regression model is used to analyze the transition period from first to second parity in this study. The study event is second birth. When women bore their first child, they came into my analysis and I trace them until they bore a second child, reached 50 years old, the interview time in 2006 or 10 years after their first parity, whichever comes first. The intensity regression here is expressed as a function of time and other covariates:

$$h(t)=A_i B_j C_k D_m E_n F_o G_p$$

Where $h(t)$ denotes second birth intensity standardized for A_i (months after the first birth), B_j (woman's age), C_k (woman's educational level), D_m (calendar year), E_n (household registration

type), F_o (urban/rural residence) and G_p (sex of the first child). Different levels of factors A-G are indexed by italics i, j, k, m, n, o , and p . The basic time variable is represented by A_i . It is analyzed by months after the first birth. And it is shown by absolute risks i.e., number of second birth per 1000 woman-months living as one-child mother. Other covariates are supposed to modify the absolute risks with multiplicative effects. The second birth risks for women of a certain group relative to the baseline group are presented as relative risks. Model parameters are estimated by the maximum likelihood method. The computation of the model is based on the number of second birth occurrences and the corresponding exposure times of risk for different sub-groups of women in the data. This is performed by a computer program called EvHA, which is developed by Max Planck Institute for Demographic Research. Table 1 shows the descriptive statistics of occurrences and exposure time of the covariates in the following main-effects model.

Results

Main-effects Model

Table 2: Relative Risks of Second Birth for Chinese Women, with absolute risks (per 1000 months) by duration since first birth. (N=2412)

	<i>P-value</i>		<i>P-value</i>
<i>Woman's Age</i>	<i>0.00</i>	<i>Education Level</i>	<i>0.00</i>
14-20	1	No school	1
21-25	0.97	Primary	0.83
26-30	1.08	Junior Middle	0.74
31-35	0.62	Senior Middle	0.53
36+	0.30	Technical	0.20
		University	0.14
<i>Calendar Year</i>	<i>0.00</i>	<i>Household Registration Type</i>	<i>0.00</i>
1972-1980	1	Urban	1
1981-1982	1.01	Rural	2.93
1983-1984	0.69		
1985-1986	0.81		
1987-1988	1.12		
1989-1990	0.96		
1991-1992	0.43		
1993-1995	0.31		
1996-2000	0.27		
2001-2006	0.30		
<i>Place of Residence</i>	<i>0.00</i>	<i>Sex of the 1st Child</i>	<i>0.00</i>
Urban	1	Boy	1
Rural	1.32	Girl	1.74
<i>Duration since the 1st Birth</i>	<i>0.00</i>		
<i>(Absolute risks per 1000 months)</i>			
1-2 years	3.41		
3-4 years	6.24		
5-6 years	4.86		
7-8 years	4.98		
9-10 years	5.87		

Table 2 presents our multiplicative model estimates of the impacts of sex of the first child, together with control variables on women's second birth intensity. Statistical testing shows that all factors are highly significant.⁶ As is shown in the table, control variables display some common knowledge about their effects on second birth risks, while some interesting trends can also be seen. Second birth risks for woman's age generally presents a declining trend that older women are less likely than younger women to bear a second child. Education expectedly shows a clear negative relationship with second birth risks. Women with higher educational degree are less likely to bear a second child. According to reference category of pre-one-child policy period, second birth risks fluctuated rather than declined, throughout 1980s. Afterwards, second birth risks declined sharply, and leveled off since mid 1990s. As a social and political identity to which one-child policy directly applies, household registration (Hukou) has the largest effect on probability to have a second birth in our model. Women of rural Hukou are nearly 3 times more likely to have second births than those with urban Hukou. Additionally, women living in rural areas are 32% higher than urban resident women to have second births. The standardized gap of second birth risks between urban residents and rural residents is much smaller than the effect of one's Hukou status. This reflects that the greater population control by government for cities than for rural areas is actually based on one's household registration (Hukou) type. As expected, the result shows that waiting for 3-4 years after the first birth has the highest risk to bear the second child. But surprisingly, my study shows that after a little decline during 5-6 year of spacing, second birth risks increase again in longer period after the first birth.

Second birth effect of sex of the first child is of main interest in this paper. It is shown that women whose first child is a girl are 74% more likely to bear the second child than women whose first child is a boy. This strong effect is net of impacts on second birth intensities of whether a woman holds urban Hukou, lives in urban area, her age and educational level, calendar year, and how long is the duration after the first birth. Therefore through higher second birth risks for one daughter mothers, the study suggests that son preference has independent and significant influence on fertility in China. It encourages sonless mothers, hoping to have at least a boy, to go on to make another try. In order to have deeper insight into understanding son preference in Chinese fertility behaviors and to what extent second birth differentials can be attributed to son preference, in the following analysis I move on to explore some specific structures of sex of the first child and second birth progression by means of interaction models.

⁶ P-value less than 0.05 means the factor is statistically significant at the 5% level, otherwise it is not very significant.

Interaction Models Between Sex of the First Child and Other Covariates

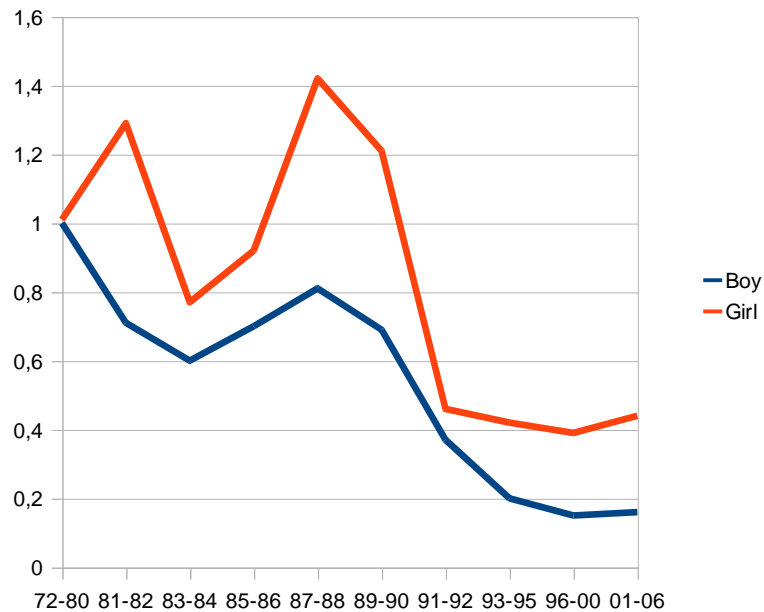


Figure 2. Relative risks of second birth by sex of the 1st child and calendar year, standardized for women's age, educational level, Hukou, place of residence, and duration after the 1st birth (P-value: 0.02)

Interactive effects of calendar year and sex of the first child are presented in Figures 2 and 3. Second birth risks display similar trends regardless of gender of the first child, and sonless mothers are under greater risks than those with a son to have second birth during the whole period under study. Second birth risks for women with a male first-birth was generally declining after one child policy was issued, while risks of second birth for women with female first-birth were somewhat more fluctuating according to the pre-one-child policy level.

For each year group, second birth risks for sonless women relative to those with a son are presented in Figure 3. It allows us to see the varying *relative* gaps between the effects of different gender of the first child on second birth over calendar time. We make male first-birth as the reference level, and relative second birth risks of women with a girl *vs* those with a boy are shown in the graph. For example, a relative risk of 1.81 means that in this year group, women with a girl have a second birth risk which is 81% higher than those with a boy. We can see that relative gaps between second birth risks of sonless women and those with a son didn't vary much during the 1980s but widened in the

1990s. There may be some relation of policy with calendar year on the role of the sex of the first child. As is described in previous section, policy enforcement varied much in 1980s, but after 1990, there was not much policy change. While the data is too thin to analyze the situation in 1980s, the stronger role of female first birth during 1990s in producing another child does not seem to stem from policies but from preference for bearing sons. As total fertility rates declined to and were maintained at below-replacement level from the early 1990s, this finding reveals that with rapid fertility decline in China, the existing son preference value increased its impact on second birth behavior. This motive is shown to become increasingly important in subsequent reproductive decisions, when the first birth in a family is a girl.

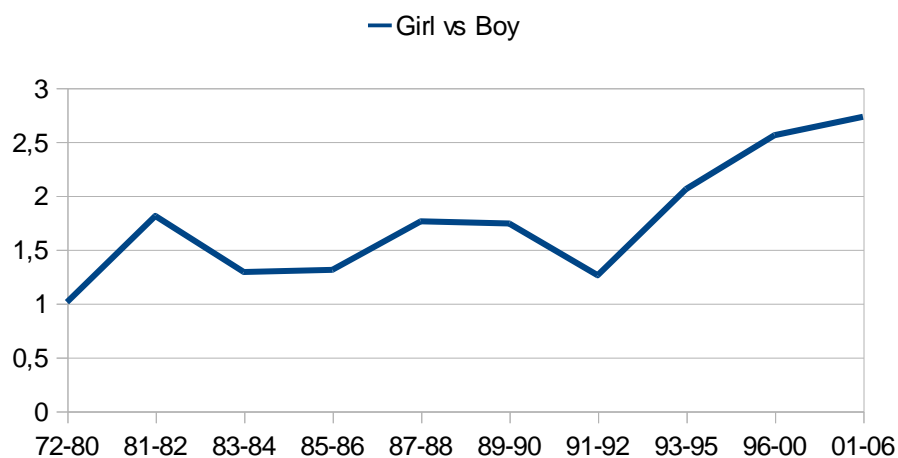


Figure 3. Relative risks of second birth by sex of the 1st child and calendar year, standardized for women's age, education, Hukou, place of residence and duration since the 1st birth (P-value: 0.02). Risks for sonless women relative to those with a son, for each year group.

The study of educational effects on fertility is prevalent in demography. And how son preference value varies with one's educational attainment is worth to discuss in a society where education is highly emphasized while son preference is strong, such as China. The interaction of second birth risks by women's educational level and sex of the first child presents a stable pattern, and statistical testing shows that this interaction is not significant (see Figure 4). Effects of first child's gender and women's education hold a multiplicative relation to each other. The more educated the woman, the less likely she will bear another child, in the meantime, second birth risks are higher for women with female first-births than those with male first-births. Thus our result suggests that son preference in China is not much influenced by women's educational level.

In order to find more information on whether differentials in second birth risks by the sex of the first child can be explained by son preference or policy eligibility, we run interactions between this

gender factor and one's household registration (Hukou) type, and urban/rural residence, respectively. As rural Hukou residents with one daughter are usually entitled to have another child under one child policy, we would expect to find that among rural Hukou residents, women with one daughter would have higher second birth risks relative to those with a son, and this relative gap would be bigger than what we would expect among women of urban Hukou. But we do not find such patterns in any of the interactions and they are not statistically significant either.⁷ Therefore our result implies that general preference for a son seems to matter more in second birth behaviors than policy eligibility for rural sonless mothers.

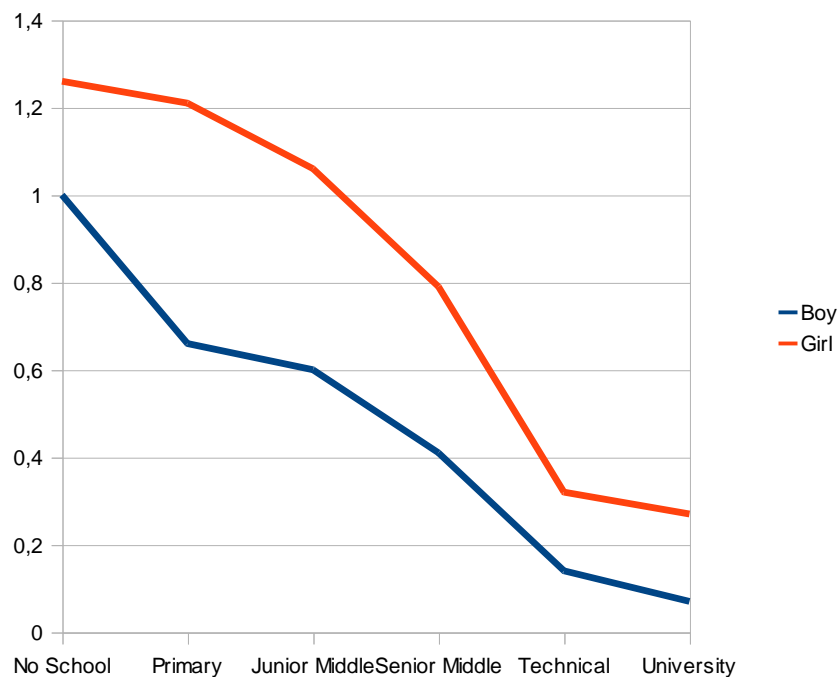


Figure 4. Relative risks of second birth by sex of the 1st child and women's educational level, standardized for women's age, calendar year, Hukou, place of residence and duration after the 1st birth (P-value: 0.46)

Effects of son preference on second birth are then interacted with two entirely demographic variables: woman's age and time since first birth. Figure 5 presents the interaction between sex of the first child and woman's age. In Figure 5a, two patterns of second birth risks for mothers with different sex of the first child can be seen. Second birth risks for women with a boy decrease when women become older, which corresponds to the expected negative effects of age on fertility. But if the first child is a girl, relative risks of progression to second birth increase during age 14 to 30, before declining afterwards. An interesting finding of this interaction is the increasing effects of son

⁷ P-value for the intensity regression model with interaction between sex of the first birth and women's Hukou is 0.47. And P-value for the model with interaction between sex of the first birth and place of residence is 0.80.

preference on second birth fertility over women's age groups. Again risks of having a second child after the birth of a boy are treated as reference category. For each age group, the higher sonless women's second birth risk is relative to that for women with a son, the stronger the effect of son preference is on second birth progression. As is displayed in Figure 5b, we can see that the older the women, the stronger the effects of son preference are in determining progress to second birth. Because age is negatively associated with childbearing, we suggest that when women's age advances, strong hope for having a son plays more and more important role in encouraging women with a girl to bear a second birth.

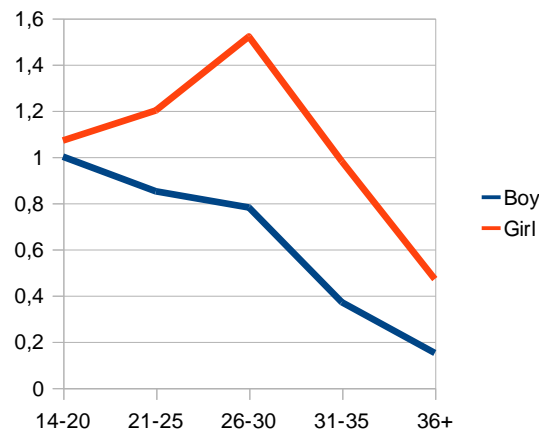


Figure 5a. Relative risks of second birth by sex of the 1st child and women's age, standardized for calendar year, women's educational level, Hukou, place of residence and duration since the 1st birth (P-value: 0.015)

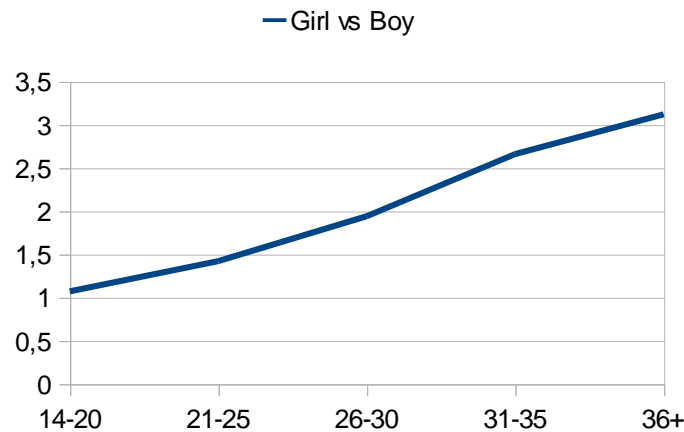


Figure 5b. Relative risks of second birth by sex of the 1st child and women's age, standardized for calendar year, women's educational level, Hukou, place of residence and duration since the 1st birth (P-value: 0.015).
Risks for sonless women relative to those with a son, for each age group.

The combined effects of sex of the first child and duration after the first birth are shown in Figure 6. Women with different gender of the first child have clear differences in second birth risks over the

10 year period after the first birth. For women with a boy, second parity risks increase to the peak of 3-4 years after the first birth and decrease thereafter, which is the natural demographic pattern we would expect. For women with a girl, second birth propensities also increase from the time when the first child was born to 3-4 years afterwards, and decrease slightly in 5-6 years after the first birth. But second birth risks for sonless women increase sharply in the last few years of the second birth interval, reaching to the highest point in 9-10 years after the first birth. The result shows that different from common pattern, women with a girl in China reawake to have another child during the last years of the normal birth spacing, possibly in order to have a son.

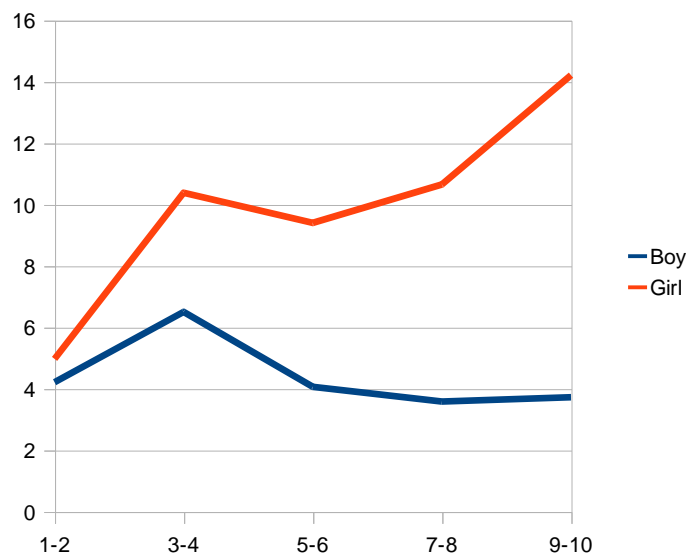


Figure 6. Absolute risks of second birth by sex of the 1st child and duration after the 1st birth, standardized for women's age, calendar year, women's educational level, Hukou and place of residence (P-value: 0.00)

Extended Model with Women's Siblings

Intergenerational transmission of second birth fertility is investigated in this section when we add two more covariates, namely the number of women's brothers and sisters to our multivariate analysis. Main results of the extended model are presented in Table 3. Compared to Table 2, adding of these two factors doesn't appear to change the main results for any other variables much. But effects of women's siblings themselves on second birth risks bring some very striking results. If a woman has more brothers, she is more likely to bear a second child. But how many sisters a woman has appears to have little and insignificant effect on second birth risks from the model output. Positive association of second birth risks with number of women's brothers suggests that in China, intergenerational transmission of fertility seems to carry out only through one's male line in family.

The uniquely strong intergenerational effect by women's number of male siblings is found when women's other socio-demographic, policy, and calendar factors are controlled for. To my knowledge, this is an interesting result concerning intergenerational transmission of fertility which we have not found in other studies. It is worth noting that women with no siblings are themselves eligible to bear a second child under policy exceptions. But low birth rate for this group in our model points to a weak role of the effects of policy eligibility on the propensity to have another child.

Table 3: Relative Risks of Second Birth for Chinese Women, with absolute risks (per 1000 months) by duration since first birth. (N=2412)

<i>Woman's Age</i>	<i>P-value</i> 0.00	<i>Education Level</i>	<i>P-value</i> 0.00
14-20	1	No school	1
21-25	0.93	Primary	0.81
26-30	1.02	Junior Middle	0.74
31-35	0.58	Senior Middle	0.53
36+	0.27	Technical	0.21
		University	0.15
<i>Calendar Year</i>	0.00	<i>Household Registration Type</i>	0.00
1972-1980	1	Urban	1
1981-1982	1.01	Rural	2.97
1983-1984	0.68		
1985-1986	0.81		
1987-1988	1.12		
1989-1990	0.97		
1991-1992	0.44		
1993-1995	0.32		
1996-2000	0.28		
2001-2006	0.32		
<i>Place of Residence</i>	0.00	<i>Sex of the 1st Child</i>	0.00
Urban	1	Boy	1
Rural	1.29	Girl	1.73
<i>Number of Brothers</i>	0.00	<i>Number of Sisters</i>	0.41
0	1	0	1
1	1.22	1	1.13
2	1.27	2	1.22
3	1.64	3	1.10
4	1.51	4	1.04
5+	2.25	5+	1.16
<i>Years after the 1st Birth</i>	0.00		
<i>(Absolute risks per 1000 months)</i>			
1-2 years	2.39		
3-4 years	4.46		
5-6 years	3.51		
7-8 years	3.59		
9-10 years	4.21		

We suppose that the more males a family has, the more the family will value extending the lineage. Further, women from such families might be internalized into this strong Confucian notion and prefer to bear sons. But no significant results are found through the interaction between sex of the first child and women's number of brothers.⁸ This suggests that gender preference in fertility behaviors cannot be inferred from the higher second birth risks for women with more brothers. Thus this extraordinary result definitely needs more exploration.

Summary and Conclusion

Inferring from the effects of sex of the first child on second birth propensities, this paper finds strong association between son preference and second birth fertility in China. With 2006 China Health and Nutrition Survey (CHNS) covering 9 provinces across the country, the study uses multivariate event-history analysis and demonstrates that among women already with one child, those with a daughter have much higher second birth risks than those with a son. The existence of this effect is independent of women's socio-demographic backgrounds, one child policy enforcement and socio-economic development. Although policy eligibilities may help to contribute to increase second birth risks for those women with a girl, given the various tests carried out in the paper, we conclude that to interpret sex specific parity progressions in terms of preference rather than eligibility seems to be correct. We do not find that rural sonless women and those with a son have wider relative gaps in second birth risks than urban women. Further, from the 1990s when there was not much policy change, the stronger role of first-born daughter in second birth progression is very clear. And for women with no siblings, i.e. those who are entitled to bear a second child, result shows that their second birth risks are rather lower than for those with siblings. Moreover, the rather skewed sex ratio of second birth (see Table 1) implies that son preference accounts very much for the motive to progress to second birth for Chinese women.

Interactions between sex of the first child and other variables in this paper show that size of effect of son preference varies. Second birth risks for women with a boy increase from the birth of the first child to 3-4 years afterwards, and then decrease. But if first child is a girl, evidence shows that after the 3-4 year peak, second birth risks increase again to the highest level during the longest period after the first birth. This reveals a very clear motive that lacking a son triggers women in China to renew their child-bearing. When Chinese fertility declined sharply from 1980s to below-replacement level, we find relative gaps between second birth risks for women with different gender

⁸ P-value for this interaction is 0.81.

of the first child actually enlarged, with sonless women having higher second birth risks relative to those of women with a boy. When women are becoming older, difference of risks of having another child for women with girl vs those with boy is also increasing in our data. How much education the woman has appears to not influence the effects of son preference in women's fertility behaviors.

The study also reveals a spectacular result concerning intergenerational transmission of fertility by women's siblings, which we believe have not been addressed before. Finding shows that women's number of brothers, rather than sisters, has strong and independent impact on second birth progression. The more brothers a woman has, the more risks she has to have second child, no matter the gender of the first birth.

Our results reveal that in the situation of strong son preference, this cultural and traditional value is an increasingly important motive for having another child in low fertility groups. As is shown in the paper, during rapid decline and below-replacement level of fertility in 1990s, at advanced ages, and at longer duration after the first birth, which is normally related to low risks of subsequent birth, son preference displays more important effects in affecting women to make reproductive decisions in China. Different from previous research which suggests the effects of factors such as more education and urbanization to reduce son preferences (Arnold and Liu 1986; Larsen 1990), this paper finds that social and economic development seems not to have weakened the effect on son preference in China. We originally expected that with rapid socio-economic developments in China, changes such as prolonged education, more economic independence, more urban life and more contact with western values, would all contribute to declining son preferences. But our findings discover that sex preference is still persistent in Chinese fertility behaviors, and the patterns seem to be stronger, not weaker with lower fertility levels. Whether fertility decline in China is due to the strict one-child policy or the country's rapid economic developments is under heated debate. But we suggest that preferences for fewer children in Chinese family are by no means related with preferences to not have a boy.

Son preference is a complex social factor which relates to culture, tradition, and social customs. It influences not only demographic behaviors, but also other life areas of people in a society where this value is prevalent. In order to gain more understanding of sex preference on fertility, straightforward statistical analyses of the effects of education, urbanization, etc., is far from sufficient. More inceptions into notions, tradition, social norms, and other more cultural exploration would be of great importance. Therefore the integration of quantitative and qualitative measures is highly recommended in future research.

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