Estimate of China's Sex-Selective Abortions

Quanbao Jiang, PhD
Institute for Population and Development Studies, Xi'an Jiaotong University
recluse_jqb@126.com

Li Mei, PhD candidate
Institute for Population and Development Studies, Xi'an Jiaotong University

Abstract

Sex-selective abortion has been under-examined in comparison with the implications of China's high sex ratio at birth, which has aroused hot debate. In this paper, using official data and several indicators, we examine the sex-selective abortions of female fetuses in past decades in China. We find that the annual number of selective abortions rose from 1980 onwards and stayed at around 1 million per year in the 1990s and 2000s. The number of selective abortions between 1980 and 2017 totals 28.66 million. The abortion of second-order female fetuses makes up the largest proportion of the total sex-selective abortions. While selective abortions among village populations made up the majority of all selective abortions, the proportion of urban selective abortion has risen markedly with rapid urbanization and convergence of sex ratio at birth. Different provinces have a different number and proportion of selective abortions.

Keywords: Sex-selective abortion; sex ratio at birth; birth order; China

Introduction

Induced abortion has been a great concern nationwide in China. According to the official statistics, the annual number of registered induced abortions increased from 5 million in the early 1970s to a peak of 14.37 million in 1983, then fluctuated between 10 and 14 million for a decade. Since 1993, the annual number has fallen below 10 million (National Health and Family Planning Commission (NHFPC), 2017). The phenomenon of this astonishingly large number of induced abortions has been complicated by China's birth control policy over the past decades (Nie, 2005). On the one hand, induced abortion was adopted as a remedial measure for out-of-quota pregnancies, as indicated in many official provincial family planning regulations under the guidelines of the national decree (Basten and Jiang, 2014); forced abortions were also prevalent in the implementation of the birth control policy to help family planning cadres to achieve their quotas and rank well in their performance evaluation (Ridgon, 1996; White, 2006; Li, 2012). On the other hand, due to the fertility squeeze (Guilmoto, 2009), people with a strong son preference switched from extra births to prenatal sex identification technology and subsequent sex-selective abortion of female fetuses to ensure a son. The issues of sex-selective abortion, sex ratio at birth (SRB), and subsequent social implications have attracted widespread attention (Zeng et al., 1993; Hesketh et al., 2005; Hesketh and Zhu, 2006; Zhu et al., 2009; Bongaarts and Guilmoto, 2015).

Sex-selective abortion has been reported since the early 1980s as a result of with the stringent implementation of the one-child-per-couple policy and the availability of sex identification technology (Hull, 1990; Zeng et al., 1993; Rigdon, 1996). In China, the entrenched tradition of son preference has prevailed throughout the country's history, as sons can provide old-age security support, carry on the family lineage, and fulfill cultural and religious functions (Jiang et al., 2011). Because of the persistence of this son preference, the obvious decline in fertility increased the pressure for sex selection (Li et al., 2000). With the availability of ultrasound technology and sex

identification, the subsequent abortion of female fetuses became widespread in China (Zeng et al., 1993; Ridgon, 1996).

Though the cause, bias extent, and implications of the high SRB has been well documented (Hull, 1990; Zeng et al., 1993; Hesketh et al., 2005; Zhu et al., 2009; Goodkind, 2011; Bongaarts and Guilmoto, 2015; Chao et al., 2019), sex-selective abortion itself has been under-examined, despite being widely carried out throughout the past decades. The SRB bias is generally used as an indicator for the extent and trends of prenatal sex selection against females, but whether the SRB is an appropriate measure of prenatal sex selection is being challenged (Dubuc and Sivia, 2018). Because sex-selective abortion is illegal, the degree to which sex-selective abortions are practiced is debated (Chu, 2001; Banister, 2002), and the actual figure for selective abortions is impossible to obtain and has to be estimated (Hesketh et al., 2005; Chen and Zhang, 2019). An estimate made three decades ago claims that, even if the abortion of girl fetuses could explain the entire increase in the SRB, they would account for less than 5 percent of all abortions reported for 1986 (Hull, 1990). Another survey of 820 women conducted in 2000 in villages in central China found that 36 percent were female sex-selective abortion (Chu, 2001). Figures for selective abortion could change with the introduction of prenatal care technology that can predict fetal sex with far greater certainty (Rigdon, 1996).

The need for an assessment of SRB inflation due to sex-selective abortion is generally acknowledged (Chao et al., 2019). However, sex-selective abortion itself deserves more quantitative examination. In this paper, we use several indicators to elucidate China's sex-selective abortions over the past decades quantitatively. We hope this will supplement the research on China's SRB gender imbalance and related studies. Below we first introduce the method (indicators), and then we introduce the data. After this we present the results, and then we conclude.

Method

Previous research focuses on the measures of SRB or missing women (Hull, 1990; Chao et al., 2019), and uses SRB or missing women to reflect the trend of

sex-selective abortion, but the practice of measuring prenatal sex selection with SRB is being challenged (Dubuc and Sivia, 2018). In this paper, we have used the following indicators related directly to abortions to elucidate China's sex-selective abortions over the past decades.

Let N_a represent the annual number of induced abortions, N_{ssa} denote the annual number of sex-selective abortions, B stand for the number of annul births, and B_m and B_f the number of male and female births. SRB_o denotes the observed SRB, and SRB_n the normal SRB without selective abortion. The reference level of SRB is generally unknown and can be obtained with past data and Bayesian models (Chen et al., 2019). A study of births covering 24 European countries with less or no discrimination against women for the period 1962 to 1980 showed a median value for sex ratio of 105.9 (Coale, 1991). China's normal SRB is generally assumed to be at the level of 106 male births for every 100 female births, so we accept SRB_n as 106.

The first indicator we use is the absolute number of sex-selective abortions for one year. We compare the observed number with reference or expected values for the calculation of sex-selective abortion numbers. It is generally assumed that male fetuses are not selectively aborted and that male births can be taken as a benchmark (Coale and Banister, 1994; Bongaarts and Guilmoto, 2015; Chao et al., 2019). We calculate the number of sex-selective abortion of female fetuses as:

$$N_{ssa} = \frac{B_m}{SRB_n} \times 100 - B_f \quad (1)$$

The second indicator is the annual proportion of sex-selective abortions to the total abortions. China-registered abortions and other family planning surgical operations annually (NHFPC, 2017), but non-medical sex-selective abortion of female fetuses is illegal and prohibited, and often takes place without registration (Chen and Zhang, 2019). If we assume that sex-selective abortions N_{ssa} is included in the total number of abortions N_a, then the proportion is

$$P_{ssa/a} = \frac{N_{ssa}}{N_a} \times 100\%, \quad (2\text{-}1)$$

or we can use Formula (2-2) if N_{ssa} is not included in the total number of abortions N_a,

$$P_{ssa/a} = \frac{N_{ssa}}{\left(N_a + N_{ssa}\right)} \times 100\%, \quad (2\text{-}2)$$

In the results section we present the results obtained with Formula (2-1).

The third indicator is the ratio of sex-selective abortions to female births, which is expressed as

$$R_{ssa/B_f} = \frac{N_{ssa}}{B_f} \times 100\% \quad (3)$$

The fourth indicator is the proportion of sex-selective abortion to the sum of female births and sex-selective abortions expressed in Formula (4), which is interdependent with Formula (3).

$$P_{ssa/\left(ssa+B_f\right)} = \frac{N_{ssa}}{\left(N_{ssa} + B_f\right)} \times 100\% \quad (4)$$

The above expressions can still be computed by birth order and by residence. In the results section we present results by birth order and by residence obtained with Formula (4).

Data

The data used include annual birth numbers, abortion numbers, and SRB. The annual birth numbers and SRB can be obtained from several government departments such as the Ministry of Public Security, the NHFPC, the National Bureau of Statistics (NBS), and the Ministry of Education. However, due to the need to pay social maintenance fees for out-of-quota births (Basten and Jiang, 2014), the delayed or

non-registration of births in the household registration system (Shi and Kennedy, 2016; Silva and Snow, 2019), and the manipulation and distortion of school enrollment (Cai, 2017), the data from the above sources are all questionable.

Large-scale under-reporting has been a concern in China's birth data quality (Merli and Raftery, 2000; Goodkind, 2011). Reports show that 19 percent of the population aged 0 to 4 were not reported in the 2000 census (Goodkind, 2011). China's statistical authorities are well aware of the issue of under-reporting. Since 1990, the NBS has adjusted upward the fertility levels reported in its censuses, sample censuses, and annual population surveys due to presumed under-reporting (Zhang and Zhao, 2006). The registered total fertility rate in the 2000 census is 1.22, but the fertility rate used for internal purposes is 1.40 (Morgan et al., 2009), which indicates a severe under-enumeration of births. About two decades ago, a dominant concern was that NBS adjustments to fertility might not be sufficient (Merli and Raftery, 2000; Attané, 2001). More recently, a new study consensus has argued instead, either explicitly or implicitly, that the NBS over-adjusts fertility (Zhang and Zhao, 2006; Gu et al., 2007; Cai, 2008; Morgan et al., 2009; Guo, 2011). The upward adjustments by the NBS themselves constitute a cause of uncertainty (Zhao and Zhang, 2006). One analysis also suggests that China's fertility in the late 1990s (and perhaps beyond) was below officially adjusted levels (Goodkind, 2011).

The collection of accurate SRB data is of top priority on this issue. Sex-selective under-reporting of female births in the form of concealment or unregistered adoption, excess female child mortality, sex-selective abortion of female fetuses, and selective

infanticide of female babies have all been discerned as factors behind China's high SRB (Hull, 1990; Zeng et al., 1993; Chu, 2001; Goodkind, 2011; Chen et al., 2015). Most studies think female births have been under-enumerated and that actual SRB should be lower than observed. Adoption of girls without registration accounted for 4 percent of all girls in 1987 (Johansson and Nygren, 1991) and in the 1990s (Chen et al., 2015). In a survey of 820 women interviewed in villages in central China, 16 girls were adopted, whereas only 6 boys were adopted (Chu, 2001). Comparison of data from the 1990 and 2000 censuses shows that over a quarter of all "missing" girls in the 1990 census were hidden in the population and reappeared in the 2000 census (Cai and Lavely, 2003), and the same sex-selective phenomenon could have been repeated between the 2000 and 2010 censuses (Cai, 2013). However, a nationwide "clean-up" survey of birth under-reporting conducted by the State Birth Planning Commission in 1999 showed that, in most provinces, more male than female births were under-reported between 1990 and 1999 (Chen, 2005). Several studies also found more male births being under-reported than female births, so the actual SRB should be even higher (Zhai and Yang, 2009; Shi, 2013). It is claimed that under-reporting accounts for a very small portion of China's higher SRB, and that the majority of SRB distortion is attributed to sex-selective abortion of female fetuses (Coale and Banister, 1994; Zhu and Hesketh, 2009). Some attempts have been made to assess the contribution of under-reporting to elevated SRB, but there is no consensus (Zeng et al., 1993; Goodkind, 2011).

The accuracy of abortion numbers is another problem faced by researchers. In the 1997 Demographic and Reproductive Health Survey of China, 27 percent of rural women reported having one or more abortions (Chu, 2001). Given China's large birth cohort, the actual number of abortions performed each year is very high (Banister, 1987). China registers abortions annually (NHFPC, 2017), and some demographers argue that the official figures are a reasonably accurate representation of total abortions (Rigdon, 1996). However, China's 1988 National Survey on Fertility and Contraception recorded only 67 percent of the 10.5 million abortions reported by the registration system for the preceding year (Tu and Smith, 1995). The social unacceptability of premarital sex and extramarital pregnancies in China (at least before 2000) (Banister, 1987; Zhou, 1989), and the illegalization and prohibition of non-medical sex-selective abortion (Chen and Zhang, 2019), all affect the accuracy of the abortion data. Ultrasound B-scans of fetus gender were in great demand (Chu, 2001) and hospitals and individually run clinics had the incentive to make money (Rigdon, 1996). Given the fact of 200 million out-of-quota births (Chen, 2015) and an averting of 400 million births due to the family planning policy claimed by Chinese government (Cai, 2010), it is not difficult to conjecture the inaccuracy of abortion statistics.

These data are flawed and have been criticized as possibly subject to under-reporting, and the data of population censuses and surveys from China's NBS still represent the most systematic and reliable data. Despite this, there are no other reliable and generally accepted sources for this estimate. In this paper we adopt the

annual number of officially registered abortion, and the SRBs by year from annual sample survey or census conducted by the authoritative NBS. We admit that the direct adoption of the census and survey data affects the results and conclusions, but these are the most reliable and available data for the present.

Results

SRB

Figure 1 depicts China's SRB over time. In the 1980s, the SRB began to rise and remained below 110 for most of the decade. In the 1990s the SRB remained within the range of 115 to 120. For the first decade of the 21st century, it fluctuated around 120, and declined after 2010. It is optimistically predicted to return to normal, as it did in South Korea (Guilmoto, 2009; Das Gupta et al., 2009).

The SRB displays marked difference by birth order and residence. Before 2010, the SRB for first births was relatively normal, but it rose to 113.73 in the 2010 census. The SRB for second, third, and fourth and above births deviated from the norm in the 1980s and rose to around 160 for third births in the 2000 and 2010 censuses, indicating a prevalence in the adoption of sex-selective abortions. Regarding residence, the village SRB is the highest, followed by township and city populations, all of which are well above the normal range. As without a social security system rural people need sons for old-age security, fertility squeeze and son preference encourages urban people to turn to prenatal diagnosis for a son.

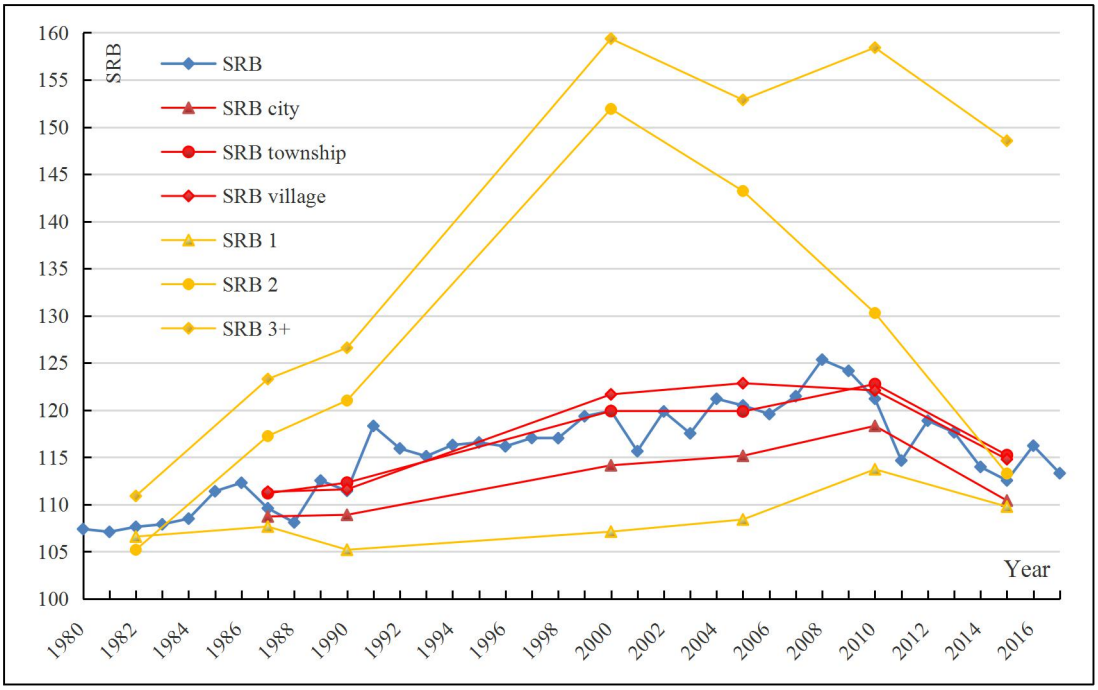

Figure 1 SRB over time by birth order and residence

Number and proportion of sex-selective abortions

Table 1 and Figure 2 present the number, proportions and ratio of sex-selective abortions, as well as the trend of abortions. Abortion has played a significant role in China's attempt to control its population growth, regarded as a "remedial" measurement and the most effect way to achieve the family planning goals set by the governments. The rise in the incidence of abortions was particularly notable in 1979–1980 with the start of the one-child-per-couple policy (Tien, 1987); it reached a peak of more than 14 million in 1983 when the government launched a drive to promote its one-child policy, and a trough of 9 million in 1984 when the one-child policy was partially relaxed in rural areas (Hardee-Cleveland and Banister, 1988). The number rebounded in the late 1980s when the government imposed measures to minimize the unfavorable demographic impact of the policy introduced in 1984 (Hardee-Cleveland and Banister, 1988) and declined in the 1990s as the Chinese

government promoted reproductive health and informed choice in family planning (Qiao, 2002). In recent years, increased contraceptive prevalence and effectiveness has reduced the significance of abortion.

The annual number of sex-selective abortions rose from 1980 onward: it was around 0.9 to 1 million in the 1990s and over 1 million in the 2000s, before declining in the 2010s. There has been a total of up to 28.66 million sex-selective aborted female fetuses. The experience in South Korea in the 1980s and early 1990s indicates that the swift diffusion of ultrasound, alongside the normalization of the "small family", is likely to result in more prenatal sex selection (Kashyap and Villavicencio, 2016). In China, as fertility declined, it became more difficult for parents to attain both their desired low family size and their desired sex composition. Couples who wanted to have at least one son increasingly had to rely on sex selection (Bongaarts, 2013). Diagnostic ultrasound, available from the 1980s, was quickly exploited as a means to determine gender (Goodkind, 1996). Around 1990, the sex ratio of 500 rural abortions and 1,226 urban abortions was 94.6 and 96.8 males for 100 females (Zeng et al., 1993). An official survey on aborted fetuses conducted in some provinces by the NHFPC shows that, among the aborted fetuses identifiable with gender, the average sex ratio was 72.25 in all surveyed provinces for the seven-year period from 2000 to 2006. About a third of the female fetuses were aborted selectively (Cai, 2009). From 1981 to 2000, the one-child policy resulted in about a 38 percent to 48 percent deficiency in females (15–20 million) (Bulte et al., 2011).

The proportion of selective abortions to total abortions and to expected female births began to rise in the 1980s, peaked in the 2000s, and then declined. The sex-selective abortion of female fetuses accounted astonishingly for 15.88 percent and 16.23 percent of all abortions indicated by $P_{ssa/a}$ in 2000 and 2010 respectively, and accounted surprisingly for 11.61 percent and 12.55 percent of expected female births indicated by $P_{ssa/(bf+ssa)}$ in 2000 and 2010 respectively.

Table 1 Number, proportion, and ratio of sex-selective abortions

Year	SRB	No. of Birth (million)	N_a (million)	N_{ssa} (thousand)	$P_{ssa/a}$ (%)	$R_{ssa/bf}$ (%)	$P_{ssa/(bf+ssa)}$ (%)
1980	107.40	17.87	9.53	113.80	1.19	1.32	1.30
1981	107.10	20.78	8.70	104.12	1.20	1.04	1.03
1982	107.63	22.47	12.42	166.42	1.34	1.54	1.51
1983	107.90	20.66	14.37	178.12	1.24	1.79	1.76
1984	108.50	20.63	8.89	233.36	2.62	2.36	2.30
1985	111.40	22.11	10.93	532.81	4.87	5.09	4.85
1986	112.30	23.96	11.58	670.77	5.79	5.94	5.61
1987	109.60	25.29	10.49	409.78	3.91	3.40	3.28
1988	108.10	24.64	12.68	234.58	1.85	1.98	1.94
1989	112.54	24.14	10.38	700.76	6.75	6.17	5.81
1990	111.45	23.91	13.49	581.16	4.31	5.14	4.89
1991	118.33	22.65	14.09	1206.36	8.56	11.63	10.42
1992	115.94	21.25	10.42	922.65	8.86	9.38	8.57
1993	115.11	21.32	9.50	851.98	8.97	8.60	7.92
1994	116.30	21.1	9.47	948.21	10.02	9.72	8.86
1995	116.57	20.63	7.48	949.94	12.71	9.97	9.07
1996	116.16	20.67	8.83	916.69	10.38	9.59	8.75
1997	117.04	20.38	6.59	978.36	14.85	10.42	9.44
1998	117.03	19.91	7.38	954.45	12.93	10.40	9.42
1999	119.35	19.09	6.76	1096.09	16.20	12.59	11.19
2000	119.92	17.71	6.66	1057.57	15.88	13.13	11.61
2001	115.65	17.02	6.28	718.28	11.43	9.10	8.34
2002	119.86	16.47	6.81	979.24	14.37	13.07	11.56
2003	117.54	15.99	7.22	799.90	11.09	10.88	9.81
2004	121.20	15.93	7.14	1032.72	14.46	14.34	12.54
2005	120.49	16.17	7.11	1002.81	14.11	13.67	12.03
2006	119.58	15.84	7.31	924.20	12.65	12.81	11.36
2007	121.48	15.94	7.63	1050.74	13.77	14.60	12.74

2008	125.35	16.08	9.17	1302.58	14.20	18.25	15.44
2009	124.16	16.15	6.11	1234.33	20.20	17.13	14.63
2010	121.21	15.92	6.36	1032.42	16.23	14.35	12.55
2011	114.66	16.04	6.63	610.26	9.20	8.17	7.55
2012	118.88	16.35	6.69	907.66	13.57	12.15	10.83
2013	117.64	16.4	6.24	827.72	13.27	10.98	9.90
2014	113.98	16.87	9.62	593.73	6.17	7.53	7.00
2015	112.55	16.55	9.85	480.96	4.88	6.18	5.82
2016	116.23	17.86	9.64	797.26	8.27	9.65	8.80
2017	113.31	17.23	9.63	557.34	5.79	6.90	6.45

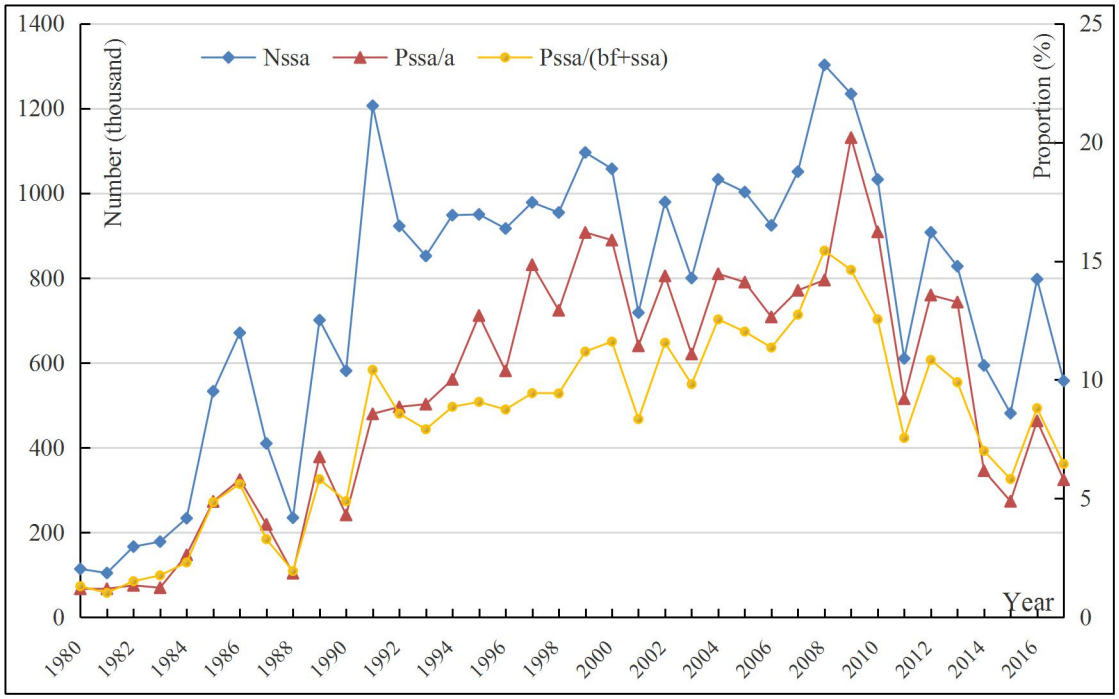

Figure 2 Number and proportion of sex-selective abortions

Number and proportion by birth order

As pointed out in the research on the subject, overall SRB is less reliable for estimating selective abortions as they might mask sex ratios at higher-order births (Jha et al., 2011). The slight increase in the reported SRB for China between 2000 and 2005 actually fell when standardized for the distribution of birth orders (Goodkind, 2011). We have examined the number and proportion of sex-selective aborted female fetuses by birth order, as presented in Figure 3.

The abortion of second-order female fetuses contributes most to the total of sex-selective abortions, followed by third-order abortions. In 2000, second-order selective abortion of female fetuses accounted for 75.08 percent of all selective abortions of female fetuses, whereas selective abortion of first-order births accounted for about 5.8 percent that year. However, in 2010, the percentage of first-order abortions rose to 32.70 percent due to selective abortion at first birth as a result of the fertility decline (Jiang et al., 2016) and the change in birth order composition (Jiang et al., 2017).

For the proportion of sex-selective aborted female fetuses to expected female births by birth order, the proportion of first-order births is relatively low, and the proportion for second- and third-order births is much higher, indicating the prevalence of selective abortion for higher birth orders. Whether the fetus will be born or aborted after an ultrasound B-scan is related to the order of the pregnancy and the sex of previous children. The higher the pregnancy order, the more likely the fetus is to be aborted (Chu, 2001). With the introduction of ultrasound technology, a county could increase the probability of a male birth by 1.3 and 2.4 percentage points for second-order and third- or higher- order births, or even by 4.8 percentage points for second-order births and 6.8 percentage points for third-order births if no sons had previously been born (Chen et al., 2013). The official survey of aborted fetuses conducted in some provinces by the NHFPC shows that the among the aborted fetuses identifiable with gender, families with only one daughter recorded the lowest sex ratio

of 50.18 for aborted fetuses, and a sex ratio of 70.06 for families with only two daughters (Cai, 2009).

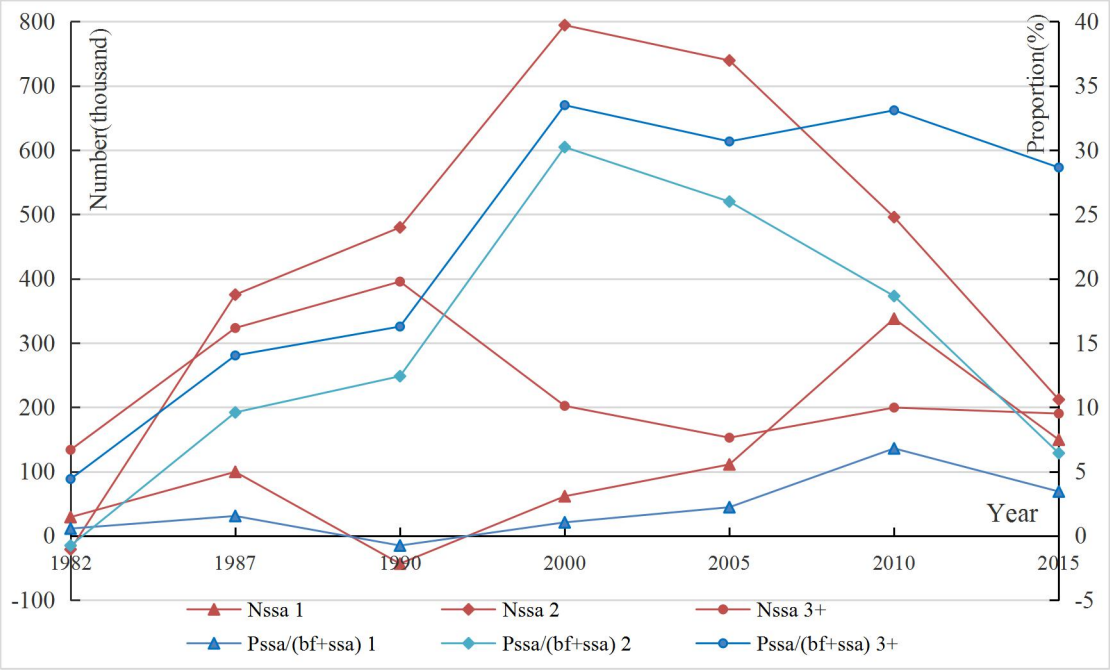

Figure 3 Number and proportion of sex-selective abortions by birth order

Number and proportion by residence

The population of China is divided into the urban population (including cities and townships) and the rural or village population. The urban and rural populations exhibit differences in fertility behavior and SRB due to their different socioeconomic levels and the different family planning policy imposed on them.

Figure 4 indicates that the majority of sex-selective abortion of female fetuses takes place among rural couples. In the 2000s, sex-selective abortions for the city, township, and village populations accounted for 11.79 percent, 13.08 percent, and 75.14 percent respectively of all sex-selective abortions. The absolute number of village selective abortions declined: the proportion of selective abortions in villages to the abortion total declined from 75.14 percent to 57.57 percent in 2010. In contrast,

city and township abortions increased rapidly to 21.75 percent and 20.68 percent respectively due to the rapid urbanization process from 36.92 percent in 2000 to 50.27 in 2010, and also to the convergence of village, township and city SRB.

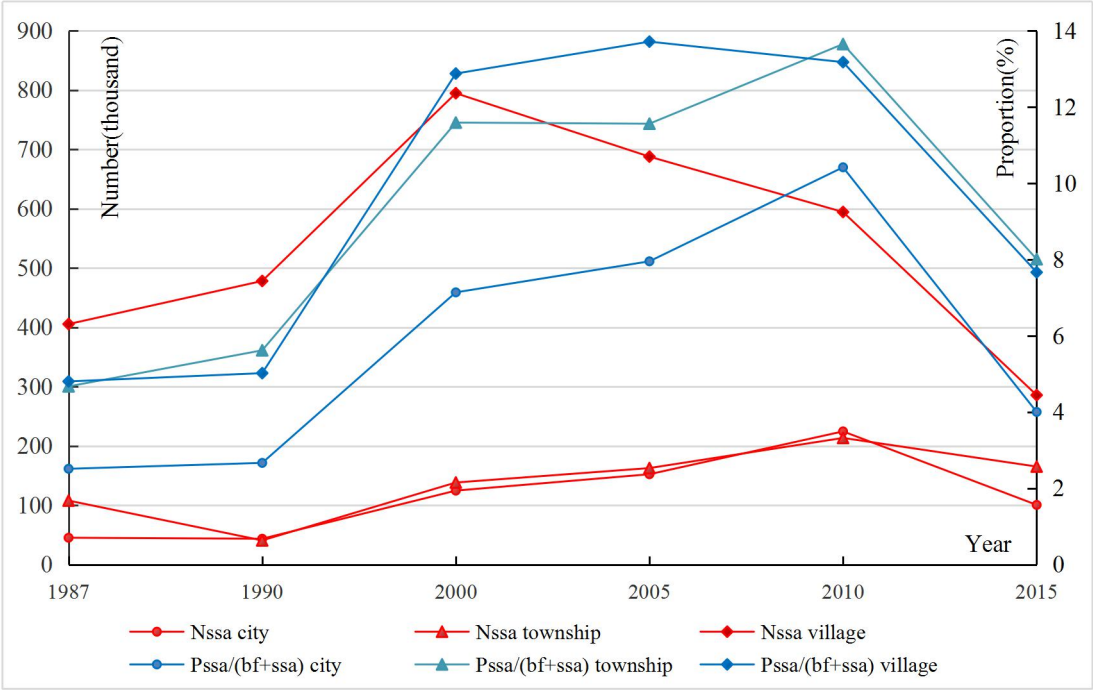

Figure 4 Number and proportion of sex-selective abortions by residence

Number and proportion by province

China's family planning policy has been localized by province. Around 2000, six provinces implemented a one-child policy for both urban and rural couples; five provinces implemented a two-child policy; and the other 19 provinces implemented a 1.5-child policy, meaning that rural couples whose first child was a daughter were permitted a second birth, while urban couples were subject to the one-child policy (Gu et al., 2007). According to China's 2000 census, the SRB in one-child policy areas was 111.6, lower than the SRB of 124.7 in 1.5-child areas but higher than that in two-child areas (Zeng, 2007). In provinces granting a quota of 1.5 or two births per couple, sex-selective abortions were seldom used for the first birth, but couples relied

heavily on sex-selective abortion for the second pregnancy if their first-born was a daughter (Li, 2007; Ebenstein, 2010).

Figures 5-7 present the number and proportion of sex-selective abortions of female fetuses by province. Figure 5 presents the temporal trend of each province and the comparison among provinces in terms of the proportion of sex-selective abortions to expected births. Generally, the proportion rose from 1990 to 2000 and 2010 and then declined in 2015, with marked provincial difference. Figures 6 and 7 illustrate the spatial discrepancies with maps. The central and eastern provinces have a higher proportion and larger numbers due to the fertility squeeze and their larger population.

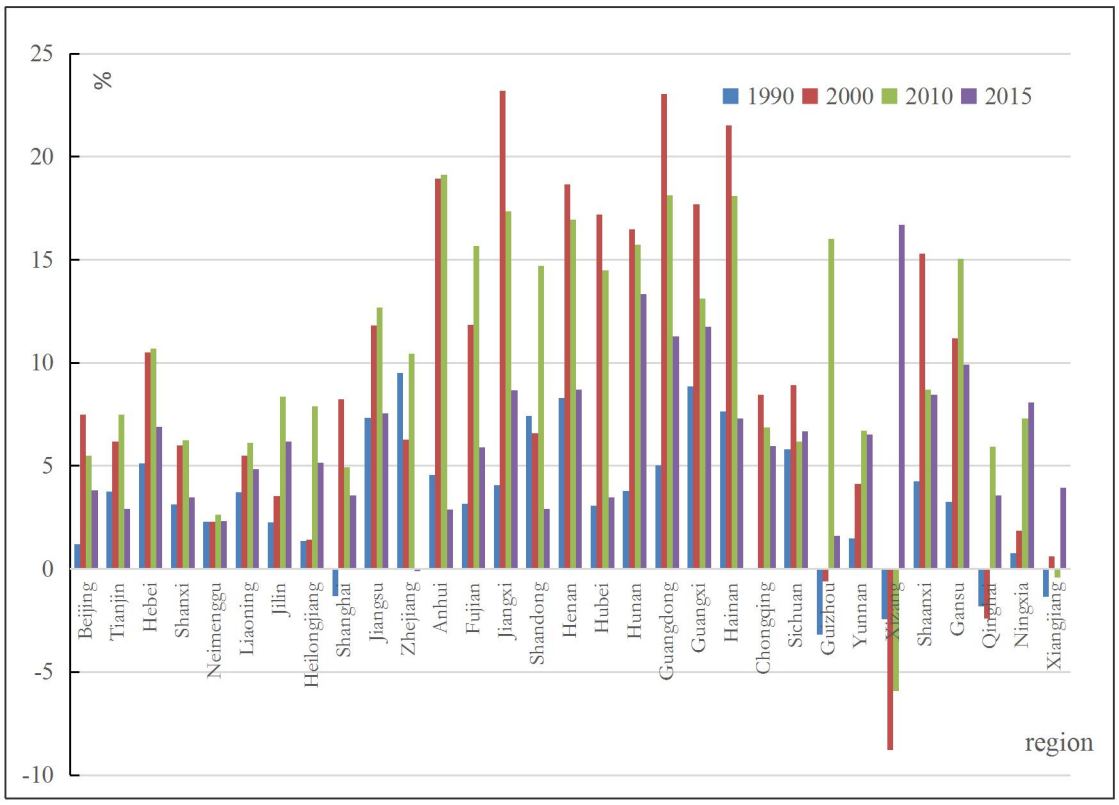

Figure 5 Proportion of selective abortions ($P_{ssa/(bf+ssa)}$) over time by province

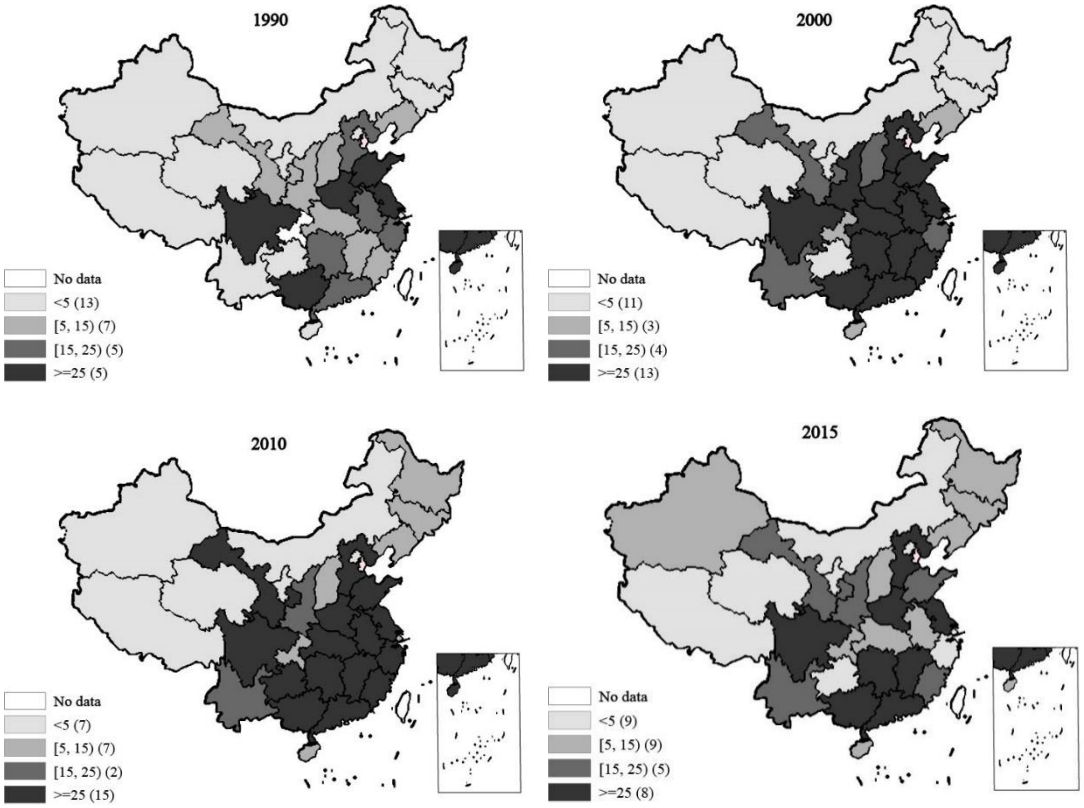

Figure 6 Number of sex-selective abortions over time by province (thousands)

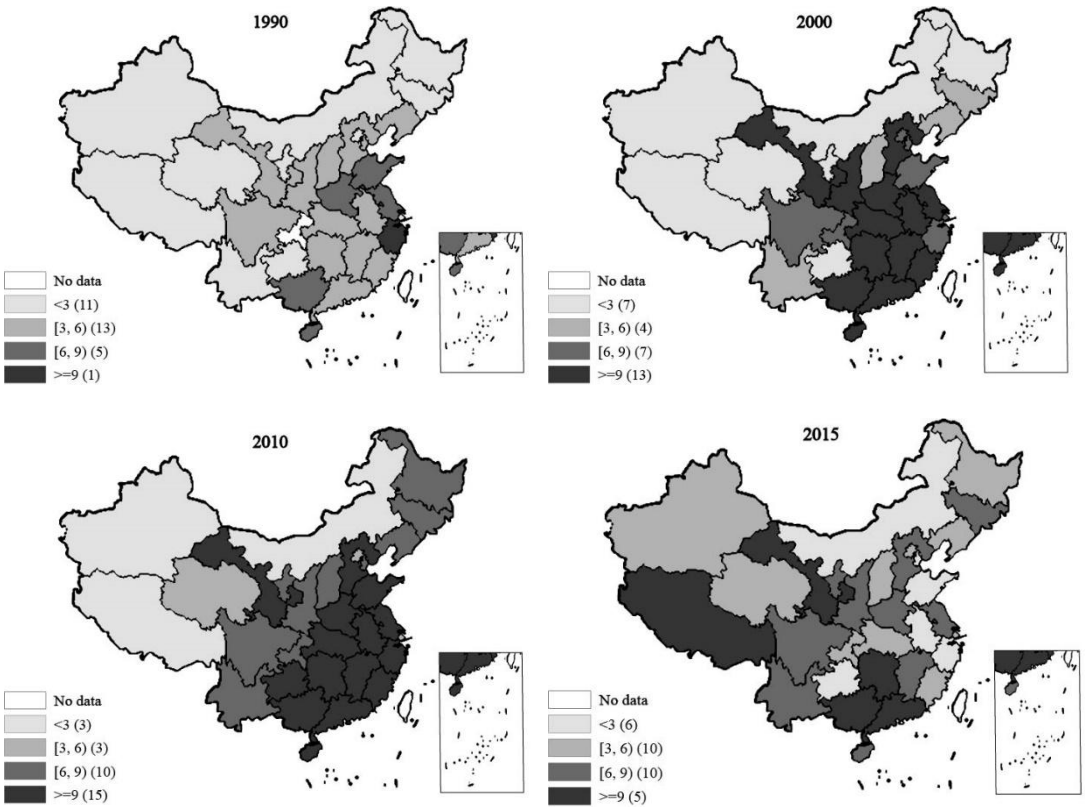

Figure 7 Proportion of sex-selective abortions over time by province (%)

Conclusion and Discussion

China's SRB has been well documented, whereas selective abortion of female fetuses has been under-examined. Sex-selective abortion has been widely practiced to obtain the desired number of sons within the family size norm over the past four decades. China is now confronted with numerous challenging demographic and public policy questions that have arisen from the use of sex-selective abortion and the subsequent phenomenon of missing girls (Nie, 2011; Bongaarts and Guilmoto, 2015), which has led to an imbalanced population sex structure and a marriage squeeze (Guilmoto, 2012; Jiang et al., 2016) as well as affecting China's population trajectory in the long term (Jiang et al., 2011). Accordingly, people have adjusted their economic behavior in a context of a shortage of marriageable women, for example accumulating wealth for marriage (Wei and Zhang, 2011) and raising the bride price and marriage expenditure to compete in the marriage market (Jiang et al., 2015). The long-term practice of selective abortions has affected and will continue to affect many aspects of Chinese society, the implications of which should be handled now with caution for China.

We found that the annual number of selective abortions rose after 1980 and stayed at around 1 million per year in the 1990s and 2000s. There has been a total of up to 28.66 million between 1980 and 2017. This total number is higher than that of 23.1 million missing female births for the period between 1970 and 2017 obtained by Chen et al. (2019) , and is lower than the general claim that China is short of 30 to 40

million missing females (Nie, 2011; Bongaarts and Guilmoto, 2015), which comprises both sex-selective abortion and excess female child mortality.

The abortion of second-order female fetuses has contributed most to the total sex-selective abortions. However, with the fertility decline and the intention of aborting first-order female fetuses, the proportion of abortion of first-order fetuses rose markedly. Sex-selective abortions are most likely to occur when the previous child (or children) is a girl girls and the current fetus is female. A survey indicates that when the first child was a girl, 92 percent of second-pregnancy female fetuses were aborted. If the first child was a boy, only 5 percent of female fetuses in the second pregnancy were aborted (Chu, 2001). With the persistence of son preference, the obvious fertility decline increased the pressure for sex selection (Li et al., 2000). People with a strong son preference tend to selectively abort female first-order fetuses (Jiang et al., 2016). With birth order composition change, the contribution of selective abortions by different birth order contributed differently to the selective abortion total.

While village population selective abortions made up the majority of all selective abortions, the proportion of urban selective abortions rose markedly with rapid urbanization and the convergence of SRB. The sex ratio for aborted fetuses whose sex is identifiable is significantly lower than the normal fetal sex ratio in both rural and urban populations, indicating that some of the pregnant women have undergone prenatal sex identification and sex-selective abortion in both rural and urban areas (Zeng et al., 1993).

Different provinces experience a different number and proportion of selective abortions. This difference is a combined reflection of different demographic features, socioeconomic development, different magnitude of the preference for sons, and varying success in prohibiting non-medical prenatal sex identification.

China's one-child policy has often been criticized for exacerbating its gender imbalance. A relaxation in the one-child policy could reduce the SRB by allowing more parents to have a son without resorting to sex selection (Ebenstein, 2011). With the adoption of the universal two-child policy, it is optimistically predicted that the new policy will bring about a more normal sex ratio, but the SRB may take many years to normalize due to the long-standing preference for sons and continued access to sex-selective technologies (Zeng and Hesketh, 2016). Over time, as countries approach high levels of development, modernization, and urbanization, the value of sons and daughters tends to equalize (Chung and Das Gupta, 2007). With social and economic transformation, son preference will decline (Chung and Das Gupta, 2007; Bongaarts, 2013). In China, the deeply entrenched son preference is currently waning due to low fertility intention, the pressure from the tight male marriage market, and the heavy burden of marriage (Jiang et al., 2015). We hope all this will reduce sex-selective abortion and improve gender equality in China.

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