



Gender Preference for Children and Sex Ratio at Birth: Trends and Regional Differences



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Forward

The high SRB is one of the important demographic characteristics of our country. Since the third national census in 1982, the national SRB has been abnormally high, and it once soared to more than 120. 111.3 in 2020 is still higher than normal. The three main causes contributing to the abnormally high SRB in China are: son preference, the fertility squeeze caused by declining fertility, and the availability of sex selection techniques. Among them, a strong son preference is the fundamental reason. With the relaxation of fertility policy and socioeconomic development, the changes in sex preference increasingly plays a decisive role in the trend of the SRB.

The United Nations Population Fund in China (UNFPA) has been concerned about China's SRB for a long time, and has also committed to forming evidence for policy advocacy through research and intervention to provide further support for China in solving the problem of high SRB and further protect girls' right to survival and development. In 2021, with the support of UNFPA China, the China Population and Development Research Center used quantitative survey data to analyze gender preferences from two dimensions: time changes and regional differences. The study found that China has completed the transition from son preference to daughter preference despite people's continued pursuit of balance preference. The gender preference in most provinces also showed a relatively "daughter" tendency, and the SRB could return to a normal level in the future. The research findings and policy recommendations are instructive.

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Abstract

After more than 30 years of high SRB, China's SRB has presented a downward trend in recent years. In the process of fertility rate decline, sex preference determines whether different countries and regions will experience a process of abnormal SRB at what point, path and speed. It plays an important role in the rise of SRB, and its changes also determine the direction of the SRB in the future. There are large regional differences across China, and the consistent of changes in gender preferences in various regions also contributes to the decline of SRB at the national level. Therefore, this study collected five nationally representative sample survey data to analyze the periodical changes and regional disparities of gender preference over the country and each province, and then discusses the relationship between gender preference and SRB. The main findings of this study are as follows:

Overall, China has completed the transition from son preference to daughter preference despite people's continued pursuit of balance preference. As the ideal combination for children, "balance preference" has not fundamentally changed, but "don't mind" and "daughter preference" have surpassed "son preference" as sub-ideal choices. From longitudinal observation, daughter preference rise rapidly in the early stages, and then waned in parallel with son preference, however, son preference subsiding at a faster pace, thereby bringing down the SRB.

From regional observation, the gender preference in most provinces shows a relatively "daughter" tendency, and manifested in the fact that the ideal number of daughter exceeds the ideal number of sons, and the ideal sex ratio among children is lower than 100. Son preference prevailed only in Guangdong and Guangxi provinces. From a longitudinal perspective, provinces with an ideal sex ratio among children inclined to son preference kept increasing in earlier stage, but the situation changed after 2017 when provinces with an ideal sex ratio among children inclined to daughter preference became the overwhelming majority and there was a steadily increasing number of provinces with stronger daughter preference.

Due to the increasing dominance of "no preference" and "daughter preference" in China, it is foreseeable that China's SRB will continue to decrease in the coming years. Given the regional differences and the asynchronous changes in gender preferences among regions, occurred in different trajectories in different locations. The stronger the gender preference is, the longer it takes for the gender preferences to abate, and the longer it takes for the SRB to reverse, but in the long run, from local to national, the SRB tends to be normal eventually.

This study draws a national picture of changes of sex preference in different periods, and provides an empirical analysis of changes and differences in national and regional SRB after 2015. The study also puts forward policy recommendations such as adhering to classified guidance and especially emphasizing should be put on a handful of provinces that are falling behind the predominant shift in gender preference.

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1. Background

The sex ratio at birth (SRB) is a basic indicator of the sex composition of birth in a population. Under normal circumstances, this ratio oscillates between 103 and 107. Beginning in the mid-1980s, China's SRB deviated from the normal range and continued to increase until 2008 when it started to decline. According to the Seventh Census conducted in 2020, China's SRB stood at 110.3, which was still above the normal range.

Gender preference has existed since ancient times. Due to the influence of stages of socio-economic development and historical and cultural traditions, different countries and regions have formed different gender preferences. In a word, it can be divided into boy preference, girl preference and no gender preference. It is understandable that people maintain gender preference at the level of ideological understanding, but if this kind of preference is intense to a certain extent, and the means to achieve the preference are obtained, fetal sex selection behavior is implemented, or children who are not the ideal gender are discriminated or abused, it will lead to serious social inequalities. Thus, the type and intensity of preferences are associated with a unusual rise of SRB. Fetal sex selection caused by strong boy preference is the direct cause of the imbalance of SRB

The three main causes contributing to the abnormally high SRB in China are: son preference, the fertility squeeze caused by declining fertility, and the availability of sex selection techniques. China's total fertility rate (TFR) was already below the replacement level of 2.1 in the 1990s and has since continued to decline. Although the implementation of the "Universal Two-Child Policy" resulted in a marginal increase in China's TFR, once the accumulated fertility potential was fully adjusted, the TFR continued to fall, reaching a low of 1.3 in 2020, according to the results of the Seventh Census. Despite China's recent launch of the "Three-Child Policy", there is hardly any room for the further decline of TFR, so the new policy will have a minor impact on the SRB. Although new techniques for fetal sex determination and sex-selective abortion continue to emerge, China's intensive efforts to clamp down on fetal sex selection are unlikely to ease, and thus the stringent control over the availability of such techniques will remain in place for the foreseeable future. As a result, the future trend of SRB hinges largely on a fundamental shift in people's gender preferences for children.

What is the current status of gender preference in China? Socioeconomic development, increasing urbanization, higher levels of education, and cultural advances all have had an impact on people's gender preferences for children. In the context of China's rapid modernization and social transformation, how have people's gender preferences for children changed over time?

Regional disparities remain one of the key attributes of China's SRB. Are there also significant differences among provinces in terms of people's gender preferences for children? Is people's gender preferences for children changing in each province as a result of the general decline in SRB? Is SRB changing in synch with such transitions in each province?

2. Objectives and Significance

Using data from a series of representative national sample surveys conducted in a different timeframe, this study explores in depth the temporal changes and regional differences in gender preferences and examines the coalition between gender preferences and SRB.

This study has the following policy implications: 1) Understanding the temporal changes in gender preferences and examining the relationship between gender preferences and SRB would offer a glimpse into the future trend of China's SRB, and 2) the research on the regional disparities in gender preferences would also inform China's case-by-case guidance for different provinces in the process of bringing the overall SRB to within a normal range.

3. Literature Review

3.1 Definition and Measurement of Gender Preference

Gender preference for children refers to an individual's attitude towards the gender of his or her children, and is manifested behaviorally as a desire to have children of a specific gender or a dislike for children of a specific gender (Liu Shuang, 2005; Shi Renbing, Yang Hui, 2021). Although there is a clear line between preference and dislike, the preference for children of one gender does not necessarily indicate a dislike for children of the other gender. Under different circumstances, gender preferences are manifested in a variety of complex combinations.

Gender preference can have a serious impact on demographic aspects such as family formation, contraceptive use, abortion decision, and birth spacing, (Chen Wei, 2002). The measurements of gender preference can also be separated into two categories: "desire" and "present facts and behaviors" (Liu Shuang, 2005; Yang Xueyan et al., 2011; Zhang Huanhuan, 2020). "Desire" refers to the gender preferences in fertility intentions, such as the ideal number of sons and daughters one intends to have, and the ratio of sons. This indicator reflects an individual's attitude and proclivity. However, desire does not always translate into actual reproductive behaviors due to economic, health, and a variety of other external constraints.

The "present facts and behaviors" indicator reflects gender preferences in fertility behaviors, such as the sex ratio at birth (SRB), the gender composition and birth orders of existing children, the parity progression ratio (PPR) by the gender of the existing child(ren), the contraceptive prevalence rate by the number and gender of existing children, the gender of the last child, the proportion of daughter-only households (Liu Shuang, 2005). These measures help to elucidate, at the macro level, the impact of gender preferences on demographics and the gender composition of children, which are thought to be a consequence of gender preferences that have prevailed in the past.

“Type” and “intensity” dimensions can also be included in gender preference. If solely “preferences” are considered, the gender preference categories can be divided into son preference, daughter preference, and no preference. Furthermore, the preference for having both a son and a daughter (referred to as a “balancing preference”) can be taken into account. These gender preference patterns have been observed frequently in previous research.

The strength of gender preference is more significant in predicting behavior since behavioral manifestations of gender preference differ depending on the level of intensity. For example, in the case of two people sharing the same preference for a son, if one would “attempt every possible means to have a son” and the other could “accept to have a daughter” despite his/her son preference, their different intensity of gender preference would lead to different behaviors and different effects on SRB.

3.2 Gender preference and SRB

3.2.1. Gender Preference and the Number of Children

Fertility has three dimensions: number, gender, and timing (Gu Baochang, 1992). Gender preference and desire for the number of children have a very deep and interconnected relationship because the number of children is the basis and premise of gender preference. Demographer Bonngarts regarded gender preference as one of the three fertility-promoting factors in his model of approximate determinants (Bonngarts, 2001). Gender preference, however, can limit fertility. The number and gender composition of a couple's existing children heavily influence their next childbirth. Gender preference is an important determinant of a couple's rigid demand for the number of children (Hou Jiawei et al., 2014), consequently, if parents want to prevent a certain gender composition of their children, it may hinder their desire to have future children (Shi Renbing and Yang Hui, 2021).

3.2.2. Gender Preference and Its changes in China

The traditional Chinese family culture has a predilection for bloodline continuation and family inheritance, and arrangements such as patrilineal descent, patriarchal dominance, and patrilocal residence have contributed to the dominance of the “son preference” culture. Most Chinese studies have found that gender preference in Chinese couples is manifested as the “son preference” underlain by the ideal gender composition of “having both a son and a daughter”. In previous surveys, an overwhelming majority of Chinese couples longed for “having both a son and a daughter”, and couples with a “son preference” outnumbered those with a “daughter preference”.

According to the results of 11 sample surveys of fertility intentions conducted from 1979 to 1998, a majority of respondents expressed their desire to have both a son and a daughter, and son preference, though subsiding over time, still dominated in certain regions (Feng Xiaotian and

Zhang Qingsong, 2002). An examination of data from the 2006 China General Social Survey (CGSS) and the 2010 Sixth Census revealed that son preference was still deeply embedded in Chinese rural households (Wang Peng, 2015; Li Shuzhuo et al., 2014). In the 1990s, most Chinese couples stopped having children after having a son, though some couples went on to have more children after giving birth to a son (Liu Shuang, 2005). A recent study found that son preference had waned from "having multiple sons" in the period between the 1950s-1980s to "having a least one son" in the 1990s, and further to "avoiding two sons" in the past decade (Shi Renbing and Yang Hui, 2021).

At the turn of the century, daughter preference began to emerge among Beijing's only children, regardless of urban or rural residence, education level, or income level (Hou Yafei, 2003). A meta-analysis of 52 research articles found that daughter preference gained popularity in the period from 1980 to 2011 (Hou Jiawei et al., 2014), while another meta-analysis of 152 research articles revealed that between 1978 to 2018, both son preference and daughter preference weakened significantly in China, (Hou Jiawei et al., 2018).

3.2.3. Determinants of Gender Preference

Gender preference results from an array of factors, including residence, income level, and education level (Chu Junhong, 2001). Globally, different countries and regions feature different gender preferences for children (Kana F, 2010), and the same can be said of China. Taking the proportion of daughter-only families as a measure of son preference, the intensity of son preference in different regions of China is approximately as follows: Guangdong, Guangxi, Fujian and Jiangxi > Henan, Southwest Shandong, Northern Anhui, Northern Jiangsu, Southern Hebei > Shanxi & Shaanxi > Northern Hebei & Shandong > Yangtze River Basin, Northeast China and Southwest China (Gong Weigang, 2013).

The gender structure of the existing children in the family can also have an impact on gender preference and rapidly diminish as the number of boys born in the family increases (Li Shuzhuo et al., 2014). The experience of living in urban areas as a migrant worker can significantly reduce the intensity of son preference among rural residents (Shi Renbing and Xiong Bo, 2011). Gender preference among urban residents is influenced by factors such as marital status and age, level of education, and occupational status, and exhibits diverse characteristics as education level and occupational status increase. 'No preference' accounts for the largest proportion of urban married youths with child(ren), suggesting that son preference is gradually weakening in urban areas (Song Jian, Tao Ye, 2012; Wang Peng, 2015; Yang Fan, 2017).

The gender preference for children is influenced by the education level of women, the opinion of parents-in-law, the son preference culture dominating the local area, and people's perception of the gender roles of children. In terms of the impact on SRB, gender preference outweighs the economic and social development levels (Liu Shuang, Feng Jiyou, 2014).

3.2.4. Gender Preference and SRB

Gender preference is directly connected to the level of SRB. The abnormally high SRB is essentially the result and manifestation of the combination of social, economic, political, cultural, and other traditional factors. The cultural and conceptual factors that play the most pivotal roles include the perception of gender, the status of women, and the family pattern and composition that are influenced by traditional culture. Although economic development might play a role, high SRB is still inevitable if the culture and people's perception of gender roles remain unchanged. Once the SRB becomes too high, it can be exceedingly difficult to bring it back to a normal range (Guo Weiming, 2004).

In China, regions with high SRBs are concentrated across provincial or municipal borders, reflecting the strong influence of culture on SRBs (Liu Hua et al., 2014; Liang Hong, 2018). Taking counties as the analysis unit, Wang Fei and Liu Shuang analyzed the data from the three censuses in 1982, 1990, and 2000 and unveiled that the trend of high SRB cross-regional concentration is becoming more and more prominent, mainly manifested as inter-provincial concentration, high in the eastern region and low in the western region. "Due to geographical proximity, people are in frequent contact with each other and therefore tend to develop similar lifestyles, folk customs, and even fertility habits and 'gender preference' through long-time mutual influence, thereby exhibiting strong 'regional characteristics.'" (Wang Fei and Liu Shuang, 2011).

The empirical analysis of national and provincial data for 1990 reveals a positive relationship between SRB and "son preference" at both the national and the provincial levels (Poston, et.al., 1997). Calculating the sex ratio of the last child and the parity progression ratio in Chinese women of childbearing age between 1997 and 2001, as well as analyzing the status of families with different gender structures of children and the live births and survival of children born to Chinese women, it was discovered that "gender preference" for children and the corresponding behavior of prenatal sex selection are the key internal driving factors behind the skewed SRB (Liu Shuang, 2005). With the weakening of son preference being slower than the weakening of daughter preference, son preference was relatively strengthened, leading to a surge in SRB in the face of continued fertility declines. With the increasing synchronization in the weakening pace of son preference and daughter preference, SRB should eventually return to normal (Hou Jiawei et al., 2018).

The spatial distribution of SRB is highly correlated with the severity of son preference. Areas with an extremely low proportion of daughter-only households in 2000 were unquestionably high in SRB. If the transition of SRB is judged by the criteria of the weakening son preference and the balancing SRB, it can be concluded that the transition of gender preference for children in Northeast China and the Yangtze River Basin regions has been completed; although the same transition has begun in Southern China and the Central Plains since 2010, it would still take some time to complete (Gong Weigang, 2013). An analysis of the determinants of SRB across provinces and territories from 1990 to 2010 found that gender equality remained the most

fundamental determinant that would assist in bringing down SRB. In areas where gender roles are more egalitarian, the SRB tended to be more normal (Yang Juhua and Li Hongjuan, 2015).

3.3 Regional Differences in SRB

Different regions of China have great differences in socio-economic development and historical and cultural customs. Initially, high SRB was only a problem that affected a specific region. Between 1982 to 2000, this problem spread rapidly to different regions, with a significant increase in the number of provinces with skewed SRB.

From 2000 to 2010, the spatial concentration of China's SRB became increasingly obvious (Shi Tao and Sun Kuili, 2014), in tandem with the divergence of the provincial SRB transition. Among the 31 provinces (autonomous regions and municipalities) in the mainland, 13 provinces experienced different degrees of decline in SRB, experienced different degrees of increase, and the remaining 2 provinces remained relatively unchanged, with the greatest increase/decrease observed in provinces with the highest SRB where SRB trends were moving in opposite directions — some were declining at a rapid pace, while others were still on the rise. As of 2010, China's dangerously high SRB remained unchanged. Taking 110 and above 120 as the dividing line between moderate and severe SRB imbalances, the number of provinces with moderate and severe SRB imbalances is still increasing, while provinces with declining SRB failed to downgrade from a severe to a moderate SRB imbalance (Shi Yaming, Liu Shuang, 2015). In terms of regional differences, the gap in SRB value between different provinces shrank between 2000 and 2010, and the same was observed between urban and rural areas, parties, and Han and ethnic minorities (Shi Renbing, 2013).

Regions contributed differently to the national SRB. Based on the degree of SRB imbalance and the number of infant girls born in each province, we are able to calculate the contribution rate of different provinces to the national SRB ¹, and this contribution rate fluctuates over time. In 2005, Anhui, Henan, and Jiangxi provinces in the central and eastern regions stood out as the top 3 provinces contributing significantly to the national surge in SRB (Cai Fei, 2007).

SRB is related to not only son preference but also to the degree of restriction of economic development and fertility policies (Jiang Q, Zhang C. 2021). Provincial differences in the SRB unbalance and complicate China's skewed SRB, making it increasingly difficult to return it to a normal range.

1 The contribution rate here refers to the ratio of the SRB increment in a specific administrative division to the overall SRB increment in the whole nation. The equation is: $(\text{provincial SRB}/100-1.07)/(\text{national SRB}/100-1.07)*(\text{provincial female births}/\text{national female births})$. Reference: Cai Fei. Factor-Specific Contribution Rate of the Rising Sex Ratio at Birth in China [J]. Population Research, 2007(04): 9-19.

3.4 Limitations of Existing studies

Existing studies focus more on the "type" of gender preference rather than its "intensity". Only one study of 298 domestic college students discovered that, compared to foreign respondents, Chinese respondents preferred to have both a son and a daughter, with slightly higher son preference than daughter preference, and were more likely to use sex selection techniques to have children of the desired gender (Shi Renbing and Jiang Lina, 2011).

Most of the existing studies on children's gender preferences are based on data on fertility intentions or even secondary data from sample surveys in specific years or places, which is insufficient to grasp national trends over time, let alone a thorough analysis of regional differences. This has led to our incomplete understanding of gender preferences due to the lack of a national picture.

Studies on SRB "cooled down" sharply after 2015. There was almost no research on the difference in SRB among different regions after 2015. Not to mention the analysis of the trend and cause of SRB changes in different regions.

4. Data and Methodology

4.1 Data

The data on which this study was built comes from five representative national sample surveys, i.e., the 1997 National Population and Reproductive Health Sample Survey, the 2001 National Family Planning/Reproductive Health Sample Survey, the 2006 National Population and Family Planning Sample Survey, the 2017 National Fertility Survey, and the 2019 National Population and Family Dynamics Survey.

These five surveys were organized and conducted nationwide by the government authority responsible for population and family planning, and covered a wide range of areas including unmarried and married groups, providing solid data support for the analysis of gender preference at the national and regional levels. In 2013, China also conducted a special survey of married women aged 20-44 on their fertility intentions. This special survey was not included in this study because unmarried people were not included.

These surveys also have their limitations. First, prior to 2016 when the fertility policy remained restrictive, the legitimacy of the government-organized and implemented fertility intention surveys was highly questionable. Second, the sampling methods used in these surveys varied, with only the 2017 and 2019 surveys using post-stratification weighting. As a result, these two surveys provide a more accurate representation of the entire population.

If the post-stratification weighting method was used in the first three surveys, authentic data on the age, residence (urban or rural), and marital structure of the total population in the same

years would be required, which would increase the burden of this study. Given the precedent for using unweighted data in such multi-source trend research (Wei Zhixin et al., 2020), this study analyzed the unweighted data for 1997, 2001, and 2016, as well as the weighted data for 2017 and 2019.

Women tend to have fewer births after the age of 45. The gender preferences among women aged 15-44 (including unmarried and married women) determine their reproductive behaviors, which will in turn have an impact on the future SRB. Therefore, this study selected women aged 15-44 as data analysis subjects in these surveys. Social and family dynamics (including the gender preferences of spouse or parents-in-law) could also have an effect on couples' gender preferences and reproductive behaviors. Nonetheless, due to the lack of relevant data, this was not included in the analysis of this study. Table 1 shows the age and marriage distribution of respondents aged 15-44 in the five surveys.

Due to the limited sample size in these surveys, the regional differences in this study refer to provincial differences. The provincial data from these sample surveys are not strictly representative at the provincial level, but they do reflect general differences and trends. In certain provinces, the sample size was too small to obtain accurate results, and hence these provinces were excluded from the analysis of regional differences.

The SRB data comes from the third, fourth, fifth, sixth, and seventh national censuses, and the 1% population sample surveys conducted in 1995, 2005, and 2015. Since the province-specific SRBs were not disclosed 2020 Seventh Census, this study calculated the province-specific SRBs in 2000 using birth registration data provided by the "Interconnected Birth Registration Information Platform" created in 2014, this platform covers the entire country, with the data of certain provinces coming from the in-hospital live birth records maintained by medical institutions, or from the birth certificates issued — more than 10 million births are registered annually.

Table 1 Age and Marriage Distribution (%) of Respondents Aged 15-44 in the Five Surveys

Year	15-19	20-24	25-29	30-34	35-39	40-44	Mean age	Unmarried	Ever-married	Number
1997	11.67	15.87	21.57	21.15	13.20	16.54	29.95	17.78	82.22	13380
2001	12.21	11.89	17.07	22.33	22.10	14.40	30.70	18.98	81.02	33984
2006	8.62	10.79	13.71	19.64	23.63	23.6	32.52	14.24	85.76	28723
2017	11.87	14.24	19.59	18.97	17.25	18.08	30.49	33.25	66.75	137371
2019	10.80	14.38	18.61	21.15	17.55	17.50	30.70	29.64	70.36	46772

4.2 Measurement

As a foregone conclusion, the gender of children has little bearing on future SRB. This study concentrated primarily on analyzing relevant data on the "desired" and "ideal number of children." The "ideal number of children," which reflects an individual's gender preference for children, is currently the most widely used indicator of fertility intentions. All five surveys included questions asking the "ideal number of children," albeit with slightly different question designs (see Table 2). The 1997 question was designed as a single-choice question, while the 2001 and 2006 questions were similar, as were the 2017 and 2019 questions. Since there is no information regarding the intensity of gender preference, this study only analyzed the types of gender preference and quantified it for numerical comparison purposes.

Table 2 Basic Facts About the Five Surveys

Year	Respondent	Question	Choices	Logic Control
1997	15,213 females aged 15-49	What do you think are the ideal number and gender composition of children in a family?	01) Don't want children; 02) a son; 03) a daughter; 04) one child, and gender doesn't matter; 05) one son and one daughter; 06) two sons; 07) two daughters; 08) two children, and gender doesn't matter; 09) at least one son; 10) at least one daughter; 11) at least one son and one daughter; 12) the more the better; 13) let nature take its course; 14) others; 15) can't tell.	
2001	39,586 females aged 15-49	In your opinion, the ideal number of children in a family should be ____ (fill in 9 if you don't mind the number of children).	Including __ son(s) and __ daughter(s), or __ children no matter the gender. (fill in "9")	When the desired number of children is "0" or "9", there is no need to answer the desired number of sons and daughters.
2006	33,257 females born between September 1956 and August 1991 (15-50 years old)	In your opinion, how many children should a couple have? (fill in "9" if can't tell)	Including __ son(s) and __ daughter(s) (fill in "99" if you don't mind the gender).	When the desired number of children is "0" or "can't tell", fill in "8" for both the number of sons and daughters.
2017	249,946 females aged 15-60	In your opinion, how many children should a family have?	____, including __ son(s) and __ daughter(s) (fill in "88" if you don't mind the gender, or "66" if the answer is "at least one". Don't leave it blank.)	If the desired number of children is "don't mind" "0" or "at least one", you still need to fill in the desired number of sons and daughters.
2019	60,000 females born between November 1, 1969, and October 31, 2004 (15-49 years old)	In your opinion, how many children should a family have?	____, including __ son(s) and __ daughter(s) (fill in "88" if you don't mind the gender, or "66" if the answer is "at least one". Don't leave it blank.)	If the desired number of children is "don't mind" or "0", you don't need to fill in the desired number of sons and daughters.

4.2.1 Composition of gender preferences

In this study, the preferences reflected by the ideal number of children were divided into balanced preference, son preference, daughter preference and no preference. Responses indicating no gender preference, such as "don't want any children," "don't mind," or "can't tell," were excluded from this study's analysis. When the ideal number of sons is equal to the ideal number of daughters and both are greater than 1, the response would be classified as "balance preference". When the ideal number of sons is greater than the ideal number of daughters, the response would be classified as "son preference", otherwise it would be classified as "daughter preference". When the respondent has no preference towards the gender of their children (regardless of how many), the response would be classified as "no preference".

For the 1997 survey, since it's hard to tell the gender preference of respondents who chose "the more the better" and "others", they were therefore excluded from the analysis of this study. The response of "at least one son and one daughter" was classified as "balance preference", while that of "let nature take its course" was classified as "no preference".

For the 2017 survey, when the ideal number of sons was greater than 0 and the respondent had no preference regarding the number of daughters, the response would be classified as "son preference", and vice-versa. If the answer was "at least one son" and the ideal number of daughters is less than or equal to 1, the response would be classified as "son preference". If the answer was "at least one son" and the ideal number of daughters was greater than 1, the response would be classified as "daughter preference", the response of "at least one daughter" would also be classified as "daughter preference". If the answer was "at least one son and one daughter", the response would be classified as "balance preference". The same classification methods apply to the data for 2019.

4.2.2 Quantified Gender Preferences

The ideal number of children, the ideal number of sons, the ideal number of daughters, and the number of responses answering "don't mind the gender" were averaged, and the proportions of the latter three values to the average ideal number of children were calculated respectively. Corresponding to SRB, the ideal sex ratio among children was also calculated, i.e., the number of sons per 100 daughters in the ideal number of children. An ideal sex ratio of 100 among children means no gender preference, whilst a value greater than 100 suggests a son preference.

It should be noted that gender preference reflects people's attitudes and beliefs regarding gender, whilst SRB is a behavioral manifestation of such attitudes and beliefs. Absolute values are far less important than the relative relationship between son and daughter preferences. The different directions and speeds of change between sons and daughters may lead to changes in the relative relationship between the two. The decline in ideal SRB cannot be explained simply by a weakening of son preference.

Many respondents answered, "at least one (son or daughter)". This kind of response cannot be quantified, but it is very important for measuring gender preference. Therefore, this study did not simply treat such responses as missing values. In the 1997 survey, the responses of "at least one son" and "at least one daughter" were assigned the value of "one son/daughter". In the 2017 survey, when the ideal number of children equaled 1, the response of "at least one son/daughter" would be assigned the value of "one son/daughter"; when the ideal number of children was greater than 1, the response of "at least one son/daughter" would then be assigned a value corresponding to the average ideal number of sons/daughters when the ideal number of sons/daughters is greater than 1; when the answer is "at least one son and one daughter", the ideal number of sons and the ideal number of daughters would be both assigned the value corresponding to 1/2 of the ideal number of children.

4.2.3 Deviations Caused by Questions and Choice Design

It should be noted that, despite our best attempts to prevent compromising the preference information during the value assignment, inconsistencies in both the questions and the choice designs may have culminated in biases. The data from the 1997 survey provided limited quantitative information because the single-choice question could not exhaust all of the gender combinations of children, so the response of "let nature take its course" was assigned the value of "don't mind gender". Precise numbers were offered in the 2001 and 2006 surveys, and the response of "at least one", was not offered as a choice, thus respondents were obligated to fill in a specific number or choose the response of "don't mind." This might lead to the underestimation of son preference and daughter preference and the findings of no preference might be skewed in these three surveys.

In contrast, the 2017 and 2019 survey designs offered the choice of "at least one", which allowed for a variety of numbers and gender combinations, and hence ensured a more accurate measurement of gender preferences. Compared with the previous survey, the choice of "at least one" is likely to make son preference or daughter preference more obvious.

4.3 Approach to Analysis

STATA 16.0 was used to uniformly code the relevant variables in the data from the five surveys and to calculate the relevant indicators respectively, thereby depicting the status and changing trend of gender preference for children with the lapse of time at the national and regional levels. Based on province-specific data, the gender preferences and the corresponding changes in different regions were further analyzed from the two dimensions of space and time. Furthermore, a model of the relationship between SRB and gender preferences was set up to examine how SRB would be affected by the changes in gender preference.

5. Current Status and Trends of Gender Preferences at the National Level

5.1 Current Status of Gender Preferences at the National level

In 2019, 73.75% of women aged 15-44 wanted to have both a son and a daughter; 11.15% did not mind the gender of their children; 9.87% wanted to have a daughter, and only 5.02% wanted to have a son. The results show that the gender preference for children has shifted to daughter preference despite people's continued pursuit of balance preference.

The higher the level of education of women, the more likely they are to be less partial to the sex of their children, and women with daughters are more likely than women with sons. Women living in urban areas are more likely to have daughters than women living in rural areas. In terms of the progression between birth cohorts, son preference only decreased by 2.71% between women born in 1970-1979 (5.79%) and those born after 2000 (3.08%), while daughter preference rose from 8.60% to 12.19%. Compared with the older age groups, the younger age groups were characterized by significantly weaker son preference and stronger daughter preference.

Table 3 Gender Preferences in Women with Different Ideal Numbers of Children (2019)

Ideal Numbers of Children	Don't Mind	Son	Daughter	Balance	Sample Size
1	33.75	22.34	43.27	-	5715
2	8.22	0.57	2.45	88.77	46746
3 or Above	3.36	34.15	48.08	14.41	3625
Total	11.13	4.93	10.20	73.74	56086

Women with different ideal numbers of children shared the same preference for a daughter. Table 3 shows that when the ideal number of children is 1, the proportion of women wanting to have a daughter reaches 43.27%, which is almost twice the proportion of women wanting to have a son; when the ideal number of children is 2, an overwhelming majority of women (88.77%) wanted both a son and a daughter, and daughter preference outnumbers son preference in the remaining women; When the ideal number of children is 3 or more, a larger proportion of women prefer daughters to sons.

In terms of quantity, in 2019, the average ideal number of children for women aged 15-44 was 1.91, of which the average ideal number of sons was 0.83 or 43%, and the average ideal

number of daughters was slightly higher, 0.90 or 47%. The average ideal sex ratio among children was 92.2 (see Table 5), a value below 100, implying that daughters outnumber sons in an ideal family unit. The percentage of the ideal number of sons remained stable regardless of respondents' differences in education level, residence (urban or rural), age, and birth cohort, indicating that the different groups of people share the same gender preferences.

5.2 Historical Changes in Gender Preferences at the National Level

According to the data from the 5 surveys, gender preferences did not change in the same direction over time (see Table 4). "Balance preference" prevailed overall, taking up a stable share of around 50% from 1997 to 2006 and reaching a peak of 75% after 2017.

In these surveys, while son preference showed a changing declining trend, daughter preference exhibited a fluctuating upward trend. Both proportions went up in 2001 and 2017, and both went down in 2006 and 2019. Such fluctuations were affected by the different survey standards, with the 1997 survey of one standard, the 2001 and 2006 surveys remaining the same, and the 2017 and 2019 surveys adopting similar questions (all are marked by different colors in Table 4). Only identical questions and choices would aid in obtaining comparable results. By examining the changes in survey data between 2001 and 2006, as well as between 2017 and 2019, it is possible to see that both the proportion of son preference and the proportion of daughter preference has dropped considerably. In addition, the share of "don't mind" increased significantly in 2019.

It is obviously more interesting to examine the differences in son preference between different years. In 1997, the proportion of sons was slightly greater than that of women, and the gap widened further in 2001 and narrowed in 2006. After 2017, the proportion of sons preferred (8.64%) was significantly lower than that of women (13.12%), and in 2019, both proportions decreased significantly, and son preference declined faster than female preference, and the gap between the two further widened. Therefore, we can infer that between 2006 and 2017, the difference in son preference and female preference continued to narrow, and eventually female preference prevailed, marking a "reversal" of gender preferences for children.

Table 4 Changes in Gender Preferences in the Five Surveys (%)

Year	Don't matter	Son	Daughter	Balance	Sample Size
1997	32.82	6.79	6.12	54.27	12394
2001	35.71	9.95	7.52	46.82	33225
2006	31.95	6.14	4.44	57.47	25143
2017	2.52	8.64	13.12	75.72	132981
2019	11.13	4.93	10.20	73.74	43884

Table 5 Changes in the Average Ideal Number of Children in the Five Surveys

Year	Ideal Number of Children	Ideal Number of Sons	Ideal Number of Daughters	Ideal Number of Either Sons or Daughters	% of Ideal Number of Sons	% Ideal Number of Daughters	Ideal Sex Ratio Among Children	% of Ideal Number of Sons (Standardized)
1997	1.65	0.62	0.61	0.43	0.37	0.37	101.70	0.37
2001	1.67	0.62	0.59	0.46	0.37	0.35	104.28	0.36
2006	1.72	0.66	0.64	0.42	0.38	0.37	102.49	0.37
2017	1.93	0.91	0.98	0.04	0.47	0.51	93.07	0.47
2019	1.91	0.83	0.90	0.18	0.44	0.47	92.31	0.43

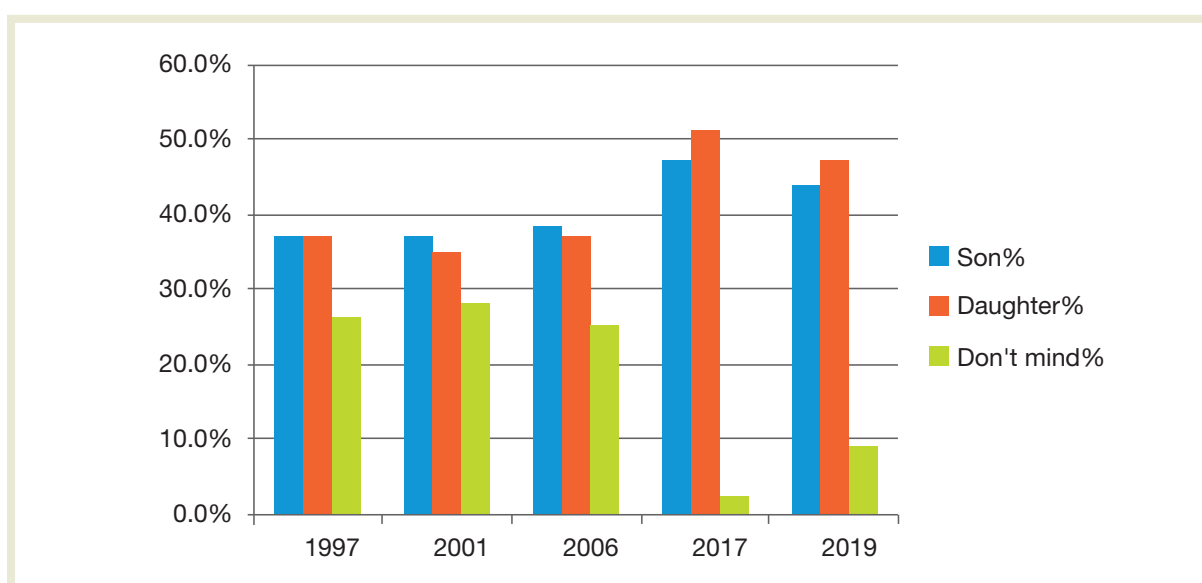


Figure 1 Proportions of Children of Different Genders to the Ideal Number of Children in the Five Surveys

Table 5 presents the changes in the ideal number of sons, daughters, or children of either gender in these five surveys. In absolute terms, the desired number of children did not change much between 1997 and 2006, but it increased to 1.93 in the 2017 survey and remained there in 2019. The ideal number of children is a reflection of women's preference for the desired number of children. With the gradual relaxation of the birth policy, this number has gradually returned to the level of around 2. As a result, both the ideal number of sons and the ideal number of daughters continued to increase from 1997 to 2017.

Due to the different survey standards, the average desired numbers of sons and daughters also fluctuated from year to year. Changes in absolute value could be influenced by changes in the ideal number of children, or they could indicate, or signal an increase or decrease in the intensity of gender preference. In 1997, 2001, and 2006, the average ideal number of sons

stabilized around 0.65, accounting for roughly 37%, which then increased sharply to 0.91 in 2017, accounting for 47%. The average desired number of females fluctuated as well, eventually surpassing the average number of sons after 2017. Both numbers and proportions declined in 2019, with the desired number of males falling quicker than the ideal number of daughters, and the latter proportion has since progressively surpassed the former (see Figure 1).

Women of different ages tend to have different gender preferences. Given the potential impact of the different age structures in different surveys, this study used the age structure of 15-44 in the 2010 census to standardize the age structure of all five surveys, and the results were not significantly different from the unstandardized results (see Table 5). In other words, the proportion of the ideal number of sons is unaffected by the structural differences. The changes are real, not caused by the changes in the age structure of these surveys.

The relative link between the ideal number of sons and the ideal number of daughters, or the ideal sex ratio of children, is more useful in predicting the development direction of gender preference. Before 2006, the ideal sex ratio among children was above 100, suggesting an overwhelming son preference, but then dropped to 93.07 in 2017 and further to 92.31 in 2019, indicating that daughter preference began to prevail. In 2013, in married women aged 20-44, the ideal sex ratio among children was 104.2 (Zhuang Yaer et al., 2014). Since married women aged 20-44 tend to have a slightly stronger son preference than females aged 15-44, the turning point of the ideal sex ratio of 100 among children was likely to occur in the period of 2013-2017.

As explained above, regardless of the classification or figures of gender preferences, the prevailing gender preference in Chinese couples is manifested as “daughter preference” underlain by the ideal gender composition of “having both a son and a daughter”. From a trend point of view, the son preference continued to weaken, while the daughter preference began to prevail. Despite a slight rollback in recent years, daughter preference weakened more slowly than son preference. The relative changes between the two have set the ideal sex ratio among children on a downward spiral, leading to a growing trend toward “daughter preference” after 2017.

6. Current Status and Temporal Changes of Gender Preferences at the Provincial Level

6.1 Current Status of Gender Preferences at the Provincial level

While there are still minor differences, 2019 was marked by a convergence of gender preferences for children across provinces. Balance preference prevailed in all provinces, whilst provinces with a higher proportion of don't mind tended to feature stronger daughter preferences, such as Shanghai, Beijing, Jiangsu, Zhejiang, and Sichuan. In the three northeastern provinces, daughter preference took up a higher share, all surpassing 15%. There

were five provinces where the combined proportion of "Don't mind" and "daughter preference" exceeded 30%, including Shanghai, Beijing, Liaoning, Zhejiang, and Jilin. Provinces ranked at the bottom were Jiangxi, Fujian, Shandong, Henan, Guizhou, and Guangdong.

In most provinces, the proportion of daughter preference was greater than that of son preference. The biggest difference is between Shanghai and Heilongjiang, with a gap of about 15 percentage points. Overall, son preference has declined across China, with Guangdong and Guangxi remaining the only provinces where son preference still eclipsed "daughter preference". In particular, in Guangxi Province, the gap between the two proportions approximated 5 percentage points, reflecting the dominance of son preference. It is worth noting that among the women surveyed in Xinjiang, the absolute proportion of son preference was also relatively high.

Table 6 Gender Preferences in each Province in 2019 (Ranked from High to Low by the Combined Proportion of "Don't Mind" + "Daughter Preference")

Province	Don't Mind	Son	Daughter	Balance	Don't Mind + Daughter	Sample Size
Shanghai	20.98	1.92	16.03	61.06	37.01	1180
Beijing	21.17	5.63	14.66	58.53	35.83	1100
Liaoning	12.86	9.73	19.96	57.45	32.82	1632
Zhejiang	22.44	2.18	9.8	65.58	32.24	2218
Jilin	14.98	9.03	15.54	60.45	30.52	790
Heilongjiang	8.03	9.44	21.33	61.2	29.36	1444
Sichuan	18.39	3.14	10.78	67.69	29.17	2543
Jiangsu	17.7	2.73	9.37	70.2	27.07	2762
Xinjiang	7.63	12.16	16.35	63.86	23.98	649
Inner Mongolia	9.26	4.14	14.62	71.97	23.88	863
Chongqing	11.26	3.30	12.25	73.18	23.51	999
Hubei	12.23	3.21	10.71	73.84	22.94	1552
Shaanxi	13.5	3.39	8.18	74.93	21.68	992
Hebei	8.91	4.25	11.76	75.08	20.67	2621
Yunnan	12.71	2.96	6.37	77.96	19.08	1270
Anhui	11.26	3.61	6.82	78.31	18.08	1977
Gansu	7.77	5.86	10.06	76.31	17.83	623
Hunan	7.52	2.86	8.88	80.73	16.40	1708
Guangxi	8.94	11.27	6.88	72.91	15.82	1287
Shanxi	7.39	3.91	8.18	80.53	15.57	1320
Guangdong	9.19	8.49	6.02	76.3	15.21	3541

Guizhou	5.31	4.48	8.58	81.64	13.89	1582
Henan	5.88	2.69	7.98	83.45	13.86	2790
Shandong	5.39	5.29	8.39	80.93	13.78	3052
Fujian	7.01	3.23	5.6	84.17	12.61	1314
Jiangxi	3.27	6.10	8.91	81.73	12.18	1111
Total	11.13	4.93	10.2	73.74	21.33	42920

The ideal number of children varied greatly among provinces. The average ideal number of children stood above 2.0 in Hunan, Xinjiang, Guizhou, Guangdong, and Guangxi, and the average ideal number of children fell below 1.8 in Beijing, Shanghai, Tianjian, and Chongqing and in the northeastern region. Differences in the ideal number of children in females aged 15-44 have long occurred between provinces, resulting in variation in the proportion of the ideal number of sons and daughters. The proportion of the ideal number of sons ranged between 32% and 48%. This proportion exceeded 45% in Shandong, Guizhou, Fujian, Guangdong, Guangxi, and Jiangxi. The proportion of the ideal number of daughter ranged between 42% and 52%.

In most provinces, the proportion of the ideal number of daughters was greater than that of the ideal number of sons, with their ideal sex ratios among children signaling a salient inclination towards daughter preference. In 2019, the ideal sex ratio among children was below 100 in most provinces, suggesting a consistent daughter preference among provinces. Guangxi and Guangdong were the only two provinces where the ideal sex ratio among children was higher than 100.

Table 7 Average Ideal Number of Children in Each Province in 2019 (Ranked from Low to High by the Ideal Sex Ratio Among Children)

Province	Ideal Number of Children	Ideal Number of Sons	Ideal Number of Daughters	Ideal Number of Either Sons or Daughters	% of Ideal Number of Sons	% Ideal Number of Daughters	Ideal Sex Ratio Among Children	Sample Size
Shanghai	1.68	0.63	0.78	0.28	0.32	0.47	79.89	1180
Heilongjiang	1.68	0.70	0.87	0.11	0.40	0.52	81.09	1444
Liaoning	1.67	0.68	0.82	0.18	0.39	0.49	83.42	1632
Beijing	1.71	0.64	0.75	0.31	0.35	0.44	85.38	1100
Inner Mongolia	1.81	0.77	0.90	0.14	0.41	0.50	86.52	863
Jilin	1.70	0.69	0.80	0.22	0.39	0.46	86.57	790
Chongqing	1.82	0.77	0.88	0.17	0.40	0.49	87.22	999

Sichuan	1.83	0.71	0.81	0.31	0.37	0.45	87.46	2543
Hubei	1.86	0.78	0.88	0.20	0.40	0.48	88.22	1552
Zhejiang	1.78	0.67	0.76	0.35	0.35	0.42	88.30	2218
Hebei	1.91	0.83	0.94	0.14	0.42	0.49	88.63	2621
Jiangsu	1.82	0.74	0.83	0.25	0.38	0.44	89.66	2762
Shaanxi	1.93	0.81	0.88	0.23	0.41	0.46	92.41	992
Gansu	1.95	0.87	0.94	0.13	0.45	0.48	92.54	623
Hunan	2.00	0.90	0.97	0.13	0.44	0.48	92.58	1708
Henan	1.97	0.90	0.97	0.10	0.45	0.49	93.52	2790
Xinjiang	2.21	1.00	1.06	0.15	0.45	0.48	93.61	649
Yunnan	1.98	0.85	0.89	0.24	0.42	0.45	94.57	1270
Shanxi	1.89	0.86	0.91	0.12	0.44	0.48	94.72	1320
Shandong	1.97	0.91	0.96	0.09	0.46	0.48	95.06	3052
Guizhou	2.07	0.96	1.01	0.09	0.46	0.49	95.10	1582
Anhui	1.92	0.84	0.89	0.19	0.43	0.46	95.18	1977
Jiangxi	2.09	1.00	1.03	0.06	0.48	0.49	97.25	1111
Fujian	1.96	0.91	0.93	0.12	0.46	0.47	97.35	1314
Guangdong	2.05	0.96	0.93	0.16	0.46	0.45	103.04	3541
Guangxi	2.16	1.02	0.97	0.17	0.46	0.45	104.89	1287
Total	1.91	0.83	0.90	0.18	0.44	0.47	92.31	42920

6.2 Changes in gender preferences at the provincial level

Figure 2 below illustrates the changes in the ideal sex ratio among children in these five surveys. Provinces marked in red are those with a sex ratio among children greater than 100. The darker the red, the stronger the son preference. Provinces marked in green are those with a sex ratio among children smaller than 100. The darker the green, the stronger the daughter preference.

The period from 1997 to 2006 can be divided into two stages. The first stage, which began in 1997 and ended in 2006, was characterized by a gradual expansion of the geographical scope of son preference. In certain provinces, the ideal sex ratio among children surpassed 110, reflecting an excessively strong son preference. In the second stage which began in 2017, daughter preference began to buck the trend, sweeping through most provinces and expanding in geographical scope until 2019.

Gender preferences also have an obvious spatial agglomeration. In the five surveys, daughter preference was dominant in Jiangsu, Zhejiang, Shanghai, and the three northeastern provinces, whilst son preference was dominant in Fujian, Jiangxi, Guangdong, and Guangxi provinces, where son preference remained strong and had a long history. Until 2019, there was still a strong son preference in Guangdong and Guangxi provinces.

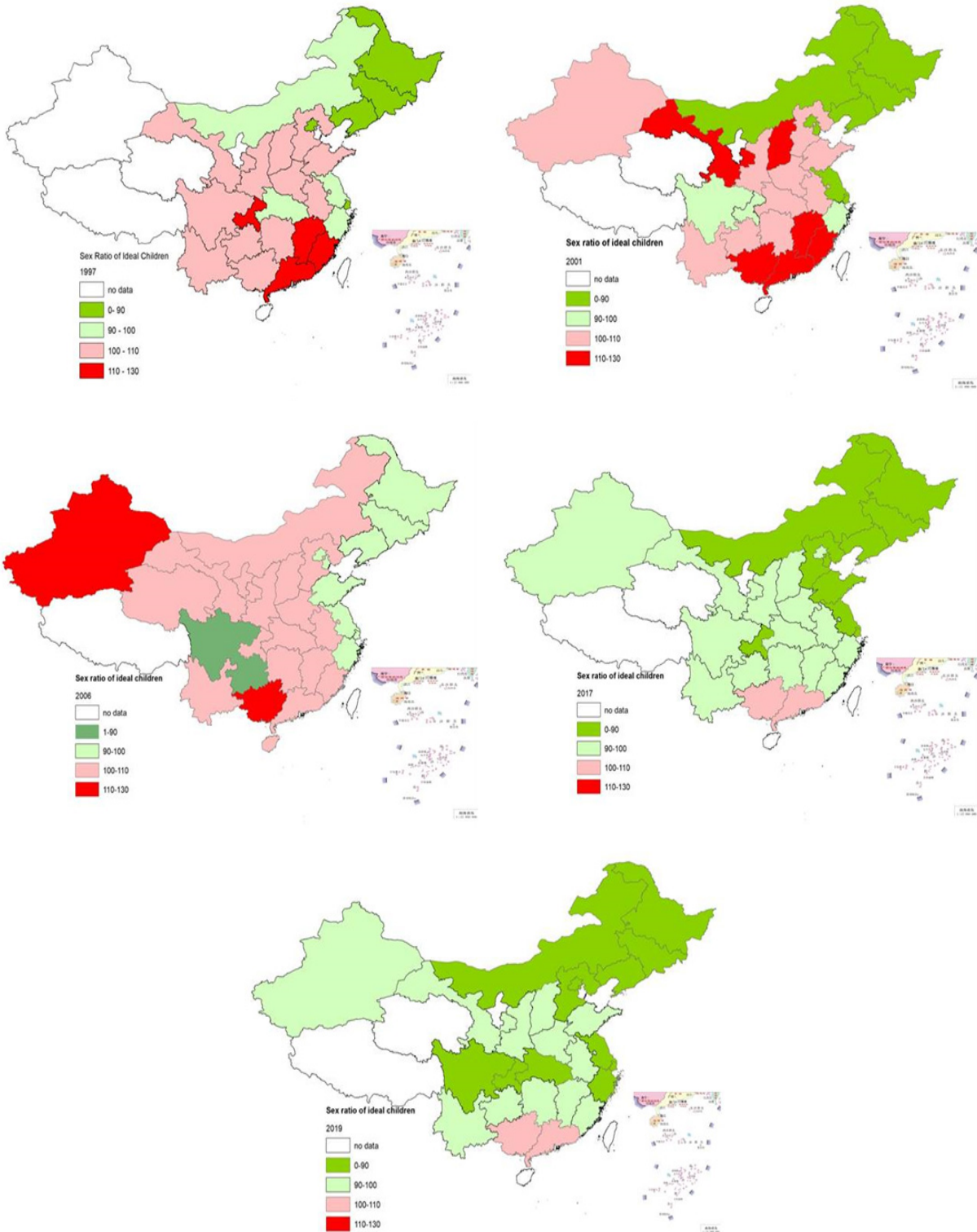


Figure 2 The Ideal Sex Ratio Among Children in Each Province in the Five Surveys

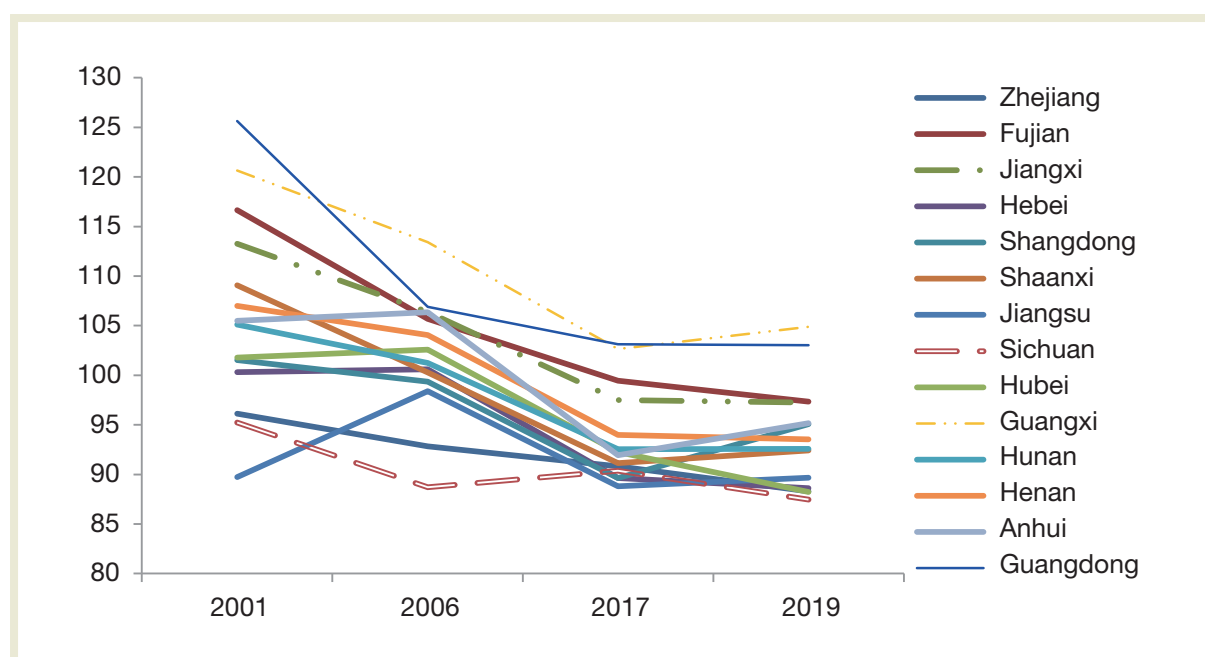


Figure 3 Changes in the Ideal Sex Ratio Among Children in the 14 Provinces with the Highest Contribution rate in 2000

Figure 3 shows the changes in the ideal sex ratio among children in 2001, 2006, 2017, and 2019 in the 14 provinces with the highest contribution rate to the national SRB in 2000. In terms of the ideal sex ratio among children, these provinces differed dramatically in 2001, with Guangdong and Guangxi remaining above 120 and Jiangsu and Zhejiang slipping below 100. From 2001 to 2019, the ideal sex ratio among children went down in all these provinces without exception, yet at different paces, with Guangdong, Fujian, and Shaanxi all falling by more than 15%, and Hubei, Jiangxi, Guangxi, and Henan all dropping by more than 12%. In contrast, there was little relative change between son preference and daughter preference in Jiangsu Province in the past 18 years. Despite the fact that the beginning ratios were varied and the changes occurred at varying rates, the direction in which gender preferences evolved was consistent across all provinces, reflecting the prominent tendency of convergence.

7. Relationship Between Gender Preferences and SRB

7.1 SRB at National and Provincial levels

7.1.1 Regional Differences in SRB

Taking 110 as the dividing line between minor and moderate SRB imbalances and 120 as the dividing line between moderate and severe SRB imbalances, during the period of 2010 to 2015, the number of provinces with severe SRB imbalance dropped from 9 to 2; provinces with

moderate SRB imbalance shrank from 19 to 13; provinces with minor SRB imbalance increased from 1 to 8, and provinces with SRB falling within the 103-107 normal range swelled from 2 to 7. In terms of trend, as of 2015, SRB had been reduced in the majority of provinces, remained stable from 2010, in eight provinces, and continued to rise in one province (Liaoning).

The national SRB in 2020, calculated using the "Interconnected Birth Registration Information Platform", is 111.09, slightly higher than the figure obtained from the Seventh Census (Jiang & Zhang, 2021). Between 2015 to 2020, there were still two provinces with significant SRB imbalances, i.e., Guangxi and Hunan in 2015, and Jiangxi and Hainan in 2020. Provinces with an SRB of more than 112 were concentrated in the southeastern coastline regions, as well as Hunan and Hubei, two southern provinces that are geographically bordered by each other. These provinces were also where son preference prevailed over daughter preference.

SRBs hover between 108 and 112 in most provinces, the number of provinces where SRBs fall below 107 has increased rapidly, and SRBs have returned to normal in 13 provinces (see Table 8 and Table 9). Overall, the SRB was declining in most provinces, with only 5 provinces (Jilin, Fujian, Jiangxi, Hainan, and Guizhou) seeing a slight increase in SRB from 2015 (see Figure 5). It can be seen that SRBs in most provinces had gone through the three stages of "rise, plateau, and decline", and different regions exhibited different characteristics — there were significant regional disparities in the stage and location of high SRB occurrence, as well as the degree and duration of high SRB.

Table 8 National and Provincial SRB in Major Years

Province	1982	1990	2000	2005	2010	2015	2020
National	108.5	111.45	116.86	118.59	117.94	112.59	111.09
Beijing	107.0	107.49	110.56	113.69	109.48	109.38	108.12
Tianjin	107.7	110.14	112.51	114.55	113.69	107.57	107.63
Hebei	108.2	112.49	113.43	120.08	114.88	111.31	108.91
Shanxi	109.3	109.64	112.52	116.21	110.22	108.80	104.47
Inner Mongolia	106.8	108.35	108.45	115.36	112.10	108.18	107.38
Liaoning	107.1	110.16	112.83	112.26	110.18	113.35	106.04
Jilin	107.8	108.67	111.23	112.45	111.18	106.34	111.78
Heilongjiang	106.9	107.30	109.71	109.64	112.41	112.00	106.17
Shanghai	105.4	104.83	110.64	117.22	111.15	102.48	107.70
Jiangsu	107.9	114.93	116.51	124.28	116.24	116.09	107.65
Zhejiang	108.8	117.64	113.86	113.56	118.13	109.90	110.31
Anhui	112.5	110.87	127.85	130.83	128.64	114.83	111.24
Fujian	108.6	110.29	117.93	122.02	125.59	108.08	118.06
Jiangxi	107.9	110.82	114.74	125.59	122.84	113.94	122.04

Shandong	109.9	115.12	112.17	114.09	119.41	110.91	110.57
Henan	110.3	116.21	118.46	115.39	117.77	112.51	108.11
Hubei	107.0	109.56	128.18	128.84	124.09	113.32	113.75
Hunan	107.6	110.25	126.16	121.30	123.23	121.08	113.05
Guangdong	110.5	111.99	130.30	118.93	120.34	119.46	113.65
Guangxi	110.7	116.91	125.55	120.68	122.68	122.89	112.13
Hainan	-	114.86	135.64	123.00	125.29	105.18	120.34
Chongqing	-	-	115.13	112.36	112.51	111.22	107.35
Sichuan	107.9	111.96	116.01	114.85	111.64	108.35	108.61
Guizhou	106.8	101.24	107.03	124.46	122.12	105.48	112.21
Yunnan	106.2	107.42	108.71	112.14	111.77	111.85	106.75
Tibet	101.3	103.22	102.73	104.04	106.61	105.79	106.02
Shaanxi	109.2	111.35	122.10	133.14	115.33	109.83	108.07
Gansu	106.3	110.82	114.82	114.79	117.37	109.94	108.46
Qinghai	106.2	104.36	110.35	116.29	112.40	105.19	106.26
Ningxia	106.2	106.96	108.79	106.81	113.86	114.00	106.68
Xinjiang	106.1	104.63	106.12	104.96	106.14	104.66	106.78

Source: Compilation of Manually Aggregated Data for the Third Census, Tabulation on the 1990 Population Census, Table 1-17; Tabulation on the 2000 Population Census, short form, Table 1-12; 2005 1% National Population Sample Survey, Table 1-8; Tabulation on the 2010 Population Census, short form, Table 1-12; 2015 1% National Population Sample Survey, Table 1-7; Data for 2020 are derived from the "Interconnected Birth Registration Information Platform". The following data on SRB also come from the above-mentioned sources.

Note: Certain numbers are in red, indicating an upward trend of SRB from 2010-2020 in these provinces.

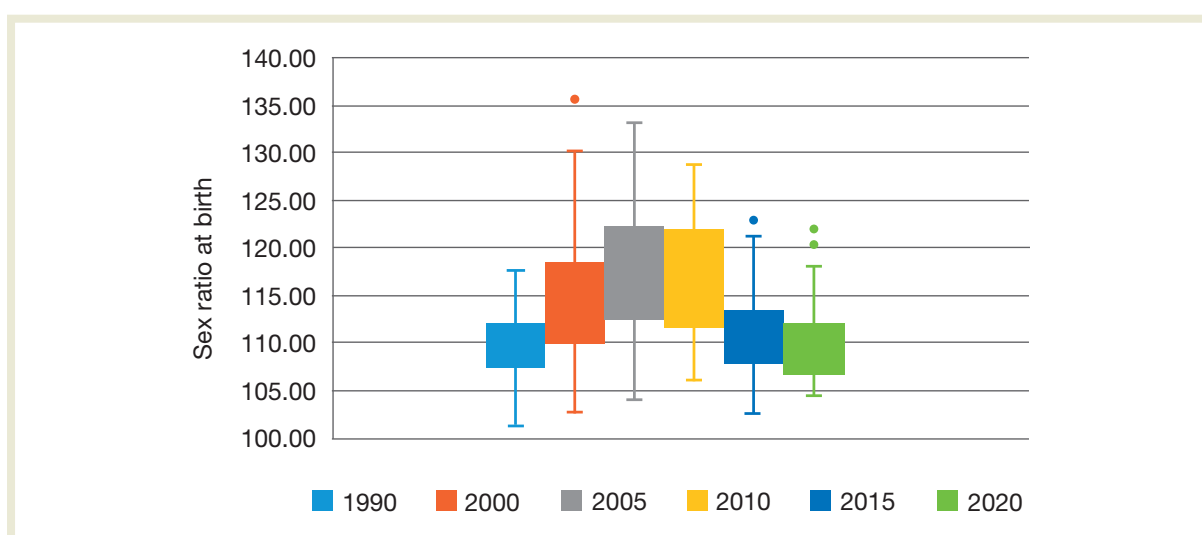


Figure 4 Boxplot of SRB in Different Years

Data source: The source is the same as for Table 8

Figure 4 and Table 9 show the distribution of SRB in different years and different provinces. Between 1990 to 2005, SRBs generally increased and inter-provincial disparities continued to widen. Beginning in 2010, SRB embarked on a downward spiral and accelerated its decline after 2015. As inter-provincial disparities gradually narrow, SRBs in the provinces are moving closer to normal.

Table 9 Distribution of SRBs in Respective Provinces in Major Years

SRB	1982	1990	2000	2010	2020
103-	Tibet (1)	Guizhou (1)	Tibet (1)		
103-107 (Normal)	Beijing, Tianjin, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Jiangxi, Hubei, Hunan, Sichuan, Guizhou, Yunnan, Gansu, Qinghai, Ningxia, Xinjiang (18)	Beijing, Heilongjiang, Shanghai, Yunnan, Tibet, Qinghai, Ningxia, Xinjiang (8)	Guizhou, Xinjiang (2)	Tibet, Xinjiang (2)	Shanxi, Tibet, Liaoning, Heilongjiang, Qinghai, Ningxia, Yunnan, Xinjiang, Chongqing, Inner Mongolia, Tianjin, Jiangsu, Shanghai (13)
108-109 (Minor imbalance)	Hebei, Shanxi, Zhejiang, Fujian, Shandong, Shaanxi (6)	Shanxi, Inner Mongolia, Jilin, Fujian, Hubei, Gansu (6)	Inner Mongolia, Heilongjiang, Yunnan, Ningxia (4)	Beijing (1)	Shaanxi, Henan, Beijing, Gansu, Sichuan, Hebei (6)
110-119 (Moderate imbalance)	Anhui, Henan, Guangdong, Guangxi (4)	Tianjin, Hebei, Liaoning, Jiangsu, Zhejiang, Anhui, Jiangxi, Shandong, Henan, Hunan, Guangdong, Guangxi, Hainan, Sichuan, Shaanxi (15)	Beijing, Tianjin, Hebei, Shanxi, Liaoning, Jilin, Shanghai, Jiangsu, Zhejiang, Fujian, Jiangxi, Shandong, Henan, Chongqing, Sichuan, Gansu, Qinghai (17)	Tianjin, Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Shandong, Henan, Chongqing, Sichuan, Yunnan, Shaanxi, Gansu, Qinghai, Ningxia (19)	Zhejiang, Shandong, Anhui, Jilin, Guangxi, Guizhou, Hunan, Guangdong, Hubei, Fujian (10)
120+ (Severe imbalance)			Anhui, Hubei, Hunan, Guangdong, Guangxi, Hainan, Shaanxi (7)	Anhui, Fujian, Jiangxi, Hubei, Hunan, Guangdong, Guangxi, Hainan, Guizhou (9)	Jiangxi, Hainan (2)

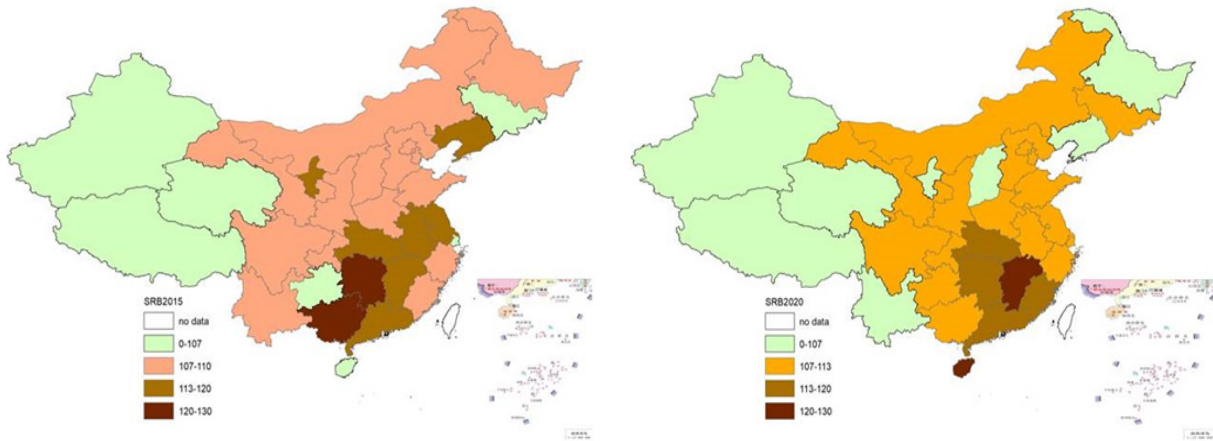


Figure 5 SRB of each Province in 2015(Left) and 2020 (Right)

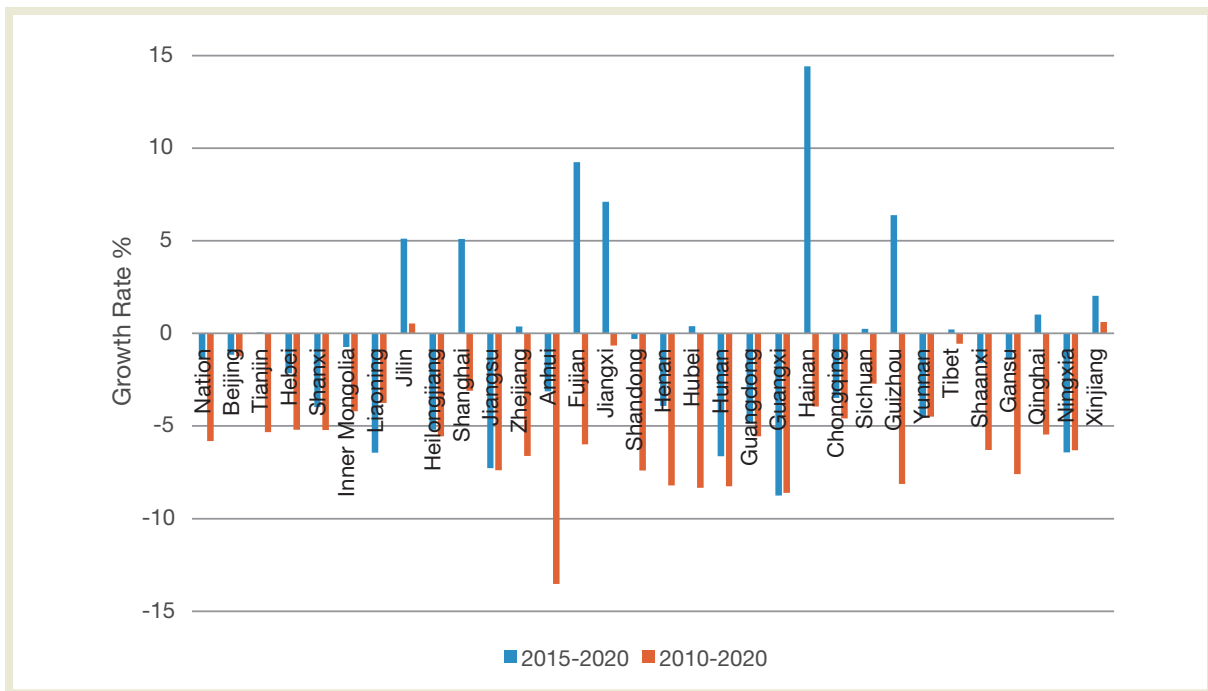


Figure 6 Growth Rate of SRB in each Province from 2010 to 2020 and from 2015 to 2020

Figure 6 shows the different rates of SRB transition in each province from 2010 to 2020 and from 2015 to 2020. In the decade between 2010 to 2020, all provinces witnessed a significant decline in SRB, with the greatest fall observed in Anhui Province. When reviewing the period from 2015 to 2020, it can be seen that while the majority of provinces are experiencing a reduction in SRB, certain provinces bucked the trend, with SRB marginally increasing, particularly in Hainan, Fujian, and Jiangxi. Against the backdrop of a general fall in SRB, a few places had moments of increase within a shifting SRB.

7.1.2. Contribution Rate of Each Province to the Skewed National SRB

The contribution rate of each province to the skewed national SRB was further analyzed, with the top 10 provinces with the highest contribution rates in 2010 and 2015 respectively listed in Figure 7. Since the number of births in each province after 2020 has not been published, calculating the contribution rate of each province in 2020 is impossible. In 2010, the cumulative contribution rate of the top 10 provinces reached 72.68%, indicating that these 10 provinces accounted for nearly three-quarters of China's skewed SRB. Among them, Anhui, Guangdong, Hunan, and Shandong contributed the greatest to the overall SRB changes in China.

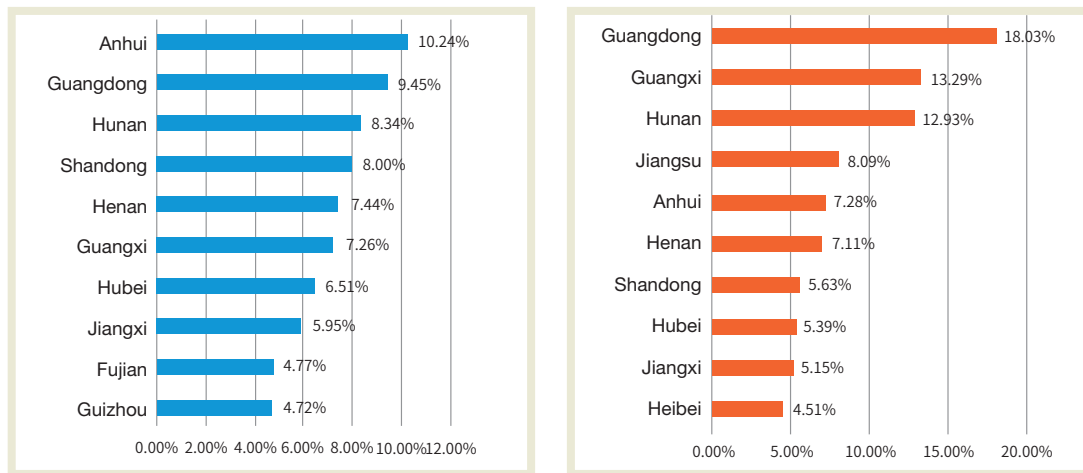


Figure 7 Top 10 Provinces with the Highest Contribution Rates in 2010 (left) and 2015 (Right)

In 2015, the cumulative contribution rate of the top 10 provinces reached 87.39%. Among them, Guangdong, Guangxi, and Hunan, all contributed more than 10%, and the total contribution rate to the national SRB tilt was 44%. Compared to 2010, 8 provinces remained on the list, with Fujian and Guizhou in 2010 being replaced by Jiangsu and Hebei in 2015. It can be seen that these 8 provinces stood out as the main contributors to China's skewed SRB. With SRB returning to normal in most provinces, the national SRB trend is increasingly being influenced by a handful of provinces due to their consistently high SRBs and a substantial number of newborns each year.

7.2 Correlation Between Gender Preference and SRB

By plotting the changing trends of the ideal sex ratio among children and SRB at the national level in Figure 8, it can be seen that the two trends are consistent, with the correlation coefficient reaching 0.956 ($p=0.011$), indicating that the change of SRB is closely related to the change of ideal sex ratio among children.

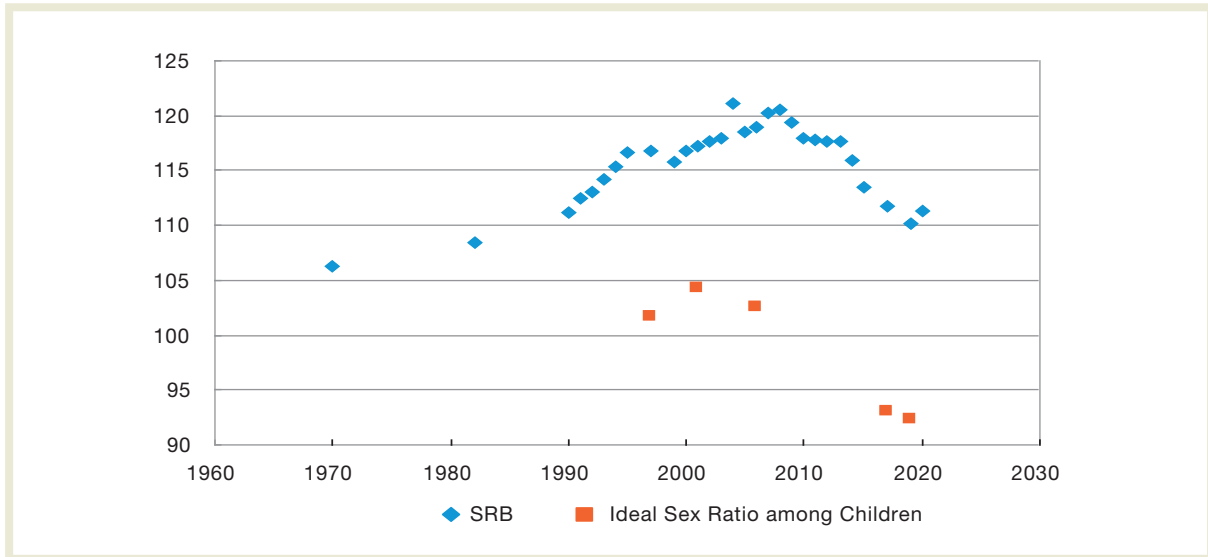


Figure 8 SRB and Ideal Sex Ratio Among Children at the National Level

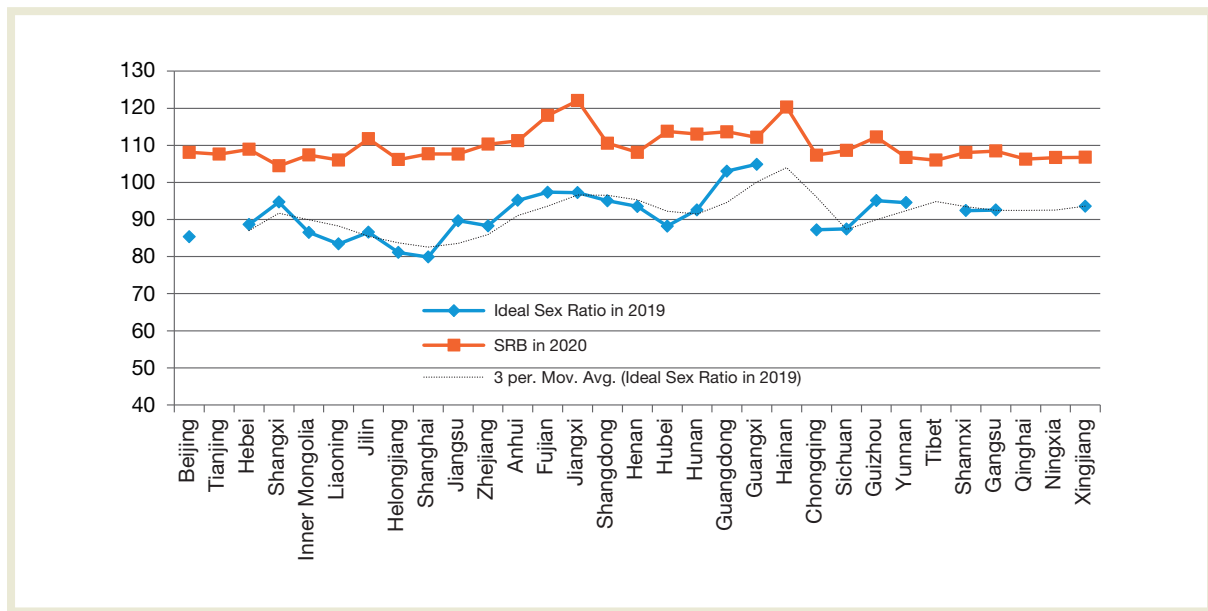


Figure 9 Ideal Sex Ratio Among Children in 2019 and SRB in 2020 at the Provincial Level

Figure 9 shows the correlation between the ideal sex ratio among children in 2019 and the SRB in 2020 in different provinces, with a correlation coefficient reaching 0.488 ($p=0.012$). The coefficient of the correlation between the ideal sex ratio among children in 1997 and the SRB in 2000 was 0.538 ($p=0.006$), suggesting a moderate correlation between the two. The correlation coefficients between the SRB in 2005 and the ideal sex ratio among children in 2016 and between the SRB in 2015 and the ideal sex ratio among children in 2016 were 0.18 and 0.47, respectively, and both were significant ($p<0.05$).

Gender preferences can guide our judgment of the future SRB trend, but it cannot be equated with SRB. Provinces with a higher ideal sex ratio among children in 2019 are not identical to provinces with a higher SRB in 2020. Since 2017, the ideal sex ratio among children at the national level has fallen below 100, but the national SRB remains high. First, the ideal sex ratio among children reflects the relative intensity of gender preference, and it takes time for gender preferences to translate into behavior, as there is a lag in the influence of gender preferences on reproductive behavior. Second, the decline in SRB is correlated with not only the gender preferences for children, but also factors such as the availability of fetal sex selection techniques, the extent of high SRB, the duration of high SRB, and the length of SRB decline. Provinces differ from each other regarding how their SRBs increased or decreased (Li Shuzhuo et al., 2011).

8. Conclusions and Discussions

8.1. The changes in gender preferences have led to the changes in SRB

Overall, at least in 2017, China has completed the transition from son preference to daughter preference despite people's continued pursuit of balance preference. As the ideal combination for children, "balance preference" has not fundamentally changed, but "don't mind" and "daughter preference" have surpassed "son preference" as sub-ideal choices. From longitudinal observation, there are differences in daughter preference and son preference change. Daughter preference rise rapidly in the early stages, but then waned in parallel with son preference, with son preference subsiding at a faster pace. Due to the differences between male births and female births, as reflected in SRB, the ideal sex ratio among children dropped rapidly, thereby bringing down the SRB.

From regional observation, the gender preference in most provinces shows a relatively "daughter" tendency, and manifested in the fact that the ideal number of daughter exceeds the ideal number of sons, and the ideal sex ratio among children is lower than 100. Son preference prevailed only in Guangdong and Guangxi provinces. From a longitudinal perspective, provinces with an ideal sex ratio among children inclined to son preference kept increasing between 1997 to 2006, but the situation changed after 2017 when provinces with an ideal sex ratio among children inclined to daughter preference became the overwhelming majority and there was a steadily increasing number of provinces with stronger daughter preference.

There seems to be a strong correlation between gender preference and SRB. Between 1997 and 2006, "son preference" and skewed SRBs grew at the same rate across China, yet after 2017, the gender preferences reversed and SRBs gradually are on the brink of getting back to normal both at the national and provincial levels. High SRB has evolved from a national issue to a regional issue. In certain provinces with a relatively severe "son preference", SRB still lingers on the precipice of a severe disparity. Given a large number of newborns in these provinces, they are holding back the speed with which the national-level SRB can return to normal.

8.2. The Return of China's SRB to Normal is Foreseeable in the Future

SRB imbalance is a patriarchal expedient technique for grappling with the demographic transition and fertility decrease, as well as the result of how people with a strong son preference actively seek fetal sex determination and selection amid the fertility squeeze. In the context of declining fertility, the gender preference for children determines whether and how different countries and regions will undergo such a decline. Globally, the increase in SRB is deemed a stage-specific phenomenon during the first demographic transition of countries with strong son preference, where the demographic transition is often split into two stages. The first stage is characterized by the transition of fertility level, which is essentially the changes in the preferred number of children and the preferred timing for childbirth. The second stage is characterized by the transition of SRB, which is essentially the change in the gender preference for children. Having completed the transition of SRB, both South Korea and China's Taiwan Province have undergone a transition from "son preference" to "daughter preference" and "no preference", with their SRBs also going through the three stages of "rise, plateau, and decline" (Guilmoto, 2009; Tin-chi Lin, 2009; Heeran C & Monica D.G. 2021). The demographic transition in China also features a shift in gender preferences.

Due to the increasing dominance of "no preference" and "daughter preference" in China, it is foreseeable that China's SRB will continue to decrease in the coming years. Given the regional differences and the asynchronous changes in gender preferences among regions, occurred in different trajectories in different locations. Due to the lag of cultural transition, the stronger the gender preference is, the longer it takes for the gender preferences to abate, and the longer it takes for the SRB to reverse. In the long run, the shift in gender preference will accelerate the conversion of SRB from "severe imbalance" to "moderate/minor imbalance," and gradually to a normal level in provinces where SRB is still remarkably high.

8.3. The shift in gender preference is objectively inevitable

The shift in gender preference in South Korea and China's Taiwan Province can be attributed to conceptual changes driven by socio-economic growth, the ever-improving social security system, the rising education level among females, and ever-increasing urbanization, which combined have spurred a rudimentary shift of the role of adults from providing "financial security" to providing "emotional support". Women born in the 80s and 90s who have acquired secondary and university education have now become the new reproductive force, and they are less likely to have a preference against the sex of their children and may even prefer daughters (Tin-chi Lin, 2009; Heeran C & Monica D.G. 2021). Furthermore, "while the economy is booming and society is changing rapidly, discriminatory gender preferences are gradually disappearing, and a social atmosphere of gender equality is gradually taking shape" (Chen Youhua, Hu Xiaowu, 2012). With urbanization entirely altering traditional rural civilizations in China, people's passion for family line continuation has substantially decreased; the fertility decision-making has returned to the rational choices made by the families; both sons and daughters now share the same economic functions and the same responsibilities for elderly support, and the large gap

in the relative value between son and daughter is gradually diminishing. Given the fact of "men outnumbering women" in the marriage market, the cost of marriage for sons is much higher than that for daughters (Kang Chuankun et al., 2020). A condo is a prerequisite for marriage in China, most parents cannot afford to purchase more condos for their son as the housing prices have skyrocketed in China, but parents are not required to buy a condo for their daughter. This makes raising a son a "less cost-effective" investment than raising a daughter.

The intensity of gender preference is also weakening. Against the backdrop of rising living standards and fierce social competition, the physiological, economic and opportunity costs of pregnancy are constantly rising for a woman. Recognizing the dangers posed by fetal sex selection on fertility and health, people are placing a higher priority on the life of fetuses. The influence of gender preferences on people's behaviors is also fading away and has gradually returned from the behavioral level to the conceptual level.

8.4 The Relaxation of Fertility Policies has also Contributed to the Decline in SRB

Whilst the shift in the gender preference for children stands out as the main driving force behind the decline in SRB, the easing of national fertility policy has also, to a substantial degree, freed up fertility space that had previously been constrained. China has, since 2013, successively rolled out the "Selective Two-Child Policy", the "Universal Two-Child Policy" and the "Three-Child Policy", thereby freeing the fertility space of people of childbearing age, and making the number and quality of children substitute for each other once again under the new stipulations — a transition from "quality for quantity" to "quantity for quality". It has been observed that with the implementation of the "Universal Two-Child Policy," the SRB for second and third births dropped significantly as people no longer use sex selection in the second and third births. Although the SRB for second and third births remains higher than that for the first birth, such a decline has objectively brought down the overall SRB (Liang Hong, 2018; Jiang Q, Zhang C., 2021). On the one hand, this decline is a consequence of the weakening of son preference; on the other hand, people now can choose the number of births on their own, and hence they can replace "gender" with "quantity" to make up for the dissatisfaction with the gender composition of their children.

The widespread decline in fertility desire is holding back people's pursuit of the ideal gender composition of children. While the number of births remains a prerequisite for the realization of parents' gender preferences for children, in the context of a low fertility rate, the interactions between the gender of children and the number of births have unveiled an intricate relationship that is very different from the past. Presently, both son and daughter preferences are beginning to wain, and balance preference is gaining momentum, yet it stays at the conceptual level. However, due to the lack of a pro-natalist social environment, fertility desire is declining among couples and low fertility has become a real problem plaguing China. Several issues, including the family's financial status, personal career development, and the availability of quality, affordable childcare are weighing heavily on people's desire to have more children. When people are

reluctant to have more children, the realization of ideal gender preference is not a solid enough reason to pursue further births.

8.5. Reliability and Limitations of Research Conclusions

The reliability of the data determines the accuracy of the conclusions. Most of the debates surrounding the decline in SRB focus mainly on the authenticity of birth registration data, with some arguing that the SRB might have been distorted by false data, which led to a decline in SRB that is both true and false (Huang Honglin & Zhou Liping, 2004). The data on gender preferences used in this study come from several sweeping sample surveys organized by the government. Before the launch of the "Universal Two-Child Policy" in 2015, the Chinese government established the "Caring for Girls Campaign" to clamp down on "illegal fetal sex determination and sex-selective abortion". Therefore, it cannot be ruled out that some respondents may conceal their true attitudes, adopt "self-protection strategies" and even cater to social expectations in the face of external pressure (Yang Yiyin & Zhang Shuguang, 2008). The proportions of son preference obtained in 1997, 2001, and 2006 surveys are likely the "bottom line" of respondents' true attitude, while those of daughter preference and no preference are most likely higher than the true levels.

The situation is supposed to have eased after the roll-out of the "Universal Two-child Policy" in 2015, and hence the results of the 2017 and 2019 surveys can be considered more reliable. From this point of view, the decline in the proportion of son preference and the increase in the proportion of daughter preference and no preference are likely to be underestimated in this study. The finding of this study — the ideal sex ratio among children has gradually fallen below 100 — has been confirmed by another related study (Zhuang Yaer et al., 2021). There are good reasons to believe that the shift in gender preference is correct and real.

There are certain limitations in this study. To begin with, the Seventh Census, conducted in 2020, did not publish the number of infants by province, education level, birth cohort, or birth order. Therefore, the analysis of the latest SRB in this study could only be based on the data derived from the "Interconnected Birth Registration Information Platform", and the results may deviate from the census data. Second, the five surveys employed different standards for surveying the ideal number of children, with the sample size being extremely small and the survey period being exceedingly long in certain surveys. These factors compromised the in-depth and accurate analysis of the temporal changes and regional differences in gender preferences. Third, this study only analyzed gender preferences at the desire and attitude levels, and SRB is a macro-indicator at the behavioral level. To better measure gender preferences, it is suggested to include family and individual indicators such as the gender composition of existing children in the survey. Fourth, the causes of the shift in gender preference need to be further analyzed.

9. Policy Implications

The principle of classified guidance should be adhered to. In particular, emphasis should be put on a handful of provinces that are falling behind the predominant shift in gender preference. There are three types of provinces in China. The first type of province includes Hainan, Anhui, Jiangxi, Fujian, Guangdong, Guangxi, Hunan, and Hubei, where son preference is still relatively strong, the shift in gender preference still lags, and the SRB remains relatively high. Existing attempts to reign in the high SRB must not be eased in these areas, particularly in Guangdong, where the sheer magnitude of the newborn population could put a significant dent in the national SRB. The second type of provinces include Zhejiang, Shandong, Shaanxi, Henan, Gansu, Sichuan, Hebei, and Guizhou, where gender preferences and SRB are both at the average level, but it is still necessary to pay close attention to future trends. The third type encompasses the remaining provinces, where both SRB and gender preference are improving.

In the first type of province, to increase advocacy and promotion of gender equality, efforts must be made to strengthen collaboration with the Women's Federation and the media. Seizing on China's push for implementing the Outline (Guiding Opinions) for the Development of Women (2021-2030), the Outline Guiding Opinions for the Development of Children (2021-2030), and the fertility support measures for the "Three-Child Policy", efforts must be made to improve women's education levels, to promote gender equality in the workplace, family, and society, to eliminate discrimination against girls and women, and to hasten the transition from gender preference to "no preference". Measures should be taken to continue to prevent "illegal fetal sex determination and sex-selective abortion", and to continue monitoring the application of new techniques for fetal sex determination and the use of assisted reproductive technologies for sex selection.

We must strengthen the monitoring and analysis of SRB. We can use data from the Seventh Census to begin a complete examination of the features of SRB in different regions according to parity, residence (urban or rural), education level, and ethnic group. We can also harness resources such as hospital delivery records, birth certificates, and interconnected administrative registration data to establish a multi-source data comparison and evaluation mechanism for the newborn population, including census, household registration, and hospital birth records. We can play to the advantages of big data and emphasize the foresightedness and effectiveness of early warning through data monitoring, thereby gradually making the shift from the passive response to high SRB to the active prevention of skewed SRB.

Concerning the first type of provinces, we should strengthen the survey and research of gender preferences at the attitude and behavioral levels and the types and intensities of such preferences, start an in-depth analysis of the causes underlying the shift in gender preference, and dig into the impact of socio-economic development and cultural transition on the shift in gender preference. We must investigate the various patterns of SRB changes in the context of China's extremely low fertility rate, based on changes in fertility level and gender preference in individual regions.

We must carry out in-depth case analysis of regions with representative SRB changes, and at the same time strengthen the summarization of governance experience and lessons learned from different provinces. While the total population of some Chinese provinces may be comparable to that of a nation, changes in SRB in specific provinces are particularly representative, and these provinces differ noticeably from their counterparts in terms of economic development, historical and cultural traditions, and fertility decline trajectory. For example, Zhejiang Province was the first to see its SRB increase and also the first to see it decrease even though its SRB has not yet returned to normal. The economically-developed Guangdong Province was also among the first provinces to see its SRB going up, and now the province finds it hard to bring the distorted SRB down. Big cities with long-lasting low fertility rates but high SRB can be exemplified by Beijing and Shanghai. In these provinces and municipalities, the rise and fall of SRB are reflective of the influence of demographic laws, and their governance experience is also worthy of study, recording, and summing up.

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