Fertility, son preference and sex-selection transition in China: an analysis of 7 provinces

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Introduction

A strong masculinization of the SRB has been well documented since the 1980s in China (Zeng et al 1993; Poston et al. 1997; Bossen 2005; Goodkind 2011) and interpreted as evidence of prenatal sex-selection against females (PSS). It displays not only parity-specific differences but also regional differences. The highest sex-ratios have been recorded in the central and south of the country, in the highly populous provinces of Henan, Jiangxi, Anhui, Guangdong, and Hainan.

By the 1982 census of China 18 provinces had a biased sex ratio at birth, comprising 78.58% of the total population. However, none of them had a sex ratio higher than 115. Until 2000, except for Tibet and Xinjiang, the sex ratio at birth for the rest 29 provinces is higher than the normal range. There are 9 provinces and autonomous regions as Fujian, Henan, Shaanxi, Guangxi, Hunan, Anhui, Hubei, Guangdong and Hainan with a sex ratio higher than the national average. Among them, 7 provinces have a sex ratio of more than 120 and 11 provinces has SRB above 120 by 2005. The population of these 11 provinces with seriously skewed SRB, accounts for 41.23% of the total population of the country. Another 16 provinces, accounting for 51.58% of the total population of the country, recorded moderately imbalanced sex ratio at birth, between 110 and 120. The overall sex ratio at birth in 2010 census didn't change much. The 2010 census counted 15 provinces with a sex ratio higher than the national average, comparing only 9 in 2000, although a number of provinces witnessed some reduction in the sex ratio at birth between these two census.

The one-child policy has been suggested as a cause of the increasing unbalanced sex ratio at birth. The likelihood to have a son reduces exponentially with a reduction in the number of children within a family (Dubuc and Coleman, 2007; Dubuc 2018). If parents want fewer children but a son they are increasingly under pressure to use PSS to reconcile their gender and family size ideals; this was coined as the *fertility squeeze effect* by Guilmoto (2009).

In addition to the family level fertility squeeze effect, change in fertility tend to amplify or dilute the impact of individual interventions (sex-selections) on the aggregated SRB (Dubuc and Sivia, 2018). As a result, although a bias in the SRB is indicative of PSS, it may not be fully accurate in estimating trends in PSS. Dubuc and Sivia (2018) proposed a new indicator of PSS correcting for the disproportionality effect of fertility change that is distorting the aggregated SRB. We are building on this work to revisit trends in PSS in seven selected Province of China between 1986 and 2017, which has a long history of distorted sex ratio at birth.

Research has shown that where couples are allowed a second child after a girl, gender bias at higher order births are driving the SRB unbalance The highest sex ratios for second order births

and the overall highest sex ratios, as seen in Henan, Anhui, Jiangxi, Hunan, Guangdong, and Hainan. These are largely more traditional, predominantly agricultural provinces, where bearing sons is still seen as necessary for long term security. This, in turn, question the role of the fertility squeeze and traditional representations and attitude to gender underlying PSS.

We analyse trends in PSS practice in seven provinces which record moderate to severe SRB unbalances. We calculated the sex-selection propensity proposed by Dubuc and Sivia (2018) to map PSS prevalence and trends. We discuss our findings accounting for fertility changes. In particular, we compare and comment the differences between SRB and PSS trends, the diffusion of PSS across the study areas, differences in son preferences and the PSS transition.

Method

We used two yet untapped data sources—1) the 120 Counties Monitoring System (120 CMS) and 2) the Birth Registration System (BRS) to examine the trends of sex ratio at birth and fertility. The 120 CMS data were used to reconstruct SRB and TFR in 1990-2014, while the BRS data is used for the most recent period, 2015-17.

As of 2016 the 120 CMS data provided a complete coverage of births in 117 sites in 28 provinces with a total population of 128.4 million (9.4% of total China population), with only three provinces, Zhejiang, Yunnan and Tibet, not represented. The sites were selected to cover both urban and rural as well as more and less economically developed areas across China (Table 1). Unlike other data sources used to estimate fertility trends in China, which often suffer from problems related to under-registration of births or incomplete population coverage, the 120 counties monitoring system provides a high coverage of counties population, births, and marriages. We included 49 counties in these 7 provinces in our analysis, for which the estimated cohort fertility indicators were comparable with those coming from other sources (e.g. the 1990, 2000 and 2010 censuses), and where levels and trends in cohort fertility and childlessness showed continuity across cohorts and reached plausible levels. Together, these 49 counties have a total population of 46.65 million, i.e., 3.47% of China's population in 2010.

The more recent BRS covers total China population and was established via the National Family planning data-sharing platform in 2014 Although the 120 CMS data were not representative of the whole country, the reconstructed changes in SRBs are close to several other sources and, more important, they closely overlap with the BRS for the period 2015-2016, also with respect to the SRB by birth order.

We use the indicator of sex-selection propensity (Phi) proposed by Dubuc and Sivia (2018), that reconcile observed TFR and SRB, to estimate the average propensity for couples to use sex-selection, across the seven provinces of the study and over time from 1986 to 2017. We use descriptive statistics and analyse the relationship between TFR and Phi and SRB and Phi using a series of graphs and linear regression models.

Table 1 Selected social and economic characteristics of 7 provinces of China analysed in this study

Province	No. of counties analysed	Population in analysed counties	Share of province population	Population with local *Hukou*	Share of minorities	Share of households registered with urban *Hukou*	Urbanization Rate	Sex ratio at birth (boys per 100 girls)	Policy fertility (1999)	GDP Per Capita
		(Million	%	(Million)	%	%	%			(¥10,000)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Hebei	7	3.44	4.8	3.4	1.7	27.1	46.3	99	1.59	11.4
Shandong	9	7.75	8.1	7.89	0.9	19.1	47.0	122	1.45	6.7
Guangdong	8	19.13	18.3	7.28	4.3	19.2	85.3	124	1.41	7.3
Anhui	6	4.41	7.4	5.91	1.0	12.5	29.5	132	1.48	4
Jiangxi	4	2.01	4.5	2.12	0.3	38.2	47.1	121	1.46	4.6
Henan	9	5.97	6.4	6.69	1.6	15.6	34.0	117	1.51	3.9
Hunan	6	3.94	6.0	4.35	0.3	15.7	39.2	123	1.48	4.2

Sources:
(1): The basic information of the 120 counties monitoring system.
(2)(3)(4)(5)(6)(7)(8): Tabulation on the 2010 Population Census of the People's Republic of China by county, China Statistics Press, 2012; SRB is calculated by the number of population aged 0 by sex in 2010 census.
(9) Gu, B., Wang, F., Guo, Z., and Zhang, E. (2007). China's local and national fertility policies at the end of the twentieth century. Population and Development Review, 33(1): 129–148. doi:10.1111/j.1728-4457.2007.00161.x.
(10) http://data.stats.gov.cn/easyquery.htm?cn=E0103
Notes:

(1) Household registration, or hukou, is one of the most important elements in China's birth planning policy (Scharping 2003; Wang 1996). There are two general categories of hukou: agricultural and non-agricultural (sometimes referred to as rural and urban). Under this system, a person's hukou is determined at birth, and changing hukou is nearly impossible, with rare exceptions. Regarding to fertility policy, people with urban hukou usually only can have one child with very rare exceptions while people with rural hukou can have a second child if first birth is a daughter during one-child policy period. The fertility policy is determined by people's hukou, not by their actual place of residence.

(2) Data for each province is based on the sampled counties in the 120 counties system.

Results

We produced series of TFR, SRB and Sex-selection propensity (Phi) for all provinces as illustrated for 2005-07 mean levels reported in figure 1. We observe a lot of variation in the maximum level of sex-selection and the peak period across provinces (table 2).

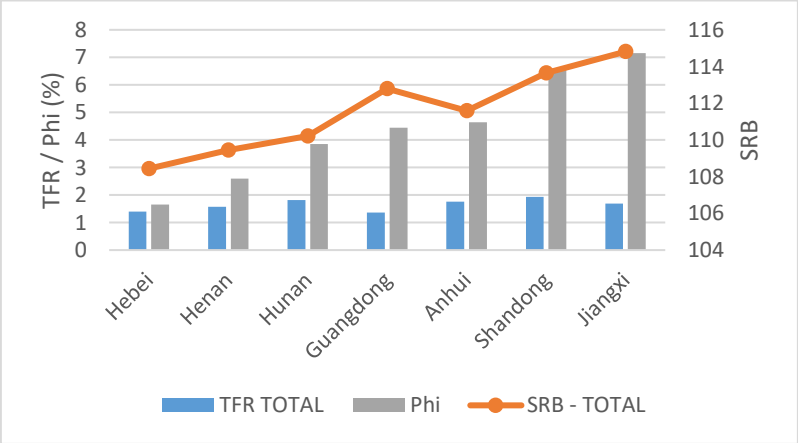

Figure 1: *TFR, SRB and sex-selection propensity (Phi) in 2015-17.*

Table 2: *Level and timing of the maximum of sex-selection before decline, by province.*

	Phi_max (%)	Date
Henan	26.3/24.8	1990/2002
Anhui	19.9	2004
Jiangxi	17.4	1998
Shandong	17.3	2012
Guangdong	14.3	2000
Hunan	11.0	2002
Hebei	10.4	2002

Source: CMS, BRS data. authors' calculations

Overall, fertility reduced in the late 1980s and 1990s, with the TFR ranging from below 1 to 1.6 across the seven provinces in 1995-97 (Figure 2). It is when the relationship between Phi and the TFR became stronger, expressing the fertility squeeze effect on sex-selection practice. In the most recent period, overall fertility increased, although with some variation across provinces – with the mean TFR ranging between 1.6 and 1.9 in 2015-17, and the relationship between Phi and TFR weaken.

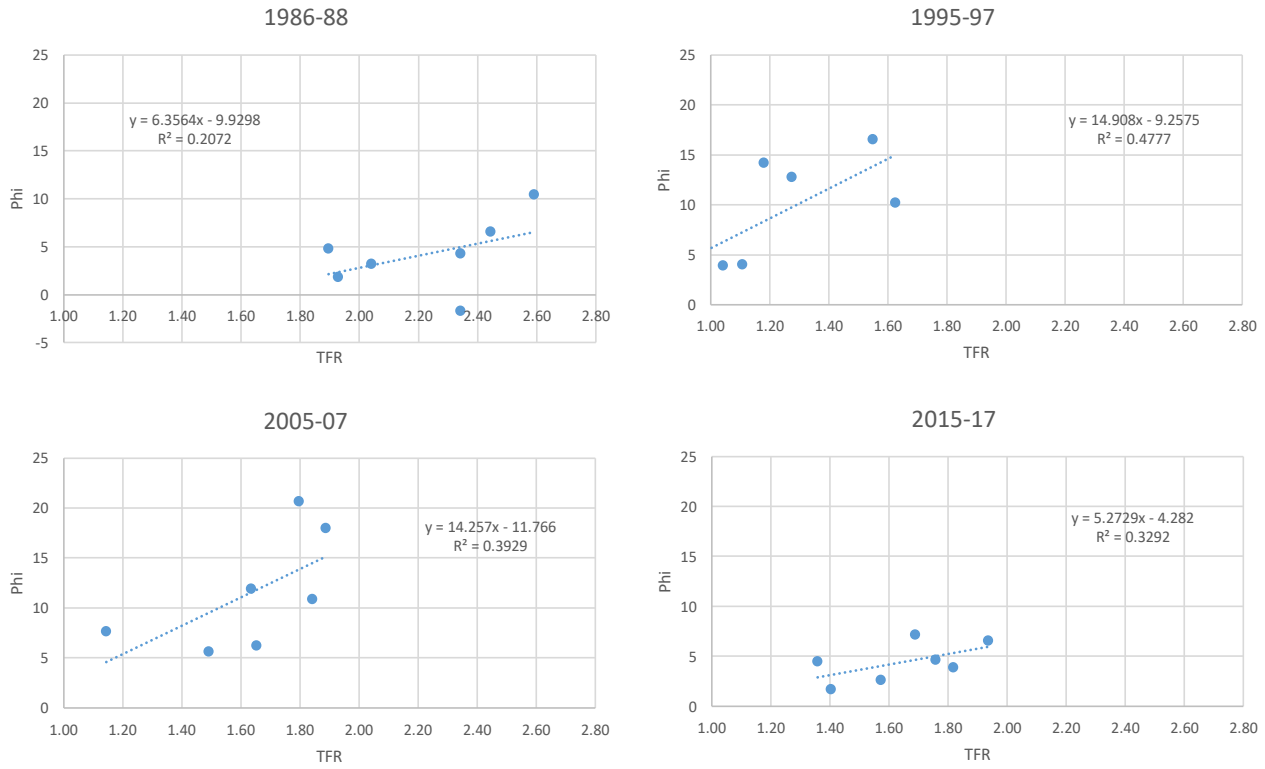

Figure 2: *The link between sex-selection practice and fertility level*: variation over time.*

* Three years mean values are shown.

Source: CMS, BRS data. authors' calculations

Unsurprisingly, there is a strong linear relationship between the SRB and Phi levels. Here we focus on the departure from the fitting line, as exemplified for the period 2005-07 in figure 3. The departure (or residual of the linear regression) is explained by the disproportionality effect of fertility on aggregated sex-ratio. The analysis is repeated for other periods showing maximum departure of the SRB in the 1990s to the early 2000s period corresponding to the period of fertility decrease to lowest levels overall.

The time series also allow to analyse in detail the relationship between SRB and sex-selection for each province. For instance, Henan sex-selection maxima in 1990 preceded the peak in SRB bias (1991). The later was triggered by the disproportionality effect of a rapid reduction in fertility between 1990 and 1991.

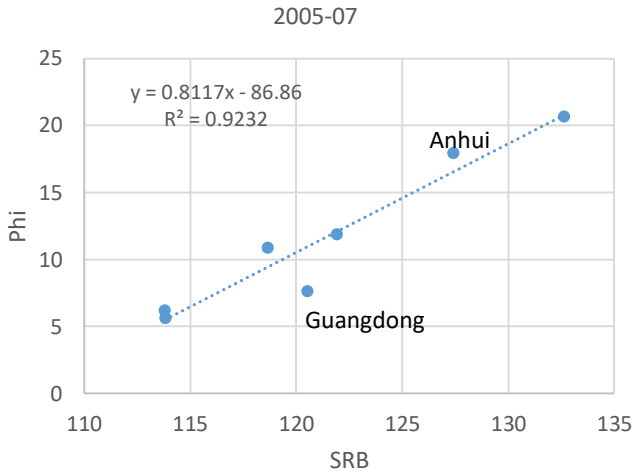

Figure 3: *SRB and sex-selection linear relationship in 2005-07*

Discussion

The combined results shown in figures 2 and 3 provide new insights into change in son preference, and allow disentangling the effect of the fertility squeeze and son preference intensity underlying sex-selection and their respective influence over time.

The draft of the paper is in process.

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