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# "Missing Girls" in China and India: trends and policy impacts

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## Abstract

The recent censuses of China and India show that the ratio of boys to girls has fallen in China, while the pace of increase has fallen in India. In both countries, the ratio has fallen most in areas that had the highest child sex ratios earlier, while rising in some surrounding areas. State policies to reduce sex-selection show mixed results. There is little evidence that financial incentives encourage parents to raise girls, and limited evidence that bans on health providers are effective in reducing prenatal sex-selection. In China, the census data show a sharp shift towards sex-selection at the first birth. This is likely related to the mode of implementation of a program to reduce sex-selection, which has been revamped and intensified in light of these census results. Studies show that media outreach can change norms, including on son preference, suggest that this is the simplest and most effective way of reducing sex-selection.

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Sex-selection to raise sons rather than daughters has attracted much attention for both humanitarian reasons as well as concern about the potential negative fallout of having high proportions of unmarried men. While sex-selection is practiced in several countries, the phenomenon raises the greatest concern in China and India. With their huge populations, they account for the overwhelming majority of "missing girls". Given the size of their populations, it will also be difficult for these countries to import enough brides to meet the shortfall.

The censuses of 2010 in China and 2011 in India enable analysis of the trends in their patterns of sex-selection. On the basis of earlier data, some argued that sex-selection may be trending downwards in these countries (Das Gupta et al 2009, Guilmoto 2009). The new census data confirm a decline in child sex ratios in China, as well as in the Northwestern states of Punjab and Haryana, which have been huge outliers in India in levels of sex-selection for over a century. For India overall, the child sex ratios are still rising, though at a lower pace than before.

The recent trends are also of interest since in both China and India there have been major programs to ban prenatal sex determination and/or sex-selective abortion, offer incentives to parents to raise girls, and conduct advocacy to reduce son preference. There are only a few rigorous evaluations of these programs, largely because of data limitations. We summarize the approaches used by the major programs, and the available evidence on their impact. Studies in India indicate at most a modest impact of the financial incentives and perhaps also the ban, but that media exposure helped reduce son preference. For China, the census data analyzed here show that some of the policies have had a strong impact on patterns of sex-selection.

Section 1 analyzes trends in "missing girls" in China and India between 2000/1 and 2010/11, while Section 2 discusses the policies followed in these countries to reduce sex-selection and the available evidence of their impact. Section 3 concludes.

## 1. Trends in "missing girls" in China and India during the 2000s

This analysis focuses largely on trends in child sex ratios, rather than on sex ratios at birth. This is for two reasons. First, child sex ratios reflect both prenatal as well as postnatal sex-selection. Postnatal sex-selection was high earlier in both China and India and persists today, so it is an important factor in assessing trends over time. Second, in both countries the data on child sex ratios are much more robust than those on sex ratios at birth, as discussed below.

Figure 1 shows the changes in child sex ratios in China and India, and for the two Northwestern Indian states that have historically had far higher levels of sex-selection than the rest of the country. Data for South Korea are added as a comparator, and include their 1995 and 2005 census data since these were full censuses. Data from the 1% sample census of China are shown in dotted lines, since these data are not directly comparable with those from the full censuses.

Child sex ratios in India continued to climb in the 2000s but at a slower pace than before (Figure 2). In China they rose sharply in the 1990s and fell by nearly 1% in the 2000s. The 1% sample census data of 2005 suggest that much of this decline may have taken place in the second half of the decade, but the data from the full and 1% sample censuses are not directly comparable with those of the full decadal censuses (Figure 3), as discussed below.

### *1.1 Data sources*

China held full censuses in 1982, 1990, 2000, and 2010. It also conducted 1% sample censuses in 1995 and 2005. The census data offer two kinds of information on levels of sex-selection: child sex ratios and the sex ratio at birth. Our analysis relies largely on the trends in child sex ratios, for several reasons.

First, sex ratios at birth estimated from Chinese census and survey data have a serious problem of under-reporting of infants, as noted by several Chinese demographers. Zhang and Zhao (2006:315) have noted that children born close to the time of enumeration tend to be under-reported in all major sources of fertility data in China. China's fertility policies provide a powerful incentive for both parents and officials to underreport births, in particular out-of-quota births. The under-reporting of infants (of both sexes) has considerable implications for estimates derived from births in the past year (Zhang and Zhao 2006; Zhai and Tao 2010).[1] In the 2010 census, the number of children rose smoothly with each successive birth year, from 15.2 million aged 4 to 15.7 million aged 1, but then dropped by 12% to 13.8 million at age 0 (<1 year) − both boys and girls were under-reported. Child sex ratios offer more robust estimates than births in the past year, since children aged 1-4 are far better enumerated and constitute most of the children in the child sex ratio.

Second, sex ratios at birth may include some sex-selection done immediately after birth (infanticide), but child sex ratios capture the net effect of prenatal and postnatal sex-selection in early childhood. There is a gender gap in infant and child mortality in China (Figure 4), beyond cases of infanticide captured in sex ratios at birth.

The data from China's 1% sample censuses are not directly comparable to the full censuses. The quinquennial trends show that the 1% sample census of 1995 substantially over-estimated child sex ratios compared with the full decadal censuses (Figure 3). Child sex ratios shot up between 1990 and 1995, and only modestly more by 2000. This effect is evident, though perhaps more muted, in the 1% sample census of 2005.

India only conducts decadal censuses of the whole population, avoiding the complexities introduced by sample censuses. However, Indian census data have a problem in that the pattern of age-misreporting differs for girls and boys. By age 7, these differences cancel each other out, so the child sex ratio in India is calculated for the age-group 0-6, in contrast with the Chinese (and global) norm of calculating it for ages 0-4.

It is in the nature of censuses that their coverage varies between censuses. This applies also to sex ratios estimated from the censuses.[2] Nevertheless, for analyzing trends in "missing girls" full population censuses have strong advantages over surveys, with their relatively small sample sizes. And vital registration systems are still a work in progress in both China and India (Li et al 2010, Tiwari 2011). The Indian Sample Registration System offers some estimates of birth and death rates and sex ratios at birth, but fluctuations due to sample size require that estimates such as that of the sex ratio at birth are presented as moving 3-year averages.

For all these reasons, the child sex ratios from the full decadal censuses of China and India offer the most robust data for assessing trends in sex-selection.

### *1.2 Trends in China*

In China, child sex ratios have fallen between 2000 and 2010 (Table 1, Figure 1). There has been a decline in sex-selection in all provinces in the Central South region, in parts of the Southwest region (Chongqing, Sichuan), the East (Anhui, Jiangsu and Jiangxi), as well as some in the other regions (Shaanxi and Gansu in the Northwest, Liaoning in the Northeast, and Shanxi in the North).

In most of the other provinces, child sex ratios have continued to rise during the 2000s, but at a lower rate than in the 1990s. Only in a few provinces (Shandong, Guizhou, Ningxia and Zhejiang) has the rate of increase in child sex ratios increased during the 2000s. It has also risen in Tibet, but the ratios there are very low.

For the most part, it is those provinces that showed the most masculine child sex ratios in the earlier censuses, which have shown a decline in these ratios. Provinces which had earlier shown less elevated child sex ratios show a continuing rise, but in most cases at a reduced pace of increase.

The 1% sample census of 2005 indicates that child sex ratios continued to rise through the mid 2000s, and fell sharply thereafter. The trend from 2005-2010 indicates a decline in almost all the provinces of China (Table 1). However, as discussed above, some of this apparent trend may be attributable to overestimation of child sex ratios in 2005.

The China census data show a small ***rise*** in sex ratios at birth between 2000 and 2010,[3] while the child sex ratios show a decline. This discrepancy is at least partly explained by the fact that excess female postnatal mortality declined sharply between 2000 and 2010 (Figure 4), making for larger numbers of surviving girls.

Several ethnic minority groups living in the peripheral regions of the Southwest and Northwest show much lower child sex ratios, especially those living in Yunnan, Xinjiang, and Tibet (Table 2). By contrast, several ethnic minorities living elsewhere, such as Guizhou province, show patterns close to the majority Han population.

### *1.3 Trends in India*

In India overall, child sex ratios continued to rise between 2001 and 2011, but at a notably slower pace than in previous decades (Table 3, Figure 2). There is a sharp downward trend in child sex ratios during 2001-2011 in the Northwestern states of Punjab and Haryana (Table 3, Figure 2) --- the states which have had by far the highest sex ratios since the censuses of the late nineteenth century, and the only states in India that had child sex ratios comparable to the national averages for China (Table 1, Figure 1). Most of the Northwestern region shows absolute declines in child sex ratios during 2001-2011, while Delhi showed a leveling off. This is despite the fact that Total Fertility has declined to 2.62 in Haryana, and to below replacement levels in Punjab, Himachal Pradesh and Delhi (Haub 2011: Figure 11).

The data for Jammu & Kashmir in 2011 are clearly out of line with past trends (Table 3), and analysis by the Registrar-General's office indicates that this is due to under-enumeration of girls in the districts that fall in Kashmir (Registrar-General of India 2011a) --- possibly because the political conditions there hindered accurate enumeration.

In the Western region, Gujarat shows a decline in child sex ratios, while most of the rest of the region shows a decline in the pace of increase in these ratios. Rajasthan is a notable exception, with an accelerating pace of increase. In the North-Central region, Uttar Pradesh and Madhya Pradesh show an accelerating pace of increase in child sex ratios.

Uttar Pradesh, Madhya Pradesh and Rajasthan account for over 28% of the population of India, and contribute much to the overall rise in child sex ratios at national level. However, censuses over the past century show sex ratios far lower than Punjab and Haryana, implying lower underlying son preference. The rise in the *manifestion* of son preference may be because these have been poor and relatively underdeveloped states, where incomes have risen due to the recent economic growth in India. This may underlie the rise in sex-selection, as Kaur (2011) and Bhalla and Kaur (2011) have argued.

There is potential for levels of sex-selection to rise further in these states, as their fertility levels are still high, far higher than other states. In 2007, Total Fertility in Uttar Pradesh was nearly 4.0, and around 3.4 in Madhya Pradesh and Rajasthan (Haub 2011: Figure 11). As fertility continues to decline in these states (NFHS-3: Table 4.1), the pressure to sex-select may increase.

In the rest of India, child sex ratios are lower (Table 3). This is despite the fact that the whole of the Southern region has below replacement fertility, while in the Eastern region West Bengal has below replacement fertility and Orissa has just above replacement fertility (Haub 2011: Figures 5, 7, and 11). Since West Bengal's population constitutes 68.5% of the Eastern region's population (Registrar General of India 2011b), the Eastern region as a whole has below replacement fertility.

Child sex ratios for India overall may continue to rise as fertility continues to decline in the populous Northern states. However, the underlying preference for sons is declining in India, as indicated by a drop in the ideal sex ratio of children from 1.42 to 1.27 boys per girl between 1992-93 and 2005-06 (Figure 5). In South Korea, reported son preference declined several years before a drop in sex ratios at birth (Chung and Das Gupta 2007).

## 2. National programs to reduce sex-selection

In both China and India, there have been several types of policies to enhance gender equality and reduce sex-selection. These include long-standing efforts to assure women equality under the law − for example in property ownership and access to employment − and advocacy to encourage greater gender equality in social norms. A range of such measures was passed in both China and India from the 1950s onwards. However, these measures are broad in their range, and it is difficult to rigorously evaluate their impact on son preference.

With the rise in sex-selection since the 1980s, efforts have been stepped up to counter the trend. Efforts include three main approaches: (1) advocacy and media outreach to encourage parents to perceive girls to be as valuable as boys; (2) financial incentives for parents to raise daughters; and (3) bans on the use of technology for sex-selective abortion for non-medical purposes. The impact of these programs is often difficult to evaluate rigorously, but we discuss here some evidence on the impact of these policies.

### *2.1: Policies in India*

***Advocacy*** to encourage parents to perceive girls to be as valuable as boys has been carried out through various channels, but these efforts have not been rigorously evaluated. Many studies[4] have shown much can be done to alter people's values and behaviors through the use of advocacy and the mass media, on issues as wide-ranging as fertility, health care utilization, and voting behavior. A few studies have examined how media exposure alters social norms on son preference in India. Using a "natural experiment" generated by different timing of the introduction of cable television, Jensen and Oster (2009) found access to these media to be associated with reduced son preference. The authors argue that this has much to do with the values of the characters typically portrayed on television, pointing out that in India many female characters in popular soap operas work outside the home, sometimes as professionals, running businesses or in other positions of authority – accelerating the spread of new ideas among people. Analyzing cross-sectional data from India, Pande and Astone (2007) also find that media exposure reduces son preference.

***Financial incentives***

As early as 1994, Haryana state started the *Apni Beti Apna Dhan* (Our Daughter, Our Wealth) program. It offers poor households[5] who give birth to daughters an immediate cash grant and a long-term savings bond redeemable at the girl's eighteenth birthday provided she is unmarried, with additional incentives for increasing educational attainment. This was given to parents for girls born amongst the first three children of either gender. In 1995, higher maturity amounts were offered to girls willing to defer redemption of their bonds by up to four years, along with a credit subsidy for entrepreneurship loans (Sinha and Joong 2009). Given the numbers of eligible households, the cash transfers are necessarily small relative to the actual cost of raising daughters, and may be significant only to the poorest families.

A careful evaluation of the early effects of the Haryana program uses the targeting strategy to compare changes in behavior between the eligible and the non-eligible households (Sinha and Joong 2009). This evaluation indicates that the program was associated with a significant if modest improvement in child sex ratios amongst the poorer households, and greater investment by households in their daughters' health. However, the study findings were inconclusive about whether the program was associated with a decline in son preference. Another evaluation by Holla et al (2007) does not find even this modest improvement in child sex ratios. Sinha and Joong (2009) point out that a fuller evaluation of the program can only be done after the girls have reached age 18, when the second (larger) conditional cash transfers are made.

As child sex ratios rose in other states, the central and some more state governments adopted similar programs from the late 1990s onwards.[6] These programs are often targeted to low-income households, offering cash rewards which increase as the girl completes successive levels of schooling. However, since they typically offer the main benefits if the girl is still unmarried at age 18, it is too early to evaluate them rigorously.

Sekher (2010) summarizes the information for many of these programs, and points to some of their drawbacks. These include low cash incentives; an intimidating volume of paperwork that parents need to complete at regular intervals to qualify for the benefits (such as immunization certificates and school records); and that several programs target only the poorest households whereas sex-selection is hardly confined to them. Some programs are linked to having small families and getting sterilized. There is also the risk inherent in the long waiting

period to collect the main cash benefits, in that programs may change before the parents receive the promised benefits. He mentions the case of Rajasthan's Rajalakshmi scheme which started in 1992 and ended in 2000. Although it set aside some funds for paying those in the program, some parents did not receive their benefits.

Sinha and Joong (2009) point out that the programs shift within a state. In 2006, Haryana state launched the "Ladli" program, with quite different goals from the previous program. All residents of the state are eligible when their second daughter is born, and the cash rewards are linked only to the girls' surviving for five years. The funds are given when the younger sister turns 18. Meanwhile, the centrally-funded Balika Samridhi program was also operational in Haryana state. This offers incremental cash awards for up to two girls (only in poor households), as their schooling increases. The number of recipients for this program was quite low, "perhaps due to high variance in the release of central funding" (Sinha and Joong 2009).

***Bans on sex-selection***

In India a law was passed in 1978 banning public healthcare facilities from providing sex determination during pregnancy except for sex linked genetic conditions. In 1994, the law was broadened (effective from 1996) to include sex determination by ultrasound and made applicable to both public and private healthcare providers. In 2002, the law was revised to include sex-selection at the time of conception.[7] Maharashtra state passed an Act in 1988, banning sex-selection by both public and private healthcare providers, 8 years before such a law applied to the rest of the country.

Bans on sex-selection are difficult to implement in settings where abortion is legal and prenatal diagnostic techniques widely used. Even if a ban against prenatal sex detection is in place, it is frequently reported that doctors find euphemisms to indicate the child's gender to the parents. Moreover, an ultrasound may be performed in one location and an abortion obtained in another, where a woman can provide alternative reasons for the procedure, thus making it difficult to prove that a sex-selective abortion took place.

Vigorous efforts have been made to inform health providers about the ban, and some doctors and clinics have been sanctioned.[8] However, given the huge numbers of potential providers it is difficult to gauge the extent to which this reduces access to prenatal sex-selection. Another possibility is that it can force some to resort to less safe methods of abortion (Ganatra 2008).

Despite the ban on sex-selective abortion, child sex ratios kept climbing (Table 3), and the ban on sex-selective abortion has been viewed as having had little if any impact on child sex ratios (Arnold et al 2002). Indeed, despite the early ban imposed in Marashtra state, its child sex ratios have climbed steadily, and more steeply than any other state during 2001-2011.

In a recent paper, Nandi and Deolalikar (2013) argue that the Act averted further worsening of child sex ratios in India. Their analysis exploits the difference in the timing of Maharashtra and the national ban. They compare changes in child sex ratios (0-6 years) between the 1991 and 2001 censuses in Maharashtra with those in neighboring areas of surrounding states. They conclude that the Act accounts for 14-26 points improvement in the child sex ratio (female/male) in the areas of neighboring states contiguous to Maharashtra. However, they caution that child sex ratios reflect both sex ratios at birth (which could be influenced by the ban) and postnatal sex-selection, which is prevalent in India.

These findings are subject to some caveats. First, the authors assume that the Maharashtra ban and the national ban were equally well implemented, which is difficult to establish. Besides, the national Act came into effect only in 1996, halfway through the decade studied (1991-2001) − and the authors point out that the Act was implemented more seriously *after* 2001, following a public outcry over the 2001 census results.[9] Second, the relative undercount of females to males varies across censuses (Dyson 2001, Guillot 2002). For an analysis such as this, it is critical to assess how intercensal changes in this relative undercount may have differed across the areas compared, and how this may affect the results.

### *2.2: China's Care for Girls Campaign: combination of advocacy, financial incentives, rigorous implementation of the ban on sex-selection, and program monitoring*

In China, a ban on sex-selective abortion was passed in 1994, and further tightened periodically from 2001 onwards (Li 2007).[10] As in India, abortion is legal and prenatal diagnostic techniques widely used, and doctors found ways to indicate the child's gender to the parents. Despite the ban, sex ratios at birth rose steadily to 120 by the late 1990s, and fluctuated around there through the 2000s (Li 2007), and child sex ratios rose alongside (Table 1).

From 2000, an intensive program to reduce sex-selection was developed − called the Care for Girls Campaign − to be implemented rigorously and backed up with sanctions (Li 2007; Zhao 2006). Starting with a pilot program in one city in 2000, pilots for a national program were tried in one county with high sex ratios in each of 24 provinces in 2003-2005. In 2005, the State Council issued an Action Plan for expanding this program across the country, with the aim of bringing the sex ratio at birth to normal by 2015.

A national office for this program was set up, and a national plan developed for the design of this campaign, along with plans for careful training, management, and evaluation of implementation. The provinces issued their own statements in 2006, which followed the main activities in the national statements,[11] and the prefectures and counties followed suit by issuing their own statements.

The program was implemented nationally from 2006. Several government departments were given responsibilities in implementing the campaign, including the departments of family planning, health, education, and police, and organizations such as the Women's Federation.

The components of this nation-wide program are summarized in Figure 6, and consist of advocacy; financial and other benefits for parents who only have girls; the provision of reproductive health services; stringent implementation of the ban on sex selection; and program monitoring and evaluation. The extra costs incurred for the program are shared between the central, provincial, and local governments, with larger central subsidies to poorer provinces.[12] However, the costs of the financial and other benefits are covered by local governments.

#### ***Advocacy***

This focused on changing social norms on son preference. It included publicity on gender equality provided through various channels, including at the local-level "population schools" where the government teaches people about reproductive health.

***Financial benefits***

The financial and other benefits provided under the Care for Girls Campaign to parents with only girls vary by locality. These may include lowered scores for school entrance, funds to support girls' education and job training, some old-age income support for their parents, and priority for accessing other social protection programs for the poor such as the *Di Bao* program. However, these benefits are often sparse since local governments in many areas are chronically short on revenues (Li 2007, World Bank 2009).

Regardless of the gender of the children born, the family planning program has since the early 2000s offered some income support after age 60 to parents who have complied with the family planning policy. The maximum support was raised in 2009 to 720 yuan annually per parent, about USD 114. These costs are shared between the central and local governments, with larger central subsidies to poorer provinces. Importantly, the gradual increases in the coverage and benefits provided by social protection systems in China also offer a growing safety net for old people.

***Reproductive health services and stringent implementation of the ban on sex selection:***

These were piggy-backed onto the family planning program, including the care of pregnant women and infants, and preventing sex-selection. The Action Plan statement specified that "in terms of the pregnant, especially for the second birth, regular monitoring and antenatal care need to be implemented strictly, to prevent the occurrence of sex-selection" (State Council of China 2005, cited in Zhao 2006).

Women pregnant with their second child were specially monitored by local family planning workers, to reduce prenatal sex-selection and infanticide. These were mostly women whose first child was a daughter, since they constitute the vast majority of those allowed a second child under the family planning policy − only some minority ethnic groups are allowed more. In areas which permit a second birth, couples found to be conducting sex-selection would be denied permission to try again for a second child.

Stringent sanctions were put in place for doctors providing sex-selection. Private clinics found doing this would have their equipment confiscated and be imposed a penalty, and the whistle-blower rewarded. Doctors in public hospitals would lose their job.

***Program monitoring and evaluation***

Local officials provide data on program implementation. If they do not meet their responsibilities in reducing sex-selection, they are subject to sanctions. At the same time, a national competition rewards those who perform well.

The Care for Girls Campaign has not yet been rigorously evaluated, but the recorded sex ratio at birth in the 24 pilot counties fell from an average of 133.8 in 2000 to 119.6 in 2005 (Li 2007). Li (2007) also notes that this is largely due to the rigorous implementation of the ban on sex-selection and the more focused provision of reproductive health services, and that a longer-term perspective requires advocacy and incentives to reduce son preference. However, the census data offer some insights into program efficacy.

**Program impact as seen from the census data**

Child sex ratios have declined between the 2000 and 2010 censuses, and the data from the 2005 1% sample census suggests that much of this took place since the Care for Girls Campaign was implemented nationally.

The census data show some interesting patterns that shed light on program impact. There is no decline in the sex ratio at birth between the 2000 and 2010 censuses (Table 1). This suggests that access to sex-selection remained despite the ban on health providers' offering these services.

However, there was a sharp shift between 2000 and 2010 towards sex-selection at first birth – away from the previous pattern of relatively normal sex ratios at birth for the first birth followed by a sharp rise at the second birth (Figure 7.1). There is little change in the sex ratio at birth for third and higher order births, but these form only 5% of births in the 2000 census.

This indicates a clear impact of the especial attention paid to monitoring women expecting their second child, to reduce sex-selection − as Li (2007) had noted in discussing the impact of the pilot studies. This policy was logical, given that before the 2010 census, the data showed that most of the sex-selection took place after the first birth. It also reduced the workload of the implementers, since only 23 percent of births in the 2000 census were second births.

Looking at differentials by the number of births permitted under the prevailing family planning policy (Figure 7.2), the decline in sex-selection of the second child was sharp in both the 1-child and 1.5 child areas (where parents were allowed a second child if the first was a girl). As expected, the effect was muted in the ethnic minority areas where 2 or more children are allowed. Similarly, the shift in the pattern of sex-selection is stronger in "towns" and "counties" (Figure 7.3), where people have typically been allowed a second child if the first was a girl.

After the 2010 census, the government has taken further steps to reduce sex-selection. In 2011 it devised a National Special Action for cracking down on sex-selection, with joint action involving 6 Ministries and Commissions: The National Population and Family Planning Commission, the Ministry of Health (combined into one ministry named the National Health and Family Planning Commission in 2013), the Ministry of Public Security, the State Food and Drug Administration, the Ministry of Health in General Logistics Department of the People's Liberation Army, and the National Women's Federation (NPFPC, 2011). The family planning department and the Women's Federation have grassroots presence throughout the country. Birth registration has also been stepped up across the country, in a joint effort by the departments of family planning, and the Ministries of Health and Public Security. The year 2012 has been named the "Year of Addressing the Issue of Abnormally High Sex Ratio at Birth" (NPFPC, 2012). Meanwhile, the National Population and Family Planning Commission revised the goal for the sex ratio at birth in 2015 to 115 rather than a normal ratio as earlier planned.

## 3. Conclusions

Child sex ratios have fallen in China as a whole between 2000 and 2010, and much of this may be during 2005-2010. They declined in all the provinces where they had reached 120 or more by 2000, but the decline was muted in the Eastern coastal provinces. Child sex ratios rose in several provinces where they were relatively low by Chinese standards. This muted the overall

decline in the ratios during this decade. The ratios are normal or low amongst some non-Han minorities living in the peripheral regions of Southwest and Northwest China.

In India, child sex ratios rose during 2001-2011, but at a much slower pace than before. They fell sharply during 2001-2011 in the Northwestern states of Punjab and Haryana, where they had historically been far higher than in the rest of the country. However, there was an increase in some populous surrounding states, which made for the national rise. In particular, the pace of increase rose in Rajasthan, Uttar Pradesh and Madhya Pradesh, which together account for 28 percent of India's population. The states in the South, East, and Northeast regions continue to have relatively low child sex ratios.

In sum, in both countries the steepest declines in child sex ratios are seen in provinces/states that had reached very high child sex ratios by 2000/1. Some provinces/states that had earlier shown less elevated child sex ratios show a continuing rise, but in most cases at a reduced pace of increase. And some groups continue to show relatively normal child sex ratios.

Turning to the state policies pursued in China and India to reduce sex-selection, similar approaches have been used in both countries, but with different program design. Financial incentives have been tried in some states of India and some provinces of China (though they are very small compared to the costs of raising a child), but since the bulk of incentives accrue after a long lag, it is too soon to evaluate most of the programs in both countries. An evaluation of a longstanding program in India shows a significant though modest impact on child sex ratios − but not on son preference – while another evaluation finds no improvement in child sex ratios. These results do not seem to justify the financial and administrative costs of these programs.

There is also little evidence that the bans on providing prenatal sex-selection had much impact in either country, despite active efforts to inform health providers and the public about the bans and the sanctions involved. However one evaluation in India suggests that although the ban did not reduce sex-selection, it may have averted further rises in sex ratios.

By contrast, China's monitoring of pregnant women to avert prenatal sex-selection and infanticide had visible impact. The focus was on monitoring the second pregnancies of women whose first child was a daughter. That this approach can work is indicated by the shift in sex-selection from the second to the first birth, as people sought to side-step the program. The program has been intensified after the 2010 Census results. If it focuses on monitoring all pregnancies, it could reduce the sex ratio at birth. The 2002 revision of China's sex-selection ban also prohibits maltreatment of baby girls, and of women who give birth to them.[13]

However, the simplest and most effective solution is not to prevent sex-selection, but to reduce the ***demand*** for it by changing social norms as to the relative value of girls and boys. The South Korean example shows that intense son preference is far from immutable, especially in a small homogeneous country that underwent very rapid development and modernization.[14] China and India are large heterogeneous countries, so advocacy is an especially important tool for accelerating normative change across their populations. Both countries have long sought to promote gender equality through legislation, advocacy, and other measures. They also have advocacy affirming the value of girl children, but the messaging could be focused more specifically on showing that married daughters can help their aging parents. Rigorous impact evaluations of the effect of media outreach have shown that they can radically alter norms and behaviors in diverse settings on a wide range of issues − including son preference in India.[15] This approach can help China and India effect a permanent shift away from son preference.

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## Table 1 China: Trends in child sex ratios (<5 yrs) 1982-2010, and sex ratios at birth 2000-2010

Bold italics indicate where the pace of increase in the indices of sex-selection has declined. A negative sign indicates an absolute decline during the period specified.

| | Child sex ratio(m/f) | | | | | | % change in child sex ratio (full censuses) | | | % change in child sex ratio (1% sample censuses) | | % change in sex ratio at birth |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Year** | **1982** | **1990** | **1995** | **2000** | **2005** | **2010** | **1982-1990** | **1990-2000** | **2000-2010** | **1995-2005** | **2005-2010** | **2000-2010** |
| **China** | 1.07 | 1.10 | 1.18 | 1.20 | 1.23 | 1.19 | 2.80 | 9.09 | ***-0.83*** | 4.24 | ***-3.25*** | 0.92 |
| **North** | | | | | | | | | | | | |
| Beijing | 1.07 | 1.06 | 1.14 | 1.11 | 1.12 | 1.11 | ***-0.93*** | 4.72 | ***0*** | ***-1.75*** | ***-0.89*** | ***-0.98*** |
| Tianjin | 1.07 | 1.08 | 1.10 | 1.13 | 1.18 | 1.13 | 0.93 | 4.63 | ***0*** | 7.27 | ***-4.24*** | 1.04 |
| Hebei | 1.07 | 1.09 | 1.16 | 1.16 | 1.22 | 1.17 | 1.87 | 6.42 | ***0.86*** | 5.17 | ***-4.10*** | 1.28 |
| Shanxi | 1.09 | 1.09 | 1.12 | 1.11 | 1.13 | 1.10 | 0 | 1.83 | ***-0.90*** | 0.89 | ***-2.65*** | ***-2.04*** |
| I. Mongolia | 1.06 | 1.08 | 1.13 | 1.10 | 1.09 | 1.11 | 1.89 | ***1.85*** | ***0.91*** | ***-3.54*** | 1.83 | 3.36 |
| **Northeast** | | | | | | | | | | | | |
| Liaoning | 1.06 | 1.08 | 1.14 | 1.13 | 1.14 | 1.11 | 1.89 | 4.63 | ***-1.77*** | ***0*** | ***-2.63*** | ***-2.34*** |
| Jilin | 1.06 | 1.08 | 1.10 | 1.11 | 1.12 | 1.12 | 1.89 | 2.78 | ***0.90*** | 1.82 | 0 | ***-0.05*** |
| Heilongjiang | 1.05 | 1.06 | 1.08 | 1.09 | 1.11 | 1.11 | 0.95 | 2.83 | ***1.83*** | 2.78 | 0 | 2.46 |
| **East** | | | | | | | | | | | | |
| Shanghai | 1.06 | 1.04 | 1.03 | 1.10 | 1.11 | 1.14 | ***-1.89*** | 5.77 | ***3.64*** | 7.77 | ***2.70*** | 0.46 |
| Jiangsu | 1.07 | 1.12 | 1.23 | 1.23 | 1.23 | 1.20 | 4.67 | 9.82 | ***-2.44*** | 0 | ***-2.44*** | ***-0.23*** |
| Zhejiang | 1.08 | 1.14 | 1.15 | 1.14 | 1.14 | 1.16 | 5.56 | ***0*** | 1.75 | ***-0.87*** | 1.75 | 3.75 |
| Anhui | 1.10 | 1.10 | 1.25 | 1.30 | 1.36 | 1.27 | 0 | 18.18 | ***-2.31*** | 8.80 | ***-6.62*** | 0.62 |
| Fujian | 1.06 | 1.10 | 1.27 | 1.24 | 1.20 | 1.25 | 3.77 | 12.73 | ***0.81*** | ***-5.51*** | 4.17 | 6.50 |
| Jiangxi | 1.07 | 1.10 | 1.25 | 1.33 | 1.40 | 1.30 | 2.80 | 20.91 | ***-2.26*** | 12.00 | ***-7.14*** | 7.06 |
| Shandong | 1.08 | 1.14 | 1.2 | 1.14 | 1.16 | 1.23 | 5.56 | 0 | 7.89 | ***-3.33*** | 6.03 | 6.46 |
| **Central South** | | | | | | | | | | | | |
| Henan | 1.08 | 1.14 | 1.32 | 1.32 | 1.37 | 1.25 | 5.56 | 15.79 | ***-5.30*** | 3.79 | ***-8.76*** | ***-0.58*** |
| Hubei | 1.06 | 1.08 | 1.25 | 1.29 | 1.29 | 1.24 | 1.89 | 19.44 | ***-3.88*** | 3.20 | ***-3.88*** | ***-3.19*** |
| Hunan | 1.06 | 1.09 | 1.19 | 1.24 | 1.31 | 1.21 | 2.83 | 13.76 | ***-2.42*** | 10.08 | ***-7.63*** | ***-2.32*** |
| Guangdong | 1.09 | 1.11 | 1.20 | 1.30 | 1.30 | 1.22 | 1.83 | 17.12 | ***-6.15*** | 8.33 | ***-6.15*** | ***-7.64*** |
| Guangxi | 1.09 | 1.18 | 1.28 | 1.28 | 1.22 | 1.21 | 8.26 | 8.47 | ***-5.47*** | ***-4.69*** | ***-0.82*** | ***-2.28*** |
| Hainan | | 1.14 | 1.22 | 1.36 | 1.31 | 1.25 | | 19.30 | ***-8.09*** | 7.38 | ***-4.58*** | ***-7.63*** |
| **Southwest** | | | | | | | | | | | | |
| *Chongqing*[2] | | | | 1.17 | 1.17 | 1.13 | | | ***-3.42*** | | ***-3.42*** | ***-2.28*** |
| Sichuan | 1.07 | 1.11 | 1.11 | 1.15 | 1.15 | 1.11 | 3.74 | 3.60 | ***-3.48*** | 3.60 | ***-3.48*** | ***-3.77*** |
| Guizhou | 1.06 | 1.05 | 1.12 | 1.14 | 1.27 | 1.24 | ***-0.94*** | 8.57 | 8.77 | 13.39 | ***-2.36*** | 14.1 |
| Yunnan | 1.04 | 1.07 | 1.11 | 1.13 | 1.14 | 1.13 | 2.88 | 5.61 | ***0*** | 2.70 | ***-0.88*** | 2.81 |
| Tibet | 1.02 | 1.02 | 1.04 | 1.01 | 1.03 | 1.05 | 0 | ***-0.98*** | 3.96 | ***-0.96*** | 1.94 | 3.78 |
| **Northwest** | | | | | | | | | | | | |
| Shaanxi | 1.08 | 1.09 | 1.20 | 1.26 | 1.27 | 1.17 | 0.93 | 15.60 | ***-7.14*** | 5.83 | ***-7.87*** | ***-5.54*** |
| Gansu | 1.05 | 1.08 | 1.15 | 1.19 | 1.2 | 1.18 | 2.86 | 10.19 | ***-0.84*** | 4.35 | ***-1.67*** | 2.22 |
| Qinghai | 1.04 | 1.04 | 1.06 | 1.09 | 1.12 | 1.09 | 0 | 4.81 | ***0*** | 5.66 | ***-2.68*** | 1.85 |
| Ningxia | 1.04 | 1.06 | 1.08 | 1.09 | 1.11 | 1.13 | 1.92 | 2.83 | 3.67 | 2.78 | 1.80 | 4.66 |
| Xinjiang | 1.04 | 1.03 | 1.02 | 1.06 | 1.05 | 1.06 | ***-0.96*** | 2.91 | ***0*** | 2.94 | 0.95 | 0.02 |

***Source:*** Population Censuses of China 1982, 1990, 2000, and 2010, and 1% Sample Censuses 1995 and 2005.

**Table 2: Sex ratio of children aged 0-4 years, of minority (non-Han) groups, China 1990-2010**

| | 1990 | 2000 | 2010 |
|---|---|---|---|
| China | 110.2 | 120.2 | 119.1 |
| **Minorities** | | | |
| Dai (Thai) | 102.8 | 104.8 | 103.7 |
| Uygur | 102.0 | 103.6 | 104.1 |
| Zang (Tibetan) | 102.3 | 102.8 | 105.1 |
| Bai | 102.0 | 104.9 | 107.3 |
| Hasake (Kazak) | 103.9 | 105.5 | 107.8 |
| Monggol | 105.2 | 107.7 | 110.1 |
| Man | 108.8 | 112.3 | 110.7 |
| Yi | 105.1 | 111.5 | 112.1 |
| Hui | 105.4 | 111.5 | 114.3 |
| Tujia | 106.9 | 115.9 | 116.4 |
| Li | 105.9 | 117.7 | 116.6 |
| Hani | 109.1 | 124.4 | 117.0 |
| Yao | 109.9 | 117.6 | 117.9 |
| Zhuang | 112.5 | 122.8 | 119.2 |
| Miao | 106.7 | 117.7 | 122.6 |
| Bouyei | 104.2 | 115.7 | 123.6 |
| Dong (Tung) | 113.6 | 123.6 | 124.4 |

***Source:*** Census of China 1990, 2000 and 2010

Note: The data are for minorities with a population larger than 1 million in the 2010 census.

## Table 3: Trends in India's 0-6 sex ratios by state, 1981-2011

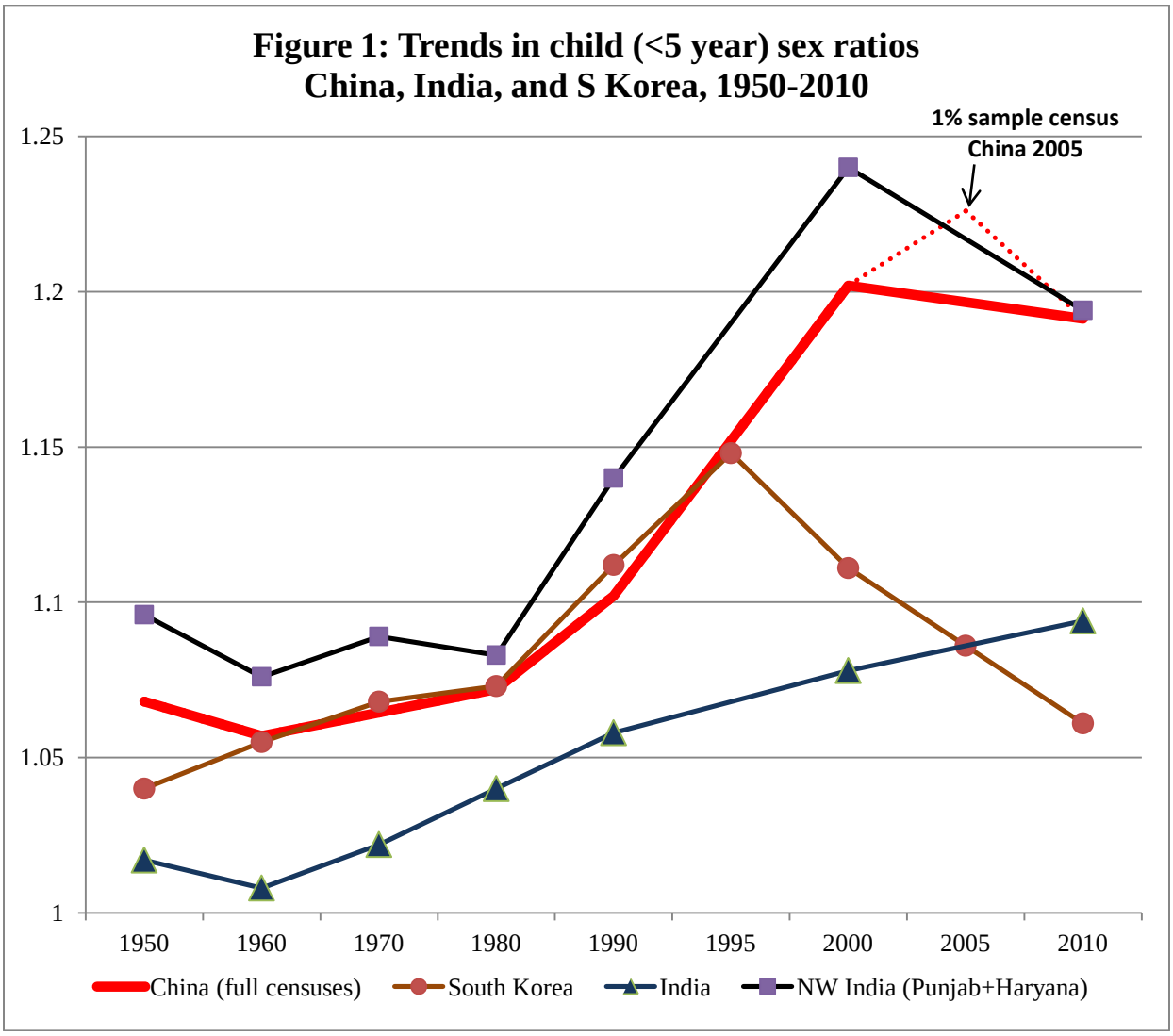
Bold italics show a slower rate of increase during 2001-2011 than 1991-2001. A negative sign shows a decrease. The UN 2010 estimates show that the average child sex ratio was 1.05 for less developed regions (excluding China)

| | 0-6 sex ratios (m/f) | | | | % change | | |
|---|---|---|---|---|---|---|---|
| | **1981** | **1991** | **2001** | **2011** | **1981-1991** | **1991-2001** | **2001-2011** |
| **India** | 1.04 | 1.06 | 1.08 | 1.09 | 1.73 | 1.98 | ***1.39*** |
| ***NorthWest*** | | | | | | | |
| Haryana | 1.11 | 1.14 | 1.22 | 1.21 | 2.61 | 7.29 | ***-1.31*** |
| Himachal Pradesh | 1.03 | 1.05 | 1.12 | 1.10 | 2.14 | 6.08 | ***-1.08*** |
| Punjab | 1.10 | 1.14 | 1.25 | 1.18 | 3.81 | 9.62 | ***-5.67*** |
| *Chandigarh UT | 1.10 | 1.11 | 1.18 | 1.15 | 0.82 | 6.38 | ***-2.54*** |
| *Delhi UT | 1.08 | 1.09 | 1.15 | 1.15 | 1.20 | 5.40 | ***0.09*** |
| Jammu &Kashmir | 1.04 | n.a. | 1.06 | 1.16 | n.a. | n.a. | 9.50** |
| ***West*** | | | | | | | |
| Rajasthan | 1.05 | 1.09 | 1.10 | 1.13 | 4.20 | 0.73 | 3.00 |
| Gujarat | 1.06 | 1.08 | 1.13 | 1.13 | 2.08 | 5.10 | ***-0.35*** |
| Maharashtra | 1.05 | 1.06 | 1.10 | 1.13 | 1.05 | 3.60 | ***3.47*** |
| Goa | 1.04 | 1.04 | 1.07 | 1.09 | 0.10 | 2.80 | ***1.97*** |
| ***NorthCentral*** | | | | | | | |
| Uttarakhand | - | 1.05 | 1.10 | 1.13 | - | 4.46 | ***2.54*** |
| Uttar Pradesh | 1.07 | 1.08 | 1.09 | 1.11 | 0.84 | 1.20 | 1.83 |
| Madhya Pradesh | 1.02 | 1.06 | 1.07 | 1.10 | 3.81 | 0.94 | 2.14 |
| ***Regions with child sex ratios similar to (or moderately above) the UN average of 1.05 for 2010*** | | | | | | | |
| ***East*** | | | | | | | |
| Bihar | 1.02 | 1.05 | 1.06 | 1.07 | 2.94 | 1.24 | ***0.94*** |
| Jharkhand | - | 1.02 | 1.04 | 1.06 | - | 1.47 | 2.32 |
| Chattisgarh | - | 1.02 | 1.03 | 1.04 | - | 0.98 | 1.07 |
| Orissa | 1.01 | 1.03 | 1.05 | 1.07 | 2.89 | 1.45 | 2.10 |
| West Bengal | 1.02 | 1.03 | 1.04 | 1.05 | 1.47 | 0.77 | 1.06 |
| ***South*** | | | | | | | |
| Kerala | 1.03 | 1.04 | 1.04 | 1.04 | 1.26 | -0.19 | 0.00 |
| Karnataka | 1.03 | 1.04 | 1.06 | 1.06 | 1.56 | 1.44 | ***0.28*** |
| Tamil Nadu | 1.03 | 1.06 | 1.06 | 1.06 | 2.03 | 0.66 | ***-0.47*** |
| Andhra Pradesh | 1.01 | 1.03 | 1.04 | 1.06 | 1.79 | 1.46 | 1.83 |
| ***NorthEast*** | | | | | | | |
| Assam | n.a. | 1.03 | 1.04 | 1.05 | n.a. | 0.97 | ***0.87*** |
| Arunachal Pradesh | 1.00 | 1.02 | 1.04 | 1.04 | 1.50 | 1.87 | ***0.48*** |
| Meghalaya | 1.01 | 1.01 | 1.03 | 1.03 | 0.50 | 1.38 | ***0.29*** |
| Manipur | 1.01 | 1.03 | 1.05 | 1.07 | 1.28 | 1.75 | 2.49 |
| Nagaland | 1.01 | 1.01 | 1.04 | 1.06 | -0.49 | 2.98 | ***2.12*** |
| Sikkim | 1.02 | 1.04 | 1.04 | 1.06 | 1.37 | 0.19 | 2.02 |
| Tripura | 1.03 | 1.03 | 1.04 | 1.05 | 0.49 | 0.10 | 1.35 |
| Mizoram | 1.01 | 1.03 | 1.04 | 1.03 | 1.78 | 0.48 | ***-0.77*** |

***Source:*** Census of India 1981, 1991, 2001, and 2011.[16]

* Delhi and Chandigarh are metropolitan cities which constitute separate administrative units (Union Territories). Since they are the only cities for which data are available, they are shown here.

**The 2011 data for Jammu & Kashmir are very dubious, as acknowledged by the census report, and discussed in the text. It has been a difficult state to hold a census, given its political situation.

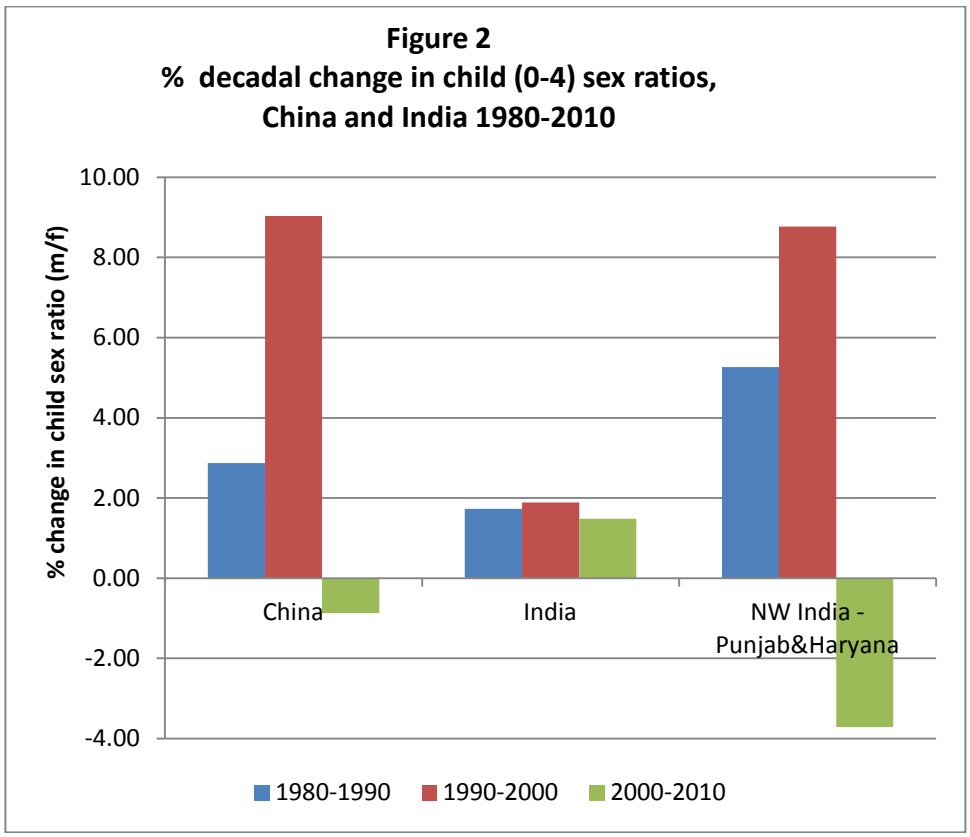



***Sources:*** 100% censuses of all 3 countries:

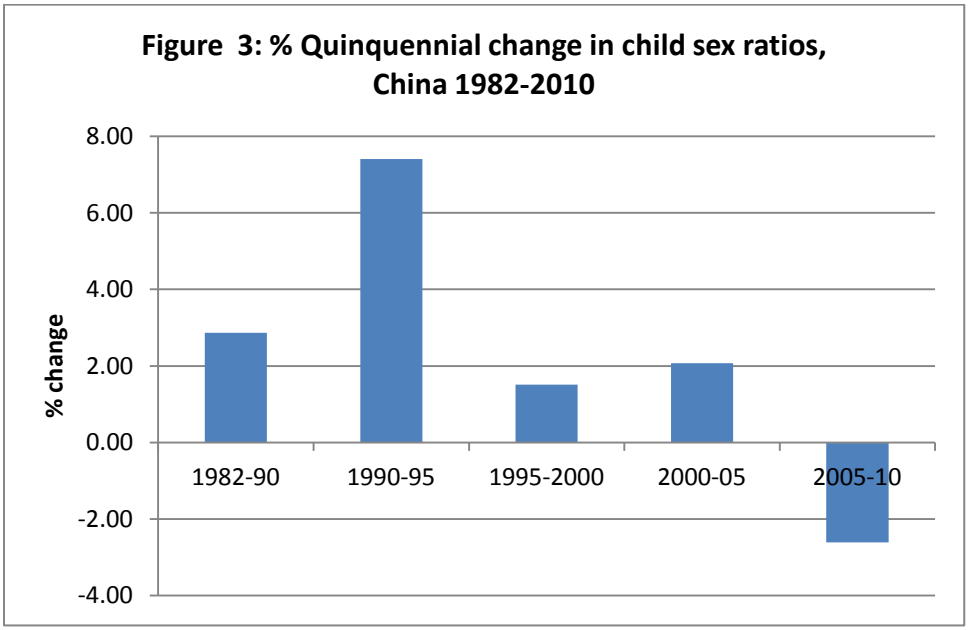
1. S. Korea: Population and Housing Censuses of Korea, 1950, 1960, 1970, 1980, 1990, 1995, 2000, 2005, and 2010.
2. China: Population Censuses of China 1953, 1964, 1982, 1990, 2000, and 2010.
3. India: Census of India, 1951, 1961, 1971, 1981, 1991, 2001, and 2011.

***Notes:***

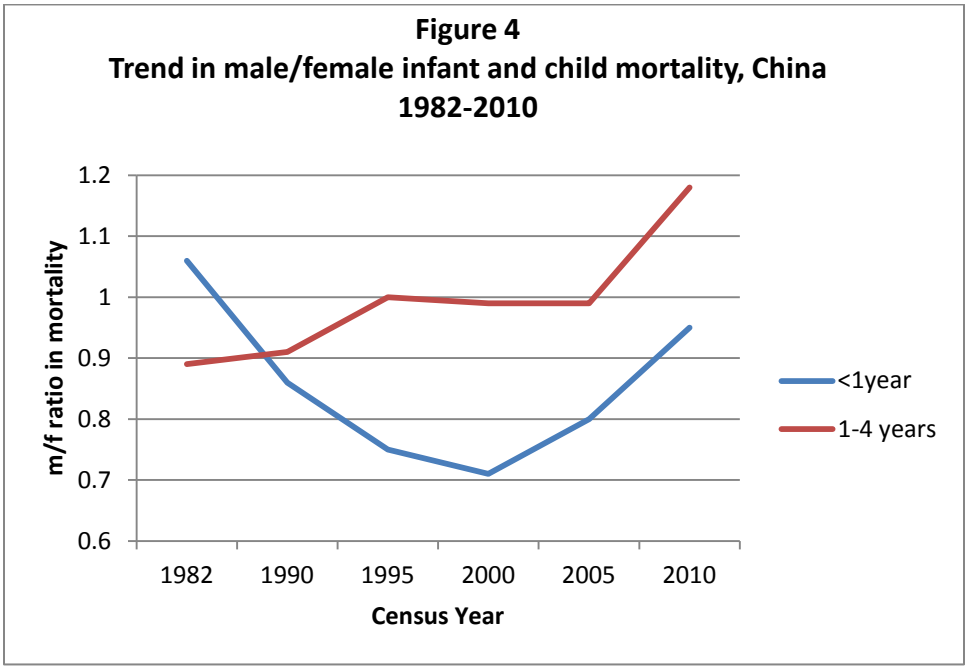
1. Data for the 2005 1% sample census of China is shown in dotted lines, since it is not a full census (see Figure 3).
2. The figures for India are the sex ratio of children aged 0-6 years (males/females), for China and South Korea they are for children aged 0-4 years.



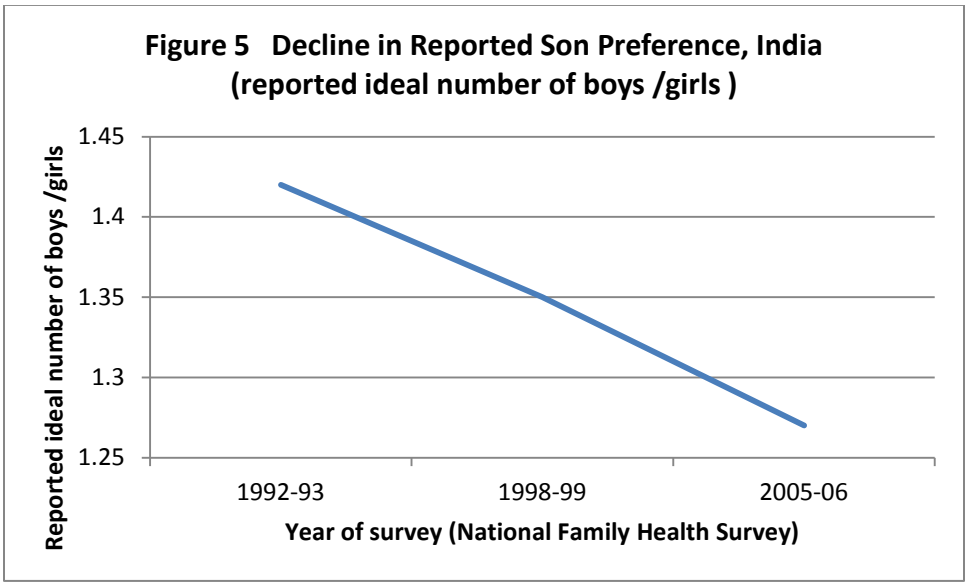

Source: Census of China 1982, 1990, 2000, and 2010; Census of India 1981, 1991, 2001 and 2011.




Source: Census of China 1982, 1990, 2000, and 2010, and 1% sample censuses of 1995 and 2005



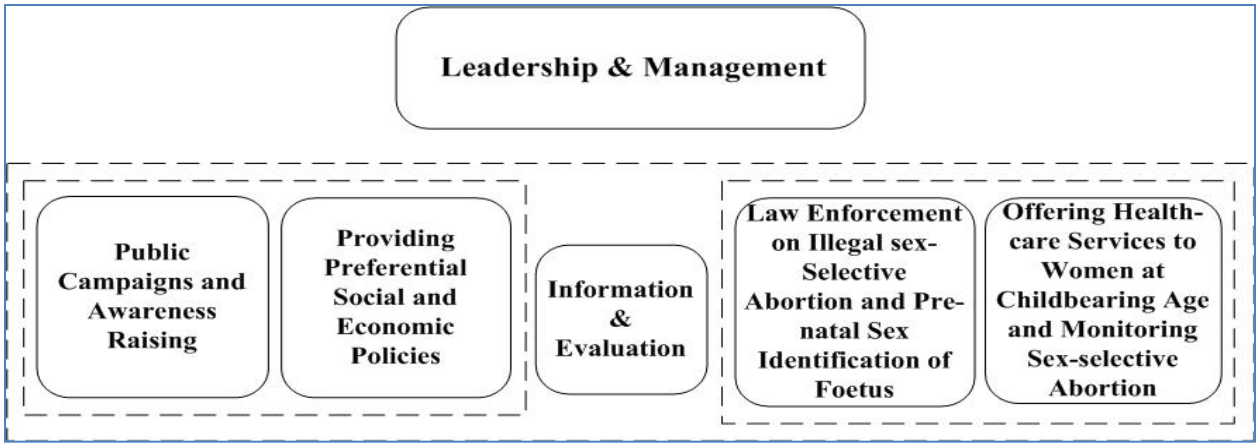

Source: Censuses of China 1982, 1990, 2000, 2010, and 1% Sample Censuses of 1995 and 2005




***** This is computed using Retherford and Roy's method (2003:33), which is to divide the reported ideal number of boys by the reported ideal number of girls. The number of reported ideal children of "either sex" is split equally between boys and girls.

***Source:*** Data for the third survey calculated from the National Family Health Survey 3 (IIPS 2007: Table 4.17.1) The observations for the first two surveys are from Retherford and Roy (2003: Table 6.5)

## Figure 6: The "5+1" Work Mechanism in the Care for Girls Campaign




Source: Li et al (2011)

**A national government-oriented public policy system and strategic platform**

- **Vision**: Protecting the basic rights and interests of survival, development and participation for women especially girls
- **Objective**: Improving girls' living environment and achieving gender equity
- **Areas**: Health care, education, employment security, parents old-age security and so on (eg. *the family incentive/rewards scheme in rural areas.)*

**Figure 7. Changes in sex ratios at birth by birth order, China**

**Figure 7.1 Trends between 1982-2010**

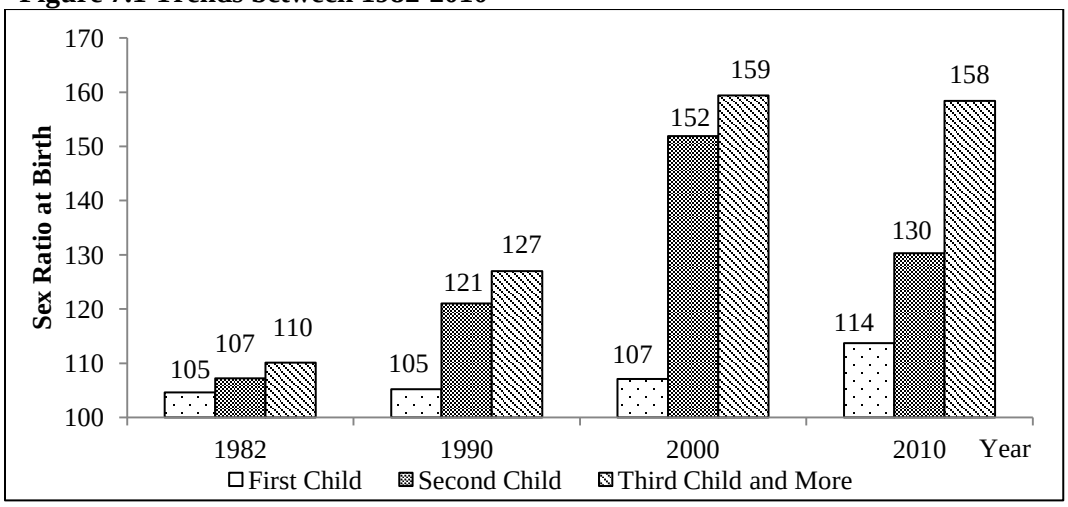



**Figure 7.2 Changes by family planning policy, 2000-2010**

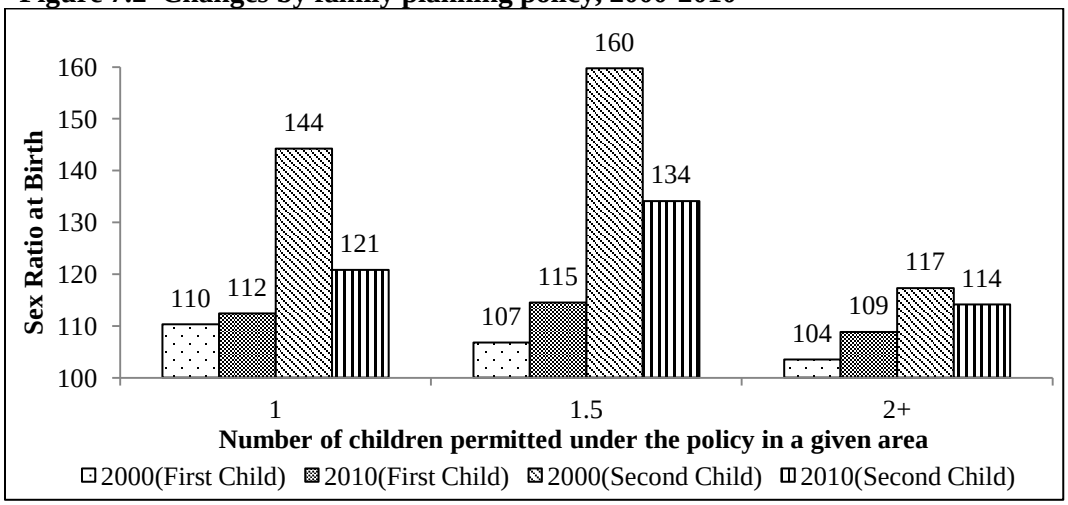
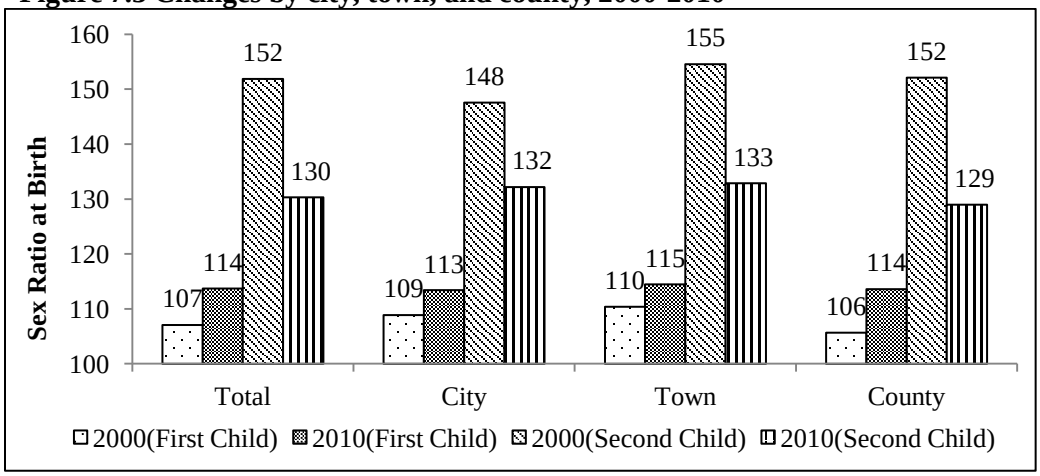



**Figure 7.3 Changes by city, town, and county, 2000-2010**




***Source:*** Census of China 1982, 1990 2000 and 2010.

***Notes:*** The policies are discussed in Gu et al (2007). "1.5 children permitted" means that parents are allowed to have a second child if the first child is a girl, handicapped, or a few other circumstances.

## Endnotes

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[1] For broader discussions of under-reporting, see also Zhang (2005) and Chen, Wei and Zhai (2007).

[2] See for example Dyson 2001 and Guillot 2002.

[3] The "short form" records a sex ratio at birth of 116.9 in 2000 and 117.9 in 2010, while the "long form" administered to 10% of the population records 119.9 for 2000 and 121.2 for 2010.

[4] For example, analyses of "natural experiments" find it changed fertility behavior in India, Brazil, and Tanazian (Jensen and Oster 2009; La Ferrara, Chong, and Duryea 2008; and Rogers et al 1999), while DellaVigna and Kaplan (2007) found it shaped voting patterns in the United States. Jensen and Oster (2009) also found it reduced son preference. Pande and Astone (2007) also find that media exposure reduces son preference in India, though they use conventional analysis of cross-sectional data, not "natural experiment" data. A plethora of studies using cross-sectional data from several settings indicate that exposure to the media strongly influences behaviors, independent of other factors such as women's education. For example, in India it was found highly correlated with maternal health care utilization (Navaneetham and Dharmalingam 2002).

[5] Non-poor families with a disadvantaged caste background - formally identified in India as belonging to a "Scheduled Caste" (SC) or "Other Backward Caste" (OBC) - would also be eligible. The wealthiest in this latter group would be excluded via a restriction on gazetted government employees or income tax payees.

[6] See Sekher (2010) for a summary of some of these programs. One central government program is the Balika Samriddhi Yojana, started in 1997 http://wcd.nic.in/BSY.htm (accessed 27 April 2013).

[7] http://www.medindia.net/indian_health_act/pre-natal-diagnostic-techniques-amendment-act-2002-definitions.htm

[8] See for example the efforts in the states of Punjab, Haryana, and Maharashtra http://pbhealth.gov.in/major13.htm, http://haryanahealth.nic.in/menudesc.aspx?Page=2, and http://www.nrhm.maharashtra.gov.in/PCPNDT.pdf (accessed 22 May 2013)

[9] Also, three of the five comparator states (Chattisgarh, Karnataka, and Andhra Pradesh) have low child sex ratios (Table 3), so they may not offer good tests of the effectiveness of the ban.

[10] Several provinces have their own additional laws, regulations, sanctions, etc

[11] The provinces made minor modifications for local circumstances, for example which departments were responsible for implementation, and the leadership of the program.

[12] These costs are paid together by central government, provincial and local government. The proportion is based on the provincial and local government's economic capabilities, e.g. local governments pay all of the cost in wealthy provinces; the central government pays the whole amount in poor provinces, and the costs are shared between the central and local governments in the remaining provinces depending on circumstances.

[13] This is Article 22 of the 2002 revision of the sex-selection ban (Li 2007: Appendix Table 1).

[14] Chung and Das Gupta (2007).

[15] See references in endnote 4.

[16] Jharkhand, Chattisgarh and Uttarakhand became states in the 1980s (divided respectively from Bihar, Madhya Pradesh and Uttar Pradesh), so there are no data for them in the 1981 census.