Paper presented at the Population Association of America meeting,
Washington DC, March 31-April 2, 2016

Is banning sex-selection the best approach for reducing prenatal discrimination?

Monica Das Gupta

Research Professor, Department of Sociology,
University of Maryland, College Park MD, USA.
Email: mdasgupta@gmail.com

Abstract

Pressure to ban prenatal sex-selection has grown with rising sex ratios at birth in some settings. Governments feel they should do something about this and bans seem an immediate step they can take. However, such bans have been in place for some time in South Korea, China, and India and the available evidence suggests they are difficult to implement. This is indicated most clearly in the Chinese census data, which throw light on the effects of a very intensive effort to implement the ban.

Many studies show that, like abortion bans, bans on sex-selection have negative consequences for unwanted children and their mothers. By contrast, studies show that other policies — including mass messaging and measures to increase gender equity — show fairly quick impact in reducing son preference and increasing parental investment in girls. Such policies offer more promise than bans for reducing sex-selection while improving girls' life-chances.

Pressure to ban the use of modern technologies for sex-selection has grown in response to concern about rising sex ratios at birth in societies with a cultural preference for sons. Such bans have been in place for some time in countries such as China, South Korea and India. Sex ratios at birth are also high in the South Caucasus countries and parts of the Balkans, prompting the Council of Europe to pass a resolution calling for its member countries to strengthen their policies to counter this trend, including banning prenatal sex-selection except to avoid serious hereditary diseases (Council of Europe 2011, 2014).

Governments feel the need to do something about sex-selection, and bans seem an immediate step they can take. This paper begins by summarizing the laws and sanctions accompanying the bans in China, South Korea and India. Section 2 discusses the negative effects of bans on children's life-chances. Section 3 discusses the available evidence on the effectiveness of these bans in reducing sex-selection, including the latest census data from China which illustrates the difficulty of implementing such bans. Section 4 discusses alternative measures that governments often take, including mass messaging and legal measures, which have been shown to have quite quick impact on lowering son preference and increasing investment in girls. Section 5 concludes with what the available evidence indicates for the policies of choice for reducing sex-selection.

1. Bans against sex-selection

The content of laws banning the use of technologies of sex-selection differs between countries and over time (Mohapatra 2013). They may prohibit prenatal sex-detection and/or sex-selective abortion, and may also apply to the period before conception. While most bans impose penalties on those providing sex-selection services, some also punish those who seek these services. All these types of bans seek to limit prenatal sex-selection, and will be referred to here as bans on sex-selection.

Bans on sex-selection for non-medical reasons are in place in most East Asian and South Asian countries with high child sex ratios. They are also in place in many developed countries (Darnovsky 2009). Albania and the South Caucasus countries do not yet have bans in place, although they have high sex ratios at birth. This paper discusses the bans in South Korea, India, and China, which have been in place for some decades.

In 1987, the South Korean government prohibited testing to identify the sex of a fetus, and providers could be punished by imprisonment for up to three years or a fine of up to $10,000 (Sung 2012: 297-8). In 1990, the Ministry of Health and Social Affairs suspended the medical licenses of eight physicians convicted of performing the tests – an action that was widely reported in the media (Westley 1995). The effort to enforce the ban increased further in 1994. As South Korea is a small country with a tightly-regulated health sector, it is far easier to implement such bans than in China and India. In 2008, the Constitutional Court ruled the ban on sex-detection unconstitutional, on the ground that it infringes the rights of health providers and parents.[1]

In India a 1994 Act (effective as of 1996) banned healthcare providers from providing sex determination during pregnancy except for sex linked genetic conditions.[2] In 2002, the law was amended to include sex-selection at the time of conception. It imposed stringent punishments for medical practitioners as well as for clients practicing sex-selection — the woman herself being

assumed to have acted under familial pressure and innocent unless proven otherwise.[3] Ultrasound tests were only permitted under severely limited conditions and doctors required to maintain detailed records justifying each ultrasound test.[4] Ultrasound equipment had to be registered. The 2002 amendment also gave the authorities extensive powers of search and seizure, and legal redress against such actions was explicitly denied if the authorities had acted "in good faith".[5] Implementation of these laws has been somewhat haphazard as described below, resulting perhaps in exacerbating the potential negative consequences of such bans.

In China, a ban on sex-selective abortion was passed in 1994, and further tightened periodically from 2001 onwards (Li 2007). In the mid-2000s, the Chinese government tried to vigorously implement the ban, as described in Section 3. In Nepal and Vietnam sex ratios at birth started rising more recently, and these countries banned prenatal sex detection and sex-selective abortion in 2002 and 2003 respectively (Ganatra 2008).

However, these bans can be difficult to implement in settings where abortion is legal and the technology that permits sex-detection is available legally for routine medical purposes such as antenatal care. For example, abortion is legal in China, India, Nepal, and Vietnam. In South Korea abortion is illegal under their 1973 law except in cases of rape, incest, some birth defects and medical conditions, or to save the life of the mother (United Nations 2002). The sanctions for health providers include imprisonment or fines (United Nations 2002). However, the law is clearly lightly implemented, since abortion rates are very high: in 2005, there were about 0.79 abortions per livebirth. This is derived from the number of abortions in 2005 estimated by a survey of health facilities (Ahn et al 2012), and the number of livebirths recorded for that year by the vital registration system (Korean Statistical Information Service), and may be an underestimate since abortions tend to be under-reported.[6]

2. Negative effects of bans on abortion / sex-selection

Many studies show that bans on abortion and bans on sex-selection impact negatively on children's life-chances. This is quite aside from the fact that such bans affect women's reproductive rights — and that banning sex-selection forces women to live with their families' displeasure at having unwanted girls.

2.1 Abortion bans and women and children's socio-economic outcomes

Studies from both developed and developing countries indicate that abortion bans have negative effects on children. They show that less investment is made in the human capital of unwanted/unplanned children, affecting their future prospects.[7]

Variation in the timing of abortion legalization across states in the United States offers "natural experiments" to test the impact on women and children's lives. Gruber et al (1999) compared a range of outcomes between cohorts born before and after abortion was legalized. They found that before abortion was legalized, the 'marginal child' would have been 40–60 percent more likely to live in a single-parent family, to live in poverty, to receive welfare, and to die as an infant. Rotz (2013) analyzed the impact of legalizing abortion in New York, the first state in the United States to do so. She found that children were born into families with greater resources after abortion was legalized, since women had been given greater control over the

timing of their births. This improved children's prospects especially among poorer households, increasing the eventual wages of black, Hispanic, and lower-wage workers.

Romania offers another "natural experiment", since a stringent ban on abortions was passed in 1966 and enforced under a strong dictatorial regime, and birth rates doubled the following year. Pop-Eleches (2013) estimates that, controlling for the socio-economic background of the mothers, children born after this ban was imposed had worse educational and labor market achievements as adults.

Turning to the developing world, Jones (2011) used data from Ghana to examine the impact of shifts in the application of the United States' policy restricting foreign aid for family planning to any organization that provides abortions. She found a 12 percent increase in pregnancies amongst rural women in Ghana during periods when the policy was more strictly implemented, with a rise in abortions and unintended births. The unintended births were concentrated among the poorest and least educated women, and those children were significantly more likely to be stunted than their siblings. These findings are consistent with other studies that indicate that greater investments are made in planned children, for example when access to contraception is expanded.

The dearth of studies reporting no effect or a positive effect of abortion bans on women and children could be either because there is no such effect, or because researchers and journals do not consider the issue to be of interest.

2.2 Sex-selection bans and the treatment of women and children

The negative impacts of abortion bans discussed above apply also to bans on sex-selection. But there are deeper ramifications in the context of bans on sex-selection, whether before or after conception.

Having unwanted daughters can affect how a woman is treated within the home. That women may suffer maltreatment in their households if they are forced to bear unwanted female children is highlighted by Article 22 of China's 2002 Population and Family Planning Law, which simultaneously prohibits sex-selection and the maltreatment of baby girls and their mothers (Li 2007: Appendix Table 1). Ethnographic studies from China, India, and South Korea indicate that, while son preference remains high, women may be insecure and/or maltreated if they do not have sons.[8] An extreme example of this is the burning of a woman and her two little girls by her husband's family in Vietnam (Phan 2014).

This effect is found in an analysis of national survey data from China which finds that women with first-born sons are significantly better-nourished and have a larger role in household decision-making than those with a first-born daughter (Li and Wu 2011).

Analogous to the studies showing better outcomes for wanted children, evidence from diverse settings indicates that the practice of prenatal sex-selection improves the life chances of those girls that are born, since more of them are actively wanted.[9] This is reflected in lower excess female child mortality after birth, and greater investment in their health and schooling.

A rise in prenatal sex-selection was found associated with a sharp decline in excess female mortality after birth in Taiwan (Lin et al 2014), while Kalsi (2013) finds further that this was associated with improvements in girls' education. In both cases, the improvements were sharpest among higher birth order girls, the group among which unwanted girls had earlier predominated. The authors conclude that greater investments are made in children who are actively wanted.

In India, Hu and Schlosser (2012) find that an increase in prenatal sex-selective abortion is associated with improved anthropometric indicators for girls relative to boys. Anthropometric outcomes are affected not only by nutritional intake, but also by the caloric drain of fighting infections and lowered ability to process nutrients. Thus the findings on improved anthropometric indicators are consistent with the large body of evidence from East and South Asia that unwanted girls (especially those of higher birth order) are given less access to medical care when they are ill (Li et al 2004, Asfaw et al 2008).

Access to modern technologies is not required to achieve sex-selection, as indicated by China's 2002 law prohibiting postnatal sex-selection which also bans discrimination against, maltreatment, or abandonment of baby girls (Li 2007: Appendix Table 1). Unwanted girls suffer excess mortality after birth, especially if the family already has a girl, as shown repeatedly in studies in East and South Asia.[10] Very high child sex ratios have been reached in the past through postnatal selection (Das Gupta and Li 2007: Figure 1).

2.3 Abortion bans and access to safe reproductive health services

Making abortion illegal may force people to pay more for abortions, and resort to using providers with less training and equipment, with adverse consequences for women's health. This is not easy to document rigorously given the difficulties of collecting reliable data on abortions in developing countries, let alone data that permits comparing the cost and health implications of legal versus illegal abortions.[11]

Perhaps the best estimates of the impact of abortion bans on maternal mortality ratios are from Romania, where the Health Ministry kept high-quality data. Maternal mortality rose sharply after the ban was imposed, and fell precipitously when it was lifted (David and Wright 1971:208, Serbanescu et al 1995:84). Data from the Romanian Health Ministry indicate that abortion-related deaths accounted almost entirely for the drop in maternal mortality ratios after the ban was lifted and women no longer needed to resort to illegal abortions (Serbanescu et al 1995:84).

Banning the sale of alcohol and drugs has many analogies to abortion bans, with the complex surveillance required for their enforcement. Their effects are easier to study, and offer useful insights. Reviewing these studies, Miron and Zwiebel (1995) note that the alcohol ban in the United States sharply decreased consumption at first, but consumption increased thereafter as people found ways around the ban. The ban raised the price of alcohol, and also had adverse health effects on consumers since the quality of alcohol was not regulated. Studies of the ban on drugs indicate that enforcement is costly, and that increasing expenditure on enforcement has diminishing returns. Moreover, attempts to enforce drug prohibition have weakened protections against unreasonable searches, and allowed authorities to seize assets without a trial or due process.

This is consistent with reports from India that efforts to implement the ban on sex-selection have caused confusion and fear amongst medical practitioners, as well as pharmacists who sell medical abortifacients. Indeed, the 2003 revision of the sex-selection ban in India gave a range of authorities sweeping powers of search and seizure with little scope for redress.[12] The effect was reportedly exacerbated by sting operations by journalists and activists, and by police visits to clinics (without any basis of reports of illegal action). Although court convictions under the law are few (UNFPA 2010a), providers feel randomly threatened and may become increasingly reluctant to provide soundscan and abortion services that are in fact legal, affecting women's access to safe abortion and the full range of antenatal checks. The price of abortion has reportedly risen. The chaotic situation created confusion about the law, leading the government to attempt to clarify the law by issuing a pamphlet (MOHFW 2007).

3. Do bans on sex-selection help normalize sex ratios at birth?

Despite all the negative effects of banning sex-selective abortion, there is a potentially strong argument for the ban if they help normalize sex ratios at birth. Sex-selection is an especially egregious manifestation of low gender equity, and also has other consequences such as a future shortage of brides.

Although postnatal sex-selection has long been practiced in parts of South and East Asia, the new technologies do make it much easier for parents to achieve their desired family composition. This is suggested by the rise in sex ratios at birth in the 1980s in China and South Korea, when the technology of prenatal sex-detection became widely available (Figure 1). It is also suggested by the rise in sex-selection when abortion was legalized in Taiwan and Nepal (Lin et al 2014, Frost et al 2013).

This argument depends crucially on whether such bans are effective at achieving more balanced sex ratios at birth. On the face of it, sex ratios at birth in South Korea and China kept climbing despite the bans passed as of 1987 in South Korea, and China in 1994 (Figures 1 and 2). Estimated sex ratios at birth in India improve after the mid-2000s (UNFPA 2010b: Figure 1), but the large sampling errors in these estimates (UNFPA 2010b, Kulkarni 2007) make it unclear whether they indicate effective implementation of the ban. Randomized evaluation of the bans' impact is hindered by lack of data, including on the counterfactual of what might have happened in the absence of the ban.

3.1 The available evidence on the bans' effectiveness at lowering sex ratios at birth

Rigorous evaluation of the impact of these bans is very difficult, given the available data.[13] Here whatever information can be gleaned is used to assess the effectiveness of the bans. The clearest information is available from a comparison of trends in China before and after the all-out effort in the mid-2000s, to implement the ban.

A study using data from India exploits the fact that the ban was introduced in the state of Maharashtra several years before the national ban on sex-selection (Nandi and Deolalikar 2013). The authors argue that the ban helped improve the child sex ratio in the areas of neighboring states contiguous to Maharashtra, and averted further worsening of child sex ratios in India. However, they caution that child sex ratios reflect both prenatal and postnatal sex-selection, and

they cannot isolate the effect on sex ratios at birth. Moreover, the data do not permit the authors to establish the validity of their assumption that the Maharashtra ban and the national ban were equally thoroughly implemented. Thus the study does not have the needed data to shed light on the impact of the ban on sex ratios at birth.

For South Korea, there are no rigorous evaluations of the impact of the ban on prenatal sex-detection. It is difficult to assess its effect, as several factors were at work simultaneously to reduce sex-selection (Figure 2). Survey data indicate that the decline in sex ratios at birth in South Korea was preceded by rapid decline in reported son preference associated with the rapid transformation of the country's economy and society (Chung and Das Gupta 2007). The Family Law was radically changed in 1989, *inter alia* giving girls and boys equal rights to inheritance (Shin 2006). From the mid-1990s, a government media campaign warned of the dangers of a shortage of girls (Liisanantti and Beese 2012:26).

From 1987, health providers who broke the law on prenatal sex-detection were subject to stringent sanctions (Sung 2012: 297-8). However, the impact of this ban is difficult to detect because of other factors at work. For example, sex ratios at birth spiked in 1990 as it was the Year of the Horse which was considered inauspicious for girls (Lee and Paik 2006). Despite efforts through the 1990s to implement the ban, as late as 2002 there were as many as 1.41 boys per girl born at birth order 3+,[14] suggesting continued access for those remaining desperate for a son. The ban was finally lifted in 2008,[15] and there was no rise in the trend of the sex ratio at birth.[16]

The government of China made by far the most vigorous effort to implement the ban on sex-selective abortion, with an intense push as part of its Care for Girls program. This program has been studied by Guo et al (2016). The program was piloted from 2003 in one county in each of 24 provinces, and implemented nationally from 2006. Several government departments were given responsibilities in implementing the campaign, including those for family planning, health, education, and police, and organizations such as the Women's Federation.

For implementing the ban on sex-selective abortion, women pregnant with their second child were specially monitored during their pregnancy by local family planning workers, as most of those allowed a second child under the family planning policy were couples whose first child was a girl and would be under greater pressure to ensure that their second child was a boy. Until then, the sex ratio at birth had been close to normal for first births but had risen sharply at second birth. Focusing on second pregnancies also made the workload of the implementers tractable, since only a quarter of births in the 2000 census were second births. Stringent sanctions were put in place for those found practicing sex-selection. Private clinics would be fined and have their equipment confiscated, and the whistle-blower rewarded. Doctors in public hospitals would lose their job. Local officials would be sanctioned for underperformance. 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. A large number of cases were investigated and punished.[17]

The 2010 census of China allows a look at the effect of these intensive efforts. The overall sex ratio at birth remained essentially stable between the censuses of 2000 and 2010, indicating that access to sex-selection remained despite the ban (Figures 1 and 3). The estimated sex ratio at birth has fluctuated around 120 boys per 100 girls since the late 1990s (Figure 1), both before and after the intervention. The effect of the intensive effort was a sharp change in the patterns of

sex-selection by birth order. The 2010 census data show a completely new pattern, with a sharp decline in the sex ratio of second births, and a sharp rise in that of first births (Figure 3). Since first births constituted nearly two-thirds of all births in the 2010 census, there was no reduction in the overall sex ratio at birth. Parents were clearly seeking to have a son at the first birth, to avoid the monitoring of second pregnancies,[18] and were clearly able to access sex-selection despite the stringent sanctions imposed on providers and clients of sex-selection services.

The vigorous implementation of the ban did succeed in reducing sex-selection amongst the targeted women (those having their second child), but even among this group the sex ratio at birth remained as high as 130 in the 2010 census. This is a somewhat limited achievement given that the entire manpower and apparatus of the family planning program was brought to bear on monitoring these pregnancies to avert sex-selection.

Only China has the political and administrative capacity as well as grassroots manpower to even consider such intense effort to avert sex-selection. Yet even there, they focused on a quarter of births, those most likely to be subject to sex-selection. It would be enormously labor-intensive to monitor every pregnancy in China. The country is focused also on communication and other ways of changing social norms on son preference.

4. What else can governments do?

A range of other policies is available to reduce son preference, to increase the value of daughters to their parents, and thereby encourage them to invest in their daughters. The impact of some of these interventions has been evaluated, and is summarized below. Studies show that such policies can effect change within quite short periods of time.

4.1 Media advocacy

Much can be done to alter people's values and behaviors through mass messaging, and a multiplicity of studies show that careful messaging can alter norms quickly.

Survey data from India permit analysis of the impact of media exposure on son preference, and find a highly significant impact. Some studies have used randomized data on access to media, and find that exposure to television is associated with improvements in several measures of gender equity, including reduced son preference (Jensen and Oster 2009, Ting et al 2014). Many cross-sectional analyses have found that greater exposure to the media is associated with reduced son preference.[19] Further, Lin and Adsera (2013) find that in India, mothers with greater media exposure allocate housework more equitably between boys and girls.

These results are consistent with other studies that find significant impact of the media on other aspects of norms and behaviors. Studies analyzing "natural experiments" have found significant impacts of radio and television messages on values and behaviors. In Brazil, women living in areas covered by the network that broadcasts *telenovela*s (soap operas) depicting small successful families have significantly lowered fertility (La Ferrara et al 2012). A radio soap opera in Tanzania was found effective at increasing contraceptive use (Rogers et al 1999). Data from the United States indicate that the media altered voting behaviour (DellaVigna and Kaplan 2007). These findings are in line with a large number of studies based on cross-sectional data,

which have found that media exposure has a large impact on a wide range of norms and behaviors.

Mass messaging to encourage people to value daughters more equally with sons is widely used in South and East Asia. This is the focus of large public awareness campaigns in China advocating for gender equity and the advantages of having daughters (Zhou et al 2012), as also in India[20].

4.2 Legal and other measures for gender equity

It is well-known that measures seeking to integrate women more fully into the economic and political mainstream help to improve gender equity, but they also help parents to see their daughters as worth investing in. All these countries have tried a range of initiatives to do this, such as laws on equal inheritance for girls and boys, and efforts to encourage both sons and daughters to care for their parents.[21]

What is less well-known is that such measures can effect changes quite quickly. Some of these initiatives in India have been evaluated, and find that girls can benefit within a few years. Deininger et al (2010) find that the 2005 legal amendment expanding rights to equal inheritance significantly increased daughters' educational attainment and likelihood to inherit land. Similar results on schooling were found by Roy (2011). In a follow-up study, Deininger et al (2014) find that the daughters of women who benefited from the reforms gain even more in terms of child labor, educational spending and attainment, and health status.

Other types of legal changes also alter gender roles. A number of studies find this is to be the case with a 1993 law in India requiring that one-third of local political representatives (*panchayats*) should be women. Women have become much more active in local political life following this law (Chattopadhyay and Duflo 2004), and this has weakened stereotypes about gender roles in the public and domestic spheres (Beaman et al 2009). Moreover, the new role models help raise girls' aspirations, erasing the gender gap in adolescent educational attainment (Beaman et al 2012).

Additional approaches to altering structures of patriarchy have also been tried in East Asia. In 2005, South Korea legislated that women can pass on their family name and assume family headship (Shin 2006). In 2008, Vietnam passed a similar law (UNFPA 2011:55-56). These changes imply that women can perform ancestor worship rituals, a concern that had powerfully motivated people to have sons to assure a peaceful afterlife. The impact of these efforts have yet to be evaluated.

4.3 Financial incentives

A direct approach that has been tried in India and China is to offer financial incentives to parents of daughters. One of the programs in India has been evaluated, and found quite ineffective (Sinha and Joong 2009; Holla et al 2007). It would be enormously expensive to begin to significantly offset the costs of raising an unwanted girl. Also, a negative message on the value of daughters is given when the state "compensates" parents specifically for having a girl.

5. Conclusions

As new prenatal sex-detection technology spread in South and East Asia, the proportions of "missing girls" rose sharply. These technologies clearly make it easier for parents to achieve their desired family composition than through postnatal selection alone.

Sex-selection is an especially egregious manifestation of low gender equity, and also has other consequences such as a future shortage of brides. Governments have sought to address the problem is by banning access to the technology of sex-detection to prevent sex-selective abortion, usually accompanied by banning sex-selective abortion. They have also sought to use other measures to reduce son preference and sex-selection, such as media outreach and legislation for gender equity.

Bans on sex-selection are difficult to implement. Randomized evaluation of the impact of these bans is hindered by lack of data, but the difficulties are illustrated by the experience of China's intensive campaign in the 2000s to implement the ban. The campaign had strong political and administrative support. The effort had two prongs. The first was to detect and punish providers and clients using sex-selection technology. This seems to have had little impact on access to sex-selection, as the overall sex ratio at birth remained unchanged. The second prong was to have the army of grassroots family planning workers monitor women expecting their second child, as they are the most likely to sex-select. This effort reduced the sex ratio at birth at second birth from 152 to 130, but was offset by a rise in sex-selection at first birth as people sought to evade the monitoring. It would be enormously labour-intensive to expand the pregnancy monitoring to include the first birth — effectively requiring the monitoring of most pregnancies in China.

Other types of intervention that require fewer resources also show promise in changing gender norms and reducing the demand for sex-selection. Many studies show that media exposure is effective at altering many aspects of behaviours and norms, including son preference. Other studies show that legal changes, such as those making for more equitable inheritance and political representation, can within a few years begin to change gender norms and parental willingness to invest in girls.

Neither bans nor the other policy interventions offer a "magic bullet" to eliminate sex-selection overnight, but both show some impact. However, the two types of approach differ in important ways. First, studies show that they differ in their impact on the treatment of girls and women. Bans can perpetuate harsh treatment of unwanted girls and their mothers — as highlighted by the Chinese government simultaneously banning sex-selection and the maltreatment of baby girls and their mothers — while the other interventions reduce son preference by enhancing gender equity. Second, bans are difficult and expensive to implement, even in settings with such unique political organization and grassroots monitoring capacity as China. Efforts to alter gender norms and reduce son preference would seem to offer many advantages over bans in effecting a permanent shift away from sex-selection.

References

Ahn H.S., H.J. Seol, J.E. Lim, S.H. Hong, S.Y. Lee, M.I. Park, S.D. Kim, and H.J. Kim. 2012. "Estimates of induced abortion in South Korea: health facilities survey", *Journal of Obstetrics and Gynaecology* 38(1):324-8

Asfaw, Abay, Stephan Klasen, and Francesca Lamanna. 2008. "Intra-household Gender Disparities in Children's Medical Care before Death in India." Proceedings of the German Development Economics Conference, Zürich, 2008.

Beaman, Lori, Raghabendra Chattopadhyay, Esther Duflo, Rohini Pande, and Petia Topalova 2009. "Powerful Women: Does Exposure Reduce Bias?" *Quarterly Journal of Economics* 124(4):1497-1540.

Beaman, Lori, Esther Duflo, Rohini Pande, Petia Topalova. 2012. "Female Leadership Raises Aspirations and Educational Attainment for Girls: A Policy Experiment in India" *Science* 335(6068):582-586.

Bhat, P. N Mari, and A. J Francis Zavier.2003. "Fertility Decline and Gender Bias in Northern India", *Demography* 40(4): 637-657.

Chattopadhyay, Raghabendra and Esther Duflo. 2004. "Women as policy makers: evidence from a randomized policy experiment in India", *Econometrica* 72 (5) 1409–1443

Choe, Minja Kim. 1987. "Sex Differentials in Infant and Child Mortality in Korea." *Social Biology* 34: 12-25.

Chung, Woojin, and Monica Das Gupta. 2007. "The Decline of Son Preference in South Korea: the roles of development and public policy", *Population and Development Review* 33(4): 757-783.

Council of Europe. 2011. Parliamentary Assembly Resolution 1829 http://assembly.coe.int/Main.asp?link=/Documents/AdoptedText/ta11/ERES1829.htm, (accessed 13 May 2014).

Council of Europe, Commissioner for Human Rights. 2014. "Sex-selective abortions are discriminatory and should be banned" http://humanrightscomment.org/2014/01/15/sex-selective-abortions-are-discriminatory-and-should-be-banned/ (accessed 13 May 2014)

Darnovsky M. 2009. Countries with laws or policies on sex selection, Berkeley, CA: Center for Genetics and Society <http://geneticsandsociety.org/downloads/200904_sex_selection_memo.pdf>, accessed May 2, 2013.

Das Gupta, Monica. 1987. "Selective Discrimination against Female Children in Rural Punjab, India." *Population and Development Review* 13(1): 77-100.

Das Gupta, Monica and Li Shuzhuo. 1999. "Gender bias in China, South Korea and India 1920-1990: the effects of war, famine and fertility decline", *Development and Change* 30(3):619-652

Das Gupta, Monica, Jiang Zhenghua, Xie Zhenming, Li Bohua, Woojin Chung, and Bae Hwa-Ok. 2003."Why is son preference so persistent in East and South Asia?: a cross-country study of China, India and the Republic of Korea" (with), *Journal of Development Studies*, 40(2): 153-187.

David, Henry P., and Nicholas H. Wright. 1971. "Abortion Legislation: The Romanian Experience", *Studies in Family Planning* 2(10): 205-210

Deininger, Klaus, Aparajita Goyal, and Hari Nagarajan. 2010. "Inheritance Law Reform and Women's Access to Capital: Evidence from India's Hindu Succession Act", Washington DC: The World Bank Policy Research Working Paper 5338

Deininger, Klaus; Xia, Fang; Jin, Songqing; Nagarajan, Hari K.. 2014. Inheritance Law Reform, Empowerment, and Human Capital Accumulation : Second-Generation Effects from India", Washington DC: The World Bank Policy Research Working Paper 7086

DellaVigna, Stefano, and Ethan Kaplan. 2007. "The Fox News Effect: Media Bias and Voting", *Quarterly Journal of Economics*, 122 (3), 1187–1234.

Frost, Melanie Dawn, Mahesh Puri, Peter Richard, and Andrew Hinde.2013 "Falling sex ratios and emerging evidence of sex-selective abortion in Nepal: evidence from nationally representative survey data" *BMJ Open* ;3:e002612

Ganatra, Bela. 2008. "Maintaining Access to Safe Abortion and Reducing Sex Ratio Imbalances in Asia." *Reproductive Health Matters* 16 (31 Supplement): 90-98.

Gaudin, Sylvestre.2011. "Son Preference in Indian Families: Absolute Versus Relative Wealth Effects," *Demography* 48 (1): 343–70.

Gruber, Jonathon, Phillip Levine, and Douglas Staiger. 1999. "Abortion Legalization and Child Living Circumstances: Who Is the "Marginal Child"?", *Quarterly Journal of Economics*, 114 (1): 263-291.

Guo, Zhen, Monica Das Gupta, and Li Shuzhuo. 2016. "'Missing Girls' in China and India: Trends and Policy Challenges", *Asian Population Studies* (forthcoming)

Haddad, Lisa B., and Nawal M. Nour. 2009 . "Unsafe Abortion: Unnecessary Maternal Mortality" *Reviews in Obstetrics and Gynaecology* 2(2):122-126.

Holla Alaka, Robert Jensen & Emily Oster. 2007. "Daughters as Wealth? The effect of cash incentives on sex ratios", Brown University, Working Paper.

Hu, Luojia and Analia Schlosser. 2012. "Trends in Prenatal Sex Selection and Girls' Nutritional Status in India", CESifo Economic Studies 58 (2): 348-372.

Hulsey TM**.** 2001. "Association between early prenatal care and mother's intention of and desire for the pregnancy", *Journal of Obstetric, Gynecologic, & Neonatal Nursing* 30(3):275-82

Jensen, Robert, and Emily Oster. 2009. "The Power of TV: Cable Television and Women's Status in India" (with Robert Jensen), *Quarterly Journal of Economics*, 124 (3): 1057-1094

Jones, Kelly. 2011. Evaluating the Mexico City Policy: How US foreign policy affects fertility outcomes and child health in Ghana, Discussion Paper 01147, International Food Policy Research Institute.

Josantony Joseph & CYDA (Centre for Youth Development and Activities). 2007. *Reflections on the Campaign against Sex Selection and Exploring Ways Forward*, Study commissioned by the UNFPA, Pune: CYDA http://countryoffice.unfpa.org/india/drive/Reflections.pdf, accessed 20 January 2015.

Kalsi, Priti. 2013. "Long-Term Effects of Legalized Abortion on Female Education in Taiwan", University of Colorado Boulder, Department of Economics Working Paper No 13-16.

Korean Statistical Information Service (kosis.kr/eng/, last accessed March 2015)

Kulkarni P M. 2007. *Estimation of missing girls at birth and juvenile ages in India*. Paper commissioned by the United Nations Population Fund (UNFPA).

La Ferrara, Eliana, Alberto Chong, and Suzanne Duryea. 2012. Soap operas and fertility: evidence from Brazil. *American Economic Journal: Applied Economics* 4(4): 1-31

Lee, Jungmin and Myungho Paik. 2006. "Sex preferences and fertility in South Korea during the year of the *horse*", *Demography* 43(2):269-292

Li, Lixing, and Xiaoyu Wu. 2011. "Gender of Children, Bargaining Power, and Intrahousehold Resource Allocation in China", *The Journal of Human Resources* 46(2): 295-316

Li, Shuzhuo, Chuzhu Zhu, and Marcus W. Feldman. 2004. "Gender Differences in Child Survival in Contemporary Rural China: A County Study." *Journal of Biosocial Sciences* 36(1): 83-109.

Li, Shuzhuo. 2007. "Imbalanced Sex Ratio at Birth and Comprehensive Intervention in China", paper prepared for the UNFPA 4th Asia Pacific Conference on Reproductive and Sexual Health and Rights, Hyderabad, India.

Liisanantti, Anu, and Karin Beese. 2012. Gendercide: The Missing Women, Brussels: European Union Directorate-General for External Policies of the Union, Policy Department Study. http://www.europarl.europa.eu/RegData/etudes/etudes/join/2012/433777/EXPO-DEVE_ET(2012)433777_EN.pdf, accessed 13 July 2014.

Lin, Tin-Chi, and Alicia Adsera. 2013. "Son Preference and Children's Housework: The Case of India", *Population Research and Policy Review* 32(4): 553–584

Lin, Ming-Jen, Jin-Tan Liu, and Nancy Qian. 2014. "More Missing Women, Fewer Dying Girls: The Impact of Sex Selective Abortion on Sex at Birth and Relative Female Mortality in Taiwan." *Journal of the European Economic Association* (forthcoming).

Marston Cicely, and John Cleland John. 2003. "Do unintended pregnancies carried to term lead to adverse outcomes for mother and child? An assessment in five developing countries", *Population Studies* 57(1):77–93.

(MOHFW 2007) Ministry of Health and Family Welfare. 2007. *The Pre-Conception and Pre-Natal Diagnostic Techniques Act, 1994: Answers to Frequently Asked Questions, a Handbook for the Public* New Delhi: Ministry of Health and Family Welfare http://pndt.gov.in/writereaddata/mainlinkfile/File53.pdf, accessed 4 June 2015

Miron, Jeffrey A., and Jeffrey Zwiebel. 1995. "The Economic Case Against Drug Prohibition", *The Journal of Economic Perspectives* 9 (4): 175-192

Mohapatra, Seema. 2013. "Global Legal Responses to Prenatal Gender Identification and Sex-Selection", *Nevada Law Journal* 13(3): 690-721

Muhuri, Pradip K., and Samuel H. Preston. 1991. "Effects of Family Composition on Mortality Differentials by Sex among Children in Matlab, Bangladesh." *Population and Development Review* 17(3): 415-34.

Nandi, Arindam, and Anil B. Deolalikar. 2013. "The Impact of a Ban on Sex-Selective Abortion on the Juvenile Sex Ratio in India: Evidence from a Policy Change." *Journal of Development Economics* 103: 216-228.

Pande, Rohini. P., and Nancy M. Astone. 2007. "Explaining Son Preference in Rural India: The Independent Role of Structural versus Individual Factors", *Population Research and Policy Review* 26(1): 1-29.

Phan Thu Hien. 2014. " Sharing experiences from UNFPA Viet Nam", presentation at the UNFPA HQ Meeting on Addressing Son Preference, New York 18 June 2014.

Pop-Eleches, Cristian. 2006. "The Impact of an Abortion Ban on Socioeconomic Outcomes of Children: Evidence from Romania", *Journal of Political Economy*, Vol. 114, pp. 744-773

Robitaille, Marie-Claire, and Ishita Chatterjee. 2014. "Sex-Selective Abortions and Infant Mortality in India: The Role of Parents' Stated Son Preference". Available at SSRN: http://ssrn.com/abstract=2557224

Rogers, Everett M., Peter W. Vaughan, Ramadhan M.A. Swalehe, Nagesh Rao, Peer Svenkerud, and Suruchi Sood (1999). Effects of an entertainment-education radio soap opera on family planning behavior in Tanzania. *Studies in Family Planning* 30(3):193–211

Rotz, Dana (2013). The Impact of Legal Abortion on the Wage Distribution: Evidence from the 1970 New York Abortion Reform, paper presented at the American Economic Association annual meeting.

Roy, Sanchari. 2011. "Empowering Women: Inheritance Rights and Female Education in India", Department of Economics, University of Warwick, Working Paper No.46

Serbanescu, Florina, Leo Morris, Paul Stupp and Alin Stanescu. 1995. "The Impact of Recent Policy Changes on Fertility, Abortion, and Contraceptive Use in Romania", *Studies in Family Planning* 26(2): 76-87

Shin, Ki-Young. 2006. "The Politics of the Family Law Reform Movement in Contemporary Korea", *The Journal of Korean Studies* 11(1): 93-128

Singh S. 2006. "Hospital admissions resulting from unsafe abortion: estimates from 13 developing countries", *Lancet* 368: 1887–92.

Sinha, Nistha, and Joanne Yoong. 2009. "Long-Term Financial Incentives And Investment In Daughters: Evidence From Conditional Cash Transfers In North India", Washington DC: The World Bank, Policy Research Working Paper # 4860.

Sung, Woong Kyu. 2012."Abortion in South Korea: The Law and the Reality", *International Journal of Law, Policy and the Family* 26(3): 278-305

Ting, Hsin-Lan, Chon-Kit Ao, and Ming-Jen Lin. 2014. "Television on Women's Empowerment in India", *The Journal of Development Studies*, DOI: 1c0.1080/00220388.2014.896456

United Nations. 2002. *Abortion Policies: A Global Review*, New York: United Nations Population Division, Dept of Economic and Social Affairs (http://www.un.org/esa/population/publications/abortion/index.htm) accessed 24 June 2014.

(UNFPA 2010a) Centre for Youth Development and Activities (CYDA), Prayatn, Adithi, Vimochana, and the Public Health Foundation of India, New Delhi. 2010. *Implementation of the PCPNDT Act in India: perspectives and challenges*, report prepared for the National Human Rights Commission (NHRC) and the United Nations Population Fund (UNFPA) Delhi.

UNFPA. 2010b. *Trends in Sex Ratio at Birth and Estimates of Girls Missing at Birth in India*, New Delhi: United Nations Population Fund (UNFPA) (http://countryoffice.unfpa.org/india/drive/SRBBooklet.pdf, accessed 11 December 2015)

UNFPA. 2011. *Son Preference in Vietnam*, Hanoi: The United Nations Population Fund.

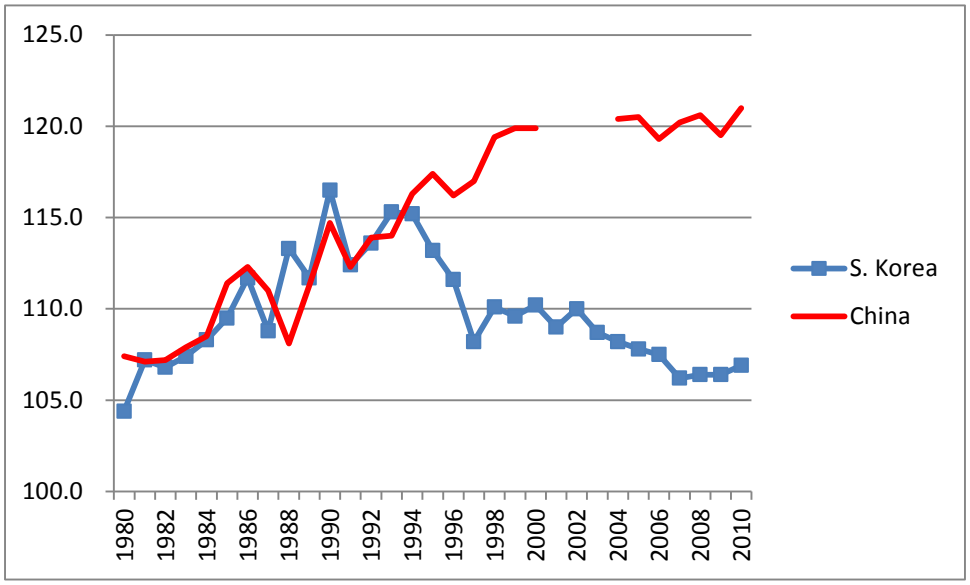
Villa, Anderson V. 2006. "Sex Preferences and Fertility Trends in South Korea", *Asia-Pacific Social Science Review* 6(2):153–61.

Westley, Sidney B. 1995. "Evidence mounts for sex-selective abortion in Asia", *Asia-Pacific and Population Policy* No.34. Honolulu: East-West Center.

World Health Organisation. 2011a. *Unsafe abortion: global and regional estimates of the incidence of unsafe abortion and associated mortality in 2008*, Geneva: World Health Organization, 6th edition.

Zhou, C., XL Wang, XD Zhou, and T Hesketh. 2012. "Son preference and sex-selective abortion in China: informing policy options", *International Journal of Public Health* 57 (3):459-465

Figure 1. Sex ratios at birth, China and South Korea, 1980-2010

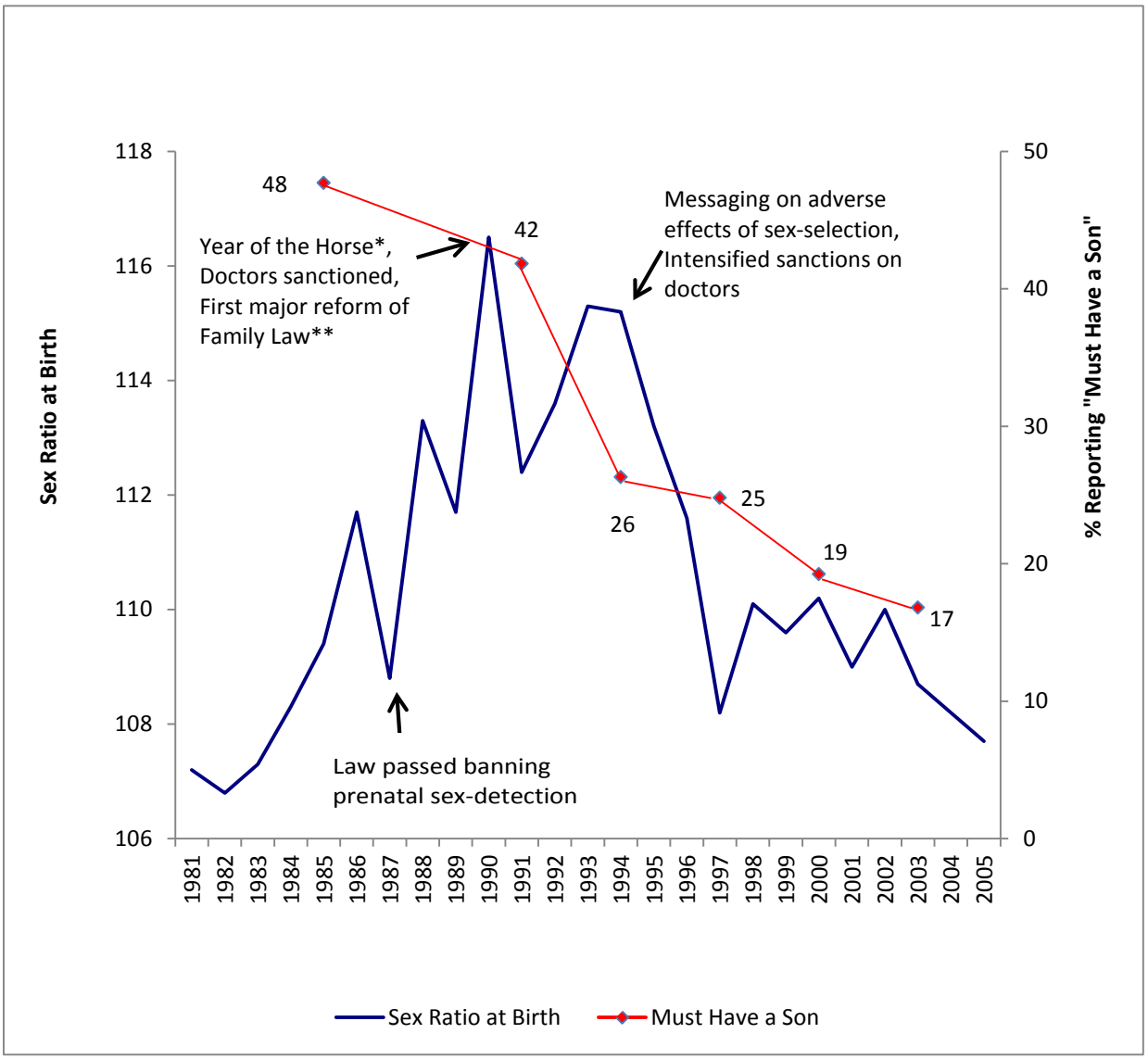


Sources:

South Korea: Korean Statistical Information Service), Statistics Korea, http://kosis.kr

China: 1980-2007 from Das Gupta, Chung and Li (2009: Figure1), 2008-09 from the National Bureau of Statistics of China (2009, 2010), and 2010 from the 2010 census (long form, as also for 2000).

Figure 2: Sex Ratios at Birth in South Korea and percentage of women reporting "must have a son"

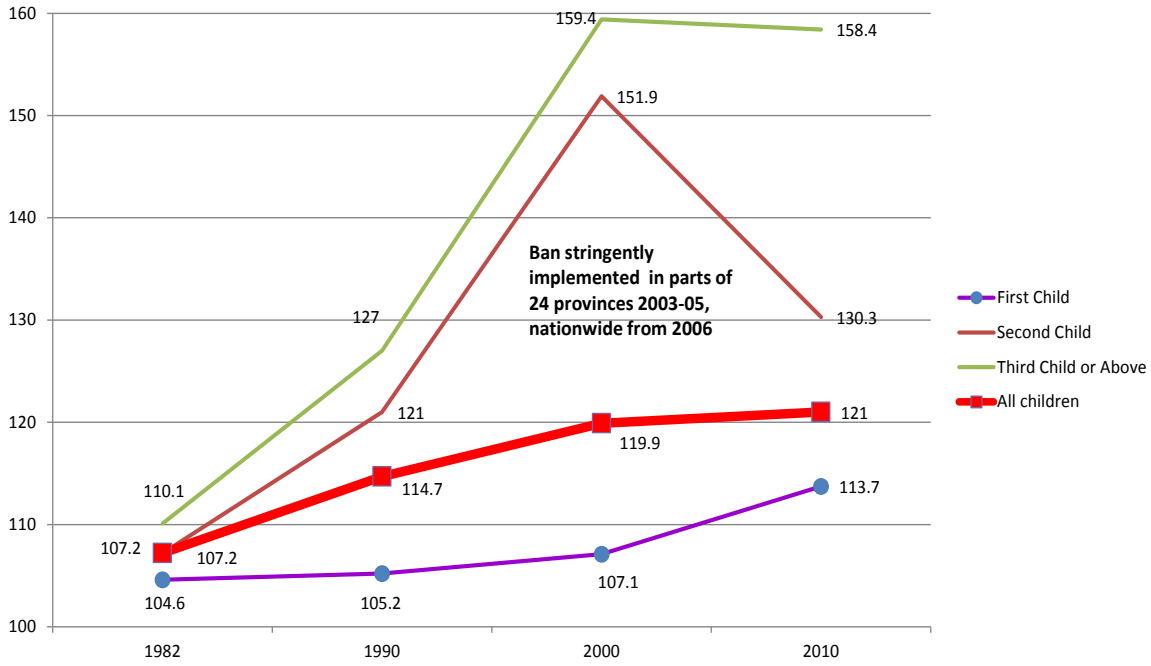


Source: Sex ratios at birth from Korean Statistical Information Service. Women reporting "must have a son" from successive Korea National Fertility and Family Health Surveys.

* The Year of the Horse is part of the 12-year animal zodiac cycle. It is considered inauspicious for girls to be born, as they are not likely to make good wives. Sex ratios at birth tend to peak in those years (Lee and Paik 2006), though the increase in 2002 was muted compared to earlier years implying a shift away from these traditional beliefs.

** This reform had several important components, including giving girls and boys equal rights to inheritance.

Figure 3: Sex Ratio at Birth by birth order, China 1982-2010



Source: Guo et al (2016), derived from the full censuses of China of 1982, 1990, 2000 and 2010.

Note: The 2000 and 2010 censuses collected data in both a "short form" and a "long form". The data from both these forms indicate that the overall sex ratio at birth remained essentially stable, rising minimally in both cases. The data here are from the "long form", as data on sex ratios at birth by birth order were only available from these.

ENDNOTES

[1] Constitutional Court of Korea, http://english.ccourt.go.kr/home/english/decisions/rcnt_decision_view.jsp?seq=463&pg=6&sch_sel=&sch_txt=&nScale=15&sch_code=9&actype= (accessed 13 July 2014)

[2] http://rajswasthya.nic.in/PCPNDT%2005.12.08/PCPNDT%20Act%20(2).pdf

[3] Article 24 of the PCPNDT Act, http://chdslsa.gov.in/right_menu/act/pdf/PNDT.pdf, accessed 12 February 2014.

[4] http://www.medindia.net/indian_health_act/pre-natal-diagnostic-techniques-amendment-act-2002-definitions.htm, and http://chdslsa.gov.in/right_menu/act/pdf/PNDT.pdf (accessed 3 October 2015).

[5] Paras 30-31 of the PCPNDT Act http://chdslsa.gov.in/right_menu/act/pdf/PNDT.pdf, accessed 12 February 2014.

[6] Many sources point to the high proportion of pregnancies aborted in South Korea. See for example Sung (2012).

[7] Less rigorous studies indicate that such under-investment begins before birth, with lower use of antenatal care for these children, controlling for mother's other characteristics (Marston and Cleland 2003, Hulsey 2001), and continues through childhood.

[8] See for example Das Gupta et al (2003).

[9] Writing of South Korea in the early 1990s, Park and Cho (1995:75-77) noted that selective abortion reduces unwanted children, improving the life-chances of girls.

[10] See for example Choe (1987) on South Korea, Das Gupta (1987) on North India, Muhuri and Preston (1991) on Bangladesh, Li et al. (2004) on China, and Lin et al (2014) on Taiwan.

[11] For attempts to estimate the consequences of unsafe abortion on maternal health, see Singh (2006) and Haddad and Nour (2009). The WHO (2011) estimates that abortion rates are similar in countries that have more restrictive abortion laws than those which do not, but that the levels of unsafe abortion are far higher in the former.

[12] Paras 30-31 of the PCPNDT Act http://chdslsa.gov.in/right_menu/act/pdf/PNDT.pdf, accessed 12 February 2014.

[13] The pilots tried in Chinese provinces before the Care for Girls program was implemented nationally might permit such evaluation, if the data were available. There are two caveats to this: (1) local officials might feel pressured to record successful outcomes, as noted for many other kinds of data; and (2) spreading news of the pilots, potentially alerting those living elsewhere of coming policy changes and the need to alter behavior in anticipation.

[14] Korean Statistical Information Service (kosis.kr/eng/, last accessed March 2015)

[15] http://go.nationalpartnership.org/site/News2?abbr=daily2_&page=NewsArticle&id=12088

[16] Korean Statistical Information Service (kosis.kr/eng/, last accessed March 2015). The data show minor fluctuations depending on the animal year, with some years inauspicious for girls to be born (Lee and Paik 2006).

[17] As many as 6700 cases were investigated in the 10 months between August 2011 and May 2012, of which 5800 cases had been concluded and about 2400 people punished. Guo et al (2016), derived from http://news.ifeng.com/gundong/detail_2012_06/03/15009788_0.shtml (*Legal Daily*, in Chinese, accessed 6 October 2015).

[18] The rise in sex-selection amongst first births cannot be attributed to tighter implementation of the family planning policy, as the estimated Total Fertility Rate remained at similarly low levels during this period: 1.44 in 1999 and 1.37 in 2009 (National Bureau of Statistics of China 2000, 2010).

[19] See for example Bhat and Zavier 2003; Pande and Astone 2007; Gaudin 2011; and Robitaille and Chatterjee 2014.

[20] A multiplicity of outreach efforts have been made by the central government and the state governments over the years. Examples of national campaigns include the Meena campaign launched in 1998 (http://www.unicef.org/rosa/media_2479.htm), and the Beti Bachao campaign launched in 2015.

[21] Laws on equal inheritance for girls and boys were passed in India in 1956, and strengthened in 2005 (http://www.hrln.org/admin/issue/subpdf/HSA_Amendment_2005.pdf), in China in 1985 (http://www.fmprc.gov.cn/ce/cgny/eng/lsqz/laws/t42224.htm), South Korea in 1989 (Shin 2006).

Laws encouraging children of both genders to care for their parents include Article 49 of China's 1982 Constitution (http://english.people.com.cn/constitution/constitution.html). Vietnam passed such a law in 2000 http://chinhphu.vn/portal/page/portal/English/legaldocuments/Policies?categoryId=886&articleId=10001412, and India in 2007 http://dc-siwan.bih.nic.in/senior_citizens_act.pdf.