

# **China's Unbalanced Sex Ratio at Birth, Millions of Excess Bachelors, and Societal Implications**

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## Introduction

Between the 1960s and the 1990s, China experienced a rapid fertility reduction from more than six children per woman in the early 1960s to less than two children per woman in the 1990s (Figure 1). This fertility reduction has been one of the most rapid fertility declines in recorded human history and has resulted since the 1980s in significantly more boys being born each year than girls. When these many millions of extra boys born in China reach marriage age they will not be able to find Chinese women to marry. This has important and relevant implications for China's marriage market, the provision of parental care, and for the incidence of HIV and other sexually transmitted infections.

In this paper we first develop estimates of how many extra boys have already been born in China through the year of 2010. We then project under two different assumptions how many extra boys will have been born in China up to the year of 2020.

Others have conducted similar statistical analyses (cf., Hull 1990; Johansson and Nygren 1991; Gu and Roy 1995; Tuljapurkar et al. 1995; Hudson and Den Boer 2002, 2004; Parish et al. 2003; Tucker et al. 2005; Zeng 2007), but none have projected numbers quite as high as ours.

The immediate cause of the demographic shift producing a deficit of girls is China's dramatic fertility transition. We show how and why China's fertility reduction resulted in a surplus of boys and a deficit of girls. Then we discuss some of the implications of this large surplus of boys.

#### China's Fertility Transition and the Increasing Sex Ratio at Birth

China has completed its demographic transition from high fertility to low fertility, moving from a total fertility rate of over 6 children per woman in the 1960s to 2.1 in the 1990s, to just over 1.5 in 2010. Poston and Glover (2005; 2006) and Poston and Zhang (2009) have traced the history of population dynamics and fertility change in China since 1949 when Mao Zedong and the Chinese Communist Party first assumed control, up to the present. "It is the dramatic decline in the TFR since the mid-1960s and the 1970s that has resulted in many extra baby boys, compared to baby girls, being born in China every year since the 1980s" and thus determining its future (Poston and Glover, 2006: 175).

Societies typically have sex ratios at birth (SRBs) of between 104 and 107, that is, around 104 to 107 boys are born for every 100 girls. This balanced sex ratio at birth is thought to be an evolutionary adaptation to the biological universal that females live longer than males. At every year of life males have higher age-specific death rates than females; thus between 104 and 107 males are required at birth for every 100 females for

there to be roughly equal numbers of males and females when the groups reach the marriage ages.

Figure 2 is a chart of time-series data for the sex ratio at birth for China and for the United States, from 1980 to 2010. The SRB in the U.S. is invariant, at about 105 for every year. This is the expected SRB if there are no human interventions operating to disturb the biology. In contrast, in China in 1980 the SRB was near normal, and then increased to 115 by 1990, to 120 by 2010. Since the mid-1980s, China's SRBs have been significantly out of balance.

(Figure 2 about here.)

China, along with Taiwan, South Korea, India and several other Asian countries have been reporting abnormally high SRBs since the 1980s and early 1990s (Arnold and Liu 1986; Gu and Roy 1995; Goodkind 1996; 2002; Kim 1997; Poston et al. 1997; Hudson and Den Boer, 2002, 2004; Poston and Glover, 2005, 2006; Jha et al., 2006; Sheth, 2006; Poston and Zhang, 2009). These unbalanced SRBs have occurred because four events or phenomena are present: 1) a rapid fertility decline in 20-30 years from high to low levels, 2) the presence of a strong preference for children of one sex, usually sons, 3) the availability and relative ease of access to technologies allowing the determination of the sex of the fetus, and 4) the availability and relative ease of access physically and normatively to abortion. These four phenomena/events are all present in China and several other countries in East Asia and South Asia.

We are not suggesting that only Asian countries run the risk of unbalanced sex ratios at birth. An unbalanced SRB will occur anywhere the above four phenomena are present. As a matter of fact, most Asian countries have balanced sex ratios at birth, e.g., North Korea, Thailand, and most of Southeast Asia. China and the few other Asian countries with unbalanced SRBs are the exceptions, not the rules. Also, there is nothing Western-centric or Euro-centric about balanced SRBs. There are no Western countries with seriously unbalanced SRBs because first, their fertility transitions were a century or more in duration, and, second, there is not as much son preference, or more generally, sex preference, in Western countries.

Why would a country such as China resort to human interventions that would produce higher than biologically normal SRBs? The answer lies in its dramatic fertility decline along with a culture that for thousands of years has been influenced by a Confucian patriarchal tradition where son preference is strong and pervasive (Kim 1997; Park and Cho 1995; Poston et al. 1997).

But as Pison (2004) has shown, when the birth rate is high, as it was in China for thousands of years up to the early 1970s, the chances that a boy will be born are very good. When Chinese women were having six children on average, the probability was less than 2 percent that none of the six children would be male. By comparison, when women have two children, the probability that neither will be a son is around 25 percent. And when women have only one child, it is under 50 percent. Chinese parents today have far fewer children than they had several decades ago. But the deeply-rooted Confucian cultural influences of son preference still make it important for many families to have at

least one son. Therefore, many families implement strategies and interventions to ensure that they will have a son.

We noted earlier that the SRB is biologically normal at about 105. For decades, the U.S. has had a balanced sex ratio at birth of around 105 (see Figure 2). The U.S. sex ratio then drops to below 100 for the ages 25-34, when men and women typically marry. But in China the sex ratio stays above 100 until the middle ages. Sex ratios above 100 in China at these older ages is a reflection, by the way, of the fact that even with balanced SRBs before the 1980s, China was producing more boys than needed for an equitable marriage market, and this occurred in part to the rapid decline in the birth rate (Lee 1981; Lee et al. 1994; Courtwright 2001; Klasen and Wink 2002). But the numbers of excess males in China have never been as large as in past decades when the SRBs have been significantly out of balance.

In China, therefore, beginning around the year of 2015, and continuing indefinitely until several decades after the SRB returns to the normal biological level of 104-107, there will be many more extra boys of marriage-age seeking females to marry, who will be unsuccessful in their courtship pursuits. How many excess Chinese boys will there be who will be unable to find Chinese brides?

For every year from the mid-1980s to 2010, we have gathered data on China's total population size, the crude birth rate, and the sex ratio at birth. With these data we have determined the actual numbers of males and females born every year. After determining the numbers of boys and girls born each year, we next used "l(x)" data from China life tables for males and for females (Huang and Liu 1995: Tables 2-6-1 and 2-6-2). The boys born each year were then "survived" to age 25, and the girls born each year

were “survived” to age 23. We use the ages of 25 and 23 because they are the “encouraged” ages at first marriage for men and women, respectively, in China (China Population Information and Research Center 2003). Given an approximate two year difference in the ages of males and females at first marriage, each year the females age 23 will comprise the pool of potential brides for the males age 25.

To illustrate, the  $l(25)$  value from the life table for males is 95709.5, indicating that .957095 of males born will survive to age 25. This survival proportion is then multiplied by the year-specific number of males born each year from the mid-1980s to 2008 using data generated from the annual SRBs shown in Table 2 and annual crude birth rates (table not shown). For instance, there were 12,863,565 males born in China in 1990; this number is multiplied by the  $l(25)$  life table proportion value (shown above), i.e., .957095, leading to 12,311,653, which is the number of males born in 1990 who will live to be age 25 in the year 2015. One then takes the number of females born in 1992 and multiplies them by their  $l(23)$  survival proportion, giving a product reflecting the number of females who will survive from birth to be 23 years old in the year of 2015. This number is then subtracted from the male number shown above yielding a difference of 1,694,117, which represents the excess number of males of age 25 over females of age 23 in the year of 2015. The above exercise is implemented for every target year from 2008 to 2033, determining how many 25 year old males born between 1983 and 2008 will be unable to find Chinese brides of age 23 who were born between 1985 and 2010. The numbers of excess males for every year are summed yielding a total number of bachelors.

In all, between the years of 1983, the starting year of the imbalanced sex ratios at birth in China, and 2010, we estimate there have been born in China a surplus of more

than 40 million males, for whom there will not be appropriately aged Chinese women in the marriage market for them to marry. We also estimated the numbers of surplus boys in three different alternate ways by altering the first marriage ages of the males to 27, and to 29, and to 31, and the females to 25, and to 27, and to 29. But no matter to which ages the males and females are survived, there will be a large excess number of marriage-age males, over 40 million, who will not be able to find women to marry who are two years younger than they.

We next developed projected numbers of the surplus boys born between 1983 and 2020, following two approaches. First, we assumed that the SRB of 120 in 2010 would not change between 2010 and 2020. Second, we assumed that the SRB of 120 in 2010 would slowly decline between 2010 and 2020 to a level of 107 to simulate the change in SRBs that occurred in South Korea in the 1990s and early 2000s. Like China, South Korea's SRB increased by 1990 to above normal levels, to 117, but then declined steadily to 107.4 by 2006 ("The Worldwide War on Baby Girls" 2010).

According to our first scenario which assumes no changes in China's SRB by 2020, we project there will be over 55 million extra boys born between 1983 and 2020 who will not be able to find wives to marry. In the second scenario, which assumes that China will be able to reduce its SRB by 2020 to 107, we project there will be a surplus of almost 51 million males. What will these many millions of young men do when they cannot find brides? In the last section of our paper we explore some of the implications.

### Implications of the Excess Numbers of Boys

Our analysis has shown that China's unbalanced SRB has resulted in over 40 million extra boys born in China who will not be able to find Chinese women to marry; they are referred to by the Chinese as *guang gun*, or "bare branches" (Hudson and den Boer 2004) because they will not be able to provide new branches on their family trees if they remain unmarried. Scholars have developed several different scenarios regarding what might happen to these extra boys, such as forced marriages, stolen girls, bigamy, prostitution (Hershatter 1997), rape, adultery, and homosexuality (Eberstadt 2000). In this section we discuss some of these implications.

In China, the "average" surplus male is unmarried, poor, unemployed, and has little education. The 2000 Chinese census showed that 89 percent of all unmarried men have not completed high school. Surplus men who are coming of age now are even less likely to have opportunities for education, which will leave them underemployed and poor. When there is an extreme excess of males in a population, history has shown many different results, including a rise in authoritarian rule in order to deal with the violence that occurs from the unattached men. However, a country may also choose to just allow the males to fight within their groups, which may lead to excess mortality (York 2007). Hudson and den Boer (2002, 2004) note that these males may experience direct physical force, or even geographical relocation. Another option for China is to recruit the boys into dangerous jobs including law enforcement, the military, and public projects.

China will likely have a difficult time adapting to the growing population of excess males in the working ages. The extra boys could well be dispatched to one of China's large public works projects in rural areas such as the natural gas pipeline from the western provinces to Shanghai, the railroad to Tibet, and the Three Gorges Dam.



There is also a precedent for mass movement of Chinese to the countryside, which occurred during the Great Leap Forward in 1960 when nearly 14 million city residents were involuntarily shipped to rural areas to work, and during the Cultural Revolution when several million unmarried men and women were moved to the countryside to work and learn with the peasants (Fairbank, 1992; Thurston, 1987).

Although bachelorhood has been accepted in some countries in the past, including those in Western Europe (Eberstadt, 2000, Hajnal, 1965), we do not believe this will happen in China. China has a culture, as does much of East Asia, that promotes marriage and does not accept bachelorhood so easily. “Unless it is swept by a truly radical change in cultural and social attitudes toward marriage in the next two decades... China (is) poised to experience an increasingly intense, and perhaps desperate, competition among young men for the nation’s limited supply of brides” (Eberstadt, 2000: 230; see also York [2007]).

One option would be for Chinese women from Hong Kong, Singapore, Indonesia, and Thailand to move to China to marry Chinese men, but this is unlikely (Poston et al., 1994; Poston 2003). For one thing, the *guang gun* are poor rural men who would not be able to afford “mail order brides” (Eberstadt, 2000: 231; Dean, 2000). The surplus boys could turn to homosexuality, but this too is probably not an option because homosexuality is believed to have a strong biological foundation (LeVay, 1991, 1996; Masters et al., 1994; Pinker, 2002; see also Stein, 1999 and Murray, 2000 for other arguments).

We believe that the most probable outcome is that these males will remain unmarried and adapt to living in communal areas that cater to their work and their

lifestyles. They are likely to move to “bachelor ghettos” in such large cities as Beijing, Shanghai, Guangzhou, and Tianjin. Demographers have shown empirically that the commercial sex markets in urban areas will quickly accommodate the millions of the *bare branch* migrants (Parish et al. 2003; Tucker et al. 2005) where the prevalence of HIV/AIDS and other sexually transmitted infections will be high. And even if they do not engage in significant amounts of commercial sex, research has shown a greater propensity for bachelors per se to test positive for sexually transmitted infections (South and Trent 2010).

The heterosexual transmission of HIV is the fastest growing avenue for the transmission of HIV/AIDS in China, according to the Ministry of Health of China (2005), with commercial sex workers accounting for 20 percent of new cases, HIV-infected partners accounting for 17 percent, and male homosexual sex accounting for 7 percent of newly infected people. The statistical analyses of Tucker and colleagues (2005) have shown that the risk for surplus men is bolstered by several factors which make them likely to engage in sex with prostitutes, such as migration and low education. And even if these males eventually find wives after earning money and becoming more stable, their HIV will place their wives at high risk, a phenomenon known as bridging. The statistical simulations of Merli and Hertog (2010) articulate these issues in far greater detail (also see Merli et al [2006] and Merli et al [2009]).

A final implication to be discussed is eldercare provision. Traditionally in China, the support of one’s elder parents has been the responsibility of the sons. The eldest son and his brothers provided the economic support, and their sisters and their wives, the emotional support. However, given contemporary China’s unbalanced sex ratio at birth,

very low levels of fertility, and increases in the numbers of elderly, the provision of eldercare could well be a problematic concern in the decades ahead. For one thing, there are now and will continue to be in China many more aged dependents per producers. In 2000 there were 16 aged dependents per 100 producers; in 2020, there will be 26, and in 2050, there will likely be 59. This is an astonishingly high number of old persons per 100 producing members in the population, nearly three times the ratio for the year 2000 (Poston and Duan 2000). When we couple China's very high dependency ratio for the year 2050 with the abnormally high sex ratios at birth, the issue of eldercare provision in the new millennium becomes even more critical. We have shown that by 2020 there will be over 50 million Chinese men who will not be able to marry. These single men will have the responsibility for providing both the economic and the emotional support for their parents. What might be the result? Anthropological research conducted in rural Ireland by Scheper-Hughes (1979) has shown that the unmarried sons who are taking care of their parents usually end up providing barely adequate, if not inadequate, eldercare, and moreover are much more likely than their siblings, male or female, to be alcoholics and/or to be suffering from mental disease, especially schizophrenia.

No one, of course, knows what will happen to this excess number of Chinese bachelors. Several possibilities have been entertained. The only fact known for certain is that there have already been born in China over 40 million boys who will not be able to marry. And there will be over 50 million bachelors by 2020 if China does not reduce in the next several years its SRB of 120. These "bare branches" are China's demographic destiny. Their presence is now beginning to be felt in China and will continue to be felt, for another several decades, perhaps longer.



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**Figure 1.**  
**Total Fertility Rates: China 1950-2010**

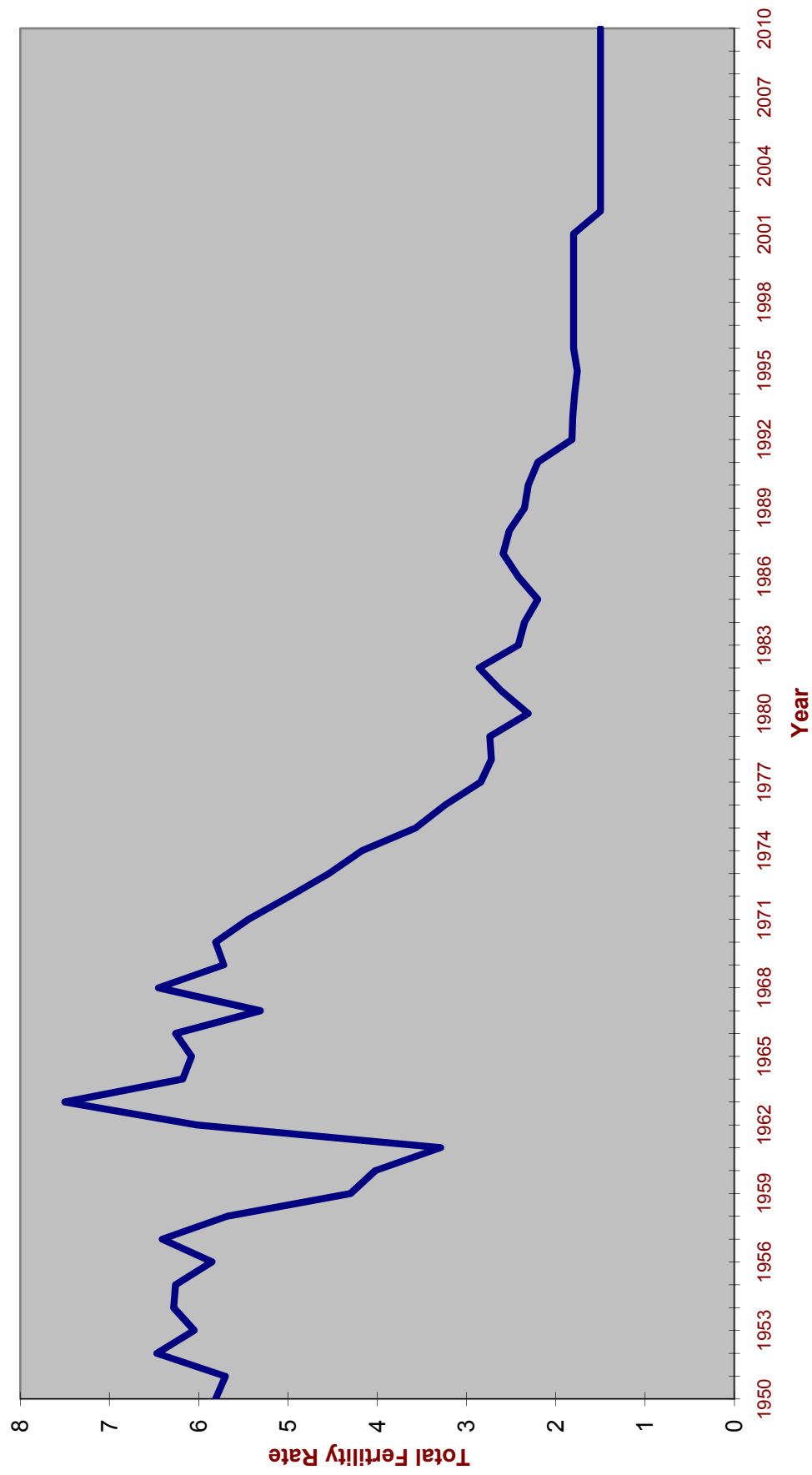
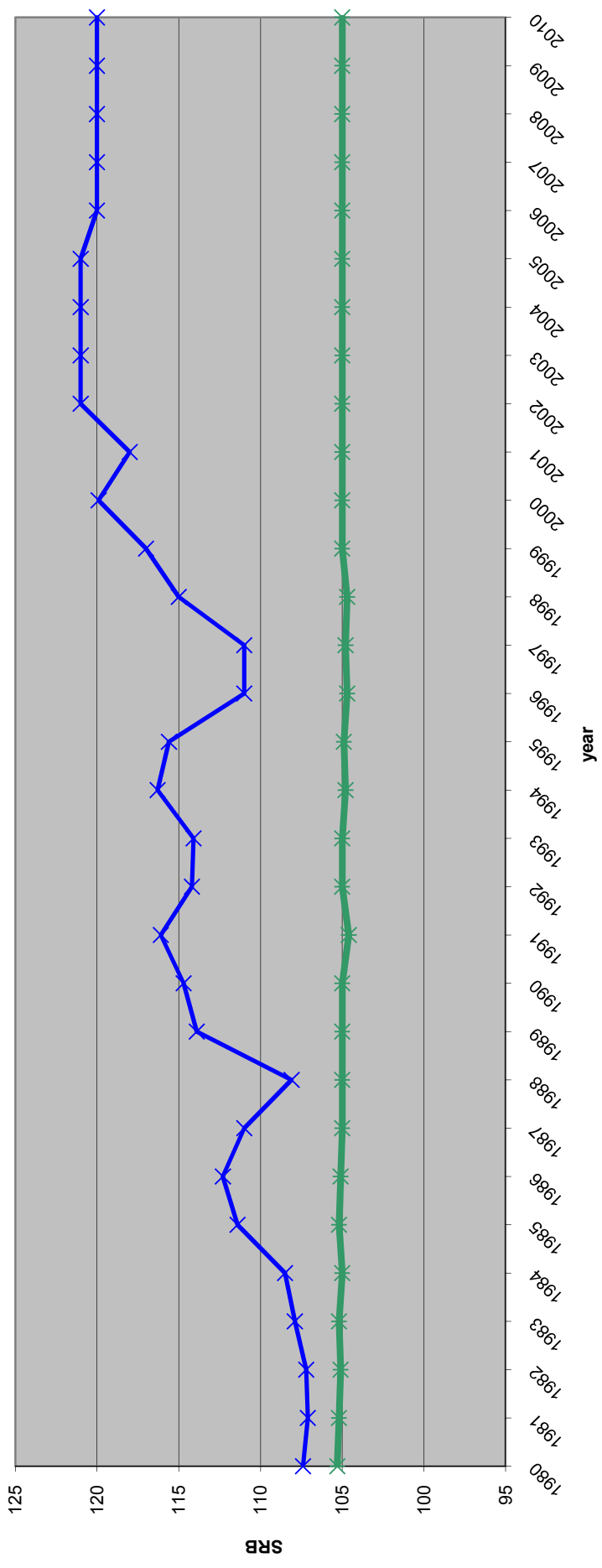


Figure 2.  
Sex Ratio at Birth: Mainland China and the United States,  
1980-2010



China (blue line with 'x' markers)  
States (green line with '\*' markers)

