

## THE PATTERN OF CHANGING TRENDS AND THE REGIONAL DIFFERENCES IN THE SEX RATIO AT BIRTH: EVIDENCE FROM KOREA AND JILIN PROVINCE, CHINA\*

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*The main purpose of this study is to develop explanations for the pattern of recently changing trends and regional differences in the sex ratio at birth in Korea and for Koreans in Jilin Province and Yanbian Autonomous Prefecture, China. The research is based on the Korean Census data, 1994 Vital Registration Statistics of Korea and the 1990 Chinese Census data. The findings suggest that, since the mid-1980s, sex ratios at birth have risen remarkably in Korea. It is particularly true in the regions of Taegu, Kyongbuk, Pusan, and Kyongnam. This paper also highlights the recent increase in the sex ratio at birth for the Korean population in China, residing in urban areas densely populated with Koreans. As the key forces behind the regional differences in sex ratios at birth, the effects of son-selective reproductive behaviors, which in turn, are affected by the community characteristics, are stressed.*

### INTRODUCTION

There have been an abundance of historical documents, classical teachings, folkways and taboos which disclose a strong son preference among Koreans. For the survival and continuation of the society and economy, various norms and values favoring sons rather than daughters became an important part of the traditional social system, particularly the kinship institution and related normative culture (Kwon and Lee 1976; Cho et al. 1982). Despite the rapid socioeconomic transformation, many of these traditional elements still exist as norms and institutionalized values among Koreans.

Son preference plays an important role in determining the level of fertility and family size. It has been pointed out that strong son preference would provide a serious barrier to the attainment of replacement level fertility (Lee 1982; Park 1983; Arnold 1985; Arnold and Liu 1986). Despite strong son preference, however, Korea has achieved the fertility level well below replacement, as Taiwan and Hong Kong.

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Since the mid-1980s, a new demographic phenomenon of high sex ratio at birth has been emerging in Korea. Similar patterns have also been observed in China, Taiwan, and Hong Kong (Hull 1990; Roy 1994; Park and Cho 1994). Sex ratios at birth have risen in these countries as people could not adjust their reproductive behaviors to meet the new conditions of low fertility and social environment.

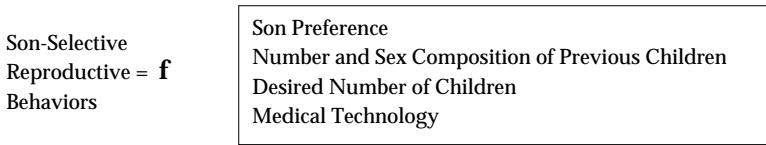
The main objective of this study is to provide explanations for the recent uprising of the sex ratio at birth. The causal mechanism and regional differences in the sex ratio at birth are questions of substantial interest to those involved with population studies. Regional differences in the sex ratio at birth can be caused by differentials in intensity of son preference, in the effectiveness with which family planning policy is implemented, health care infrastructure, and so on (Zeng et al. 1993). This paper seeks to analyze the causes and implications of regional differences in the sex ratio at birth in Korea and Jilin Province, China. In this study, attention is also given to the development of a conceptual scheme of son-selective reproductive behaviors.

The research is based on data from Korea and Jilin Province, China. For the analysis of changing trends and regional differences in sex ratios in Korea, the Korean Census for 1985, 1990, and 1995 and Vital Registration Statistics for 1994 are used. Ten percent sample data of Jilin Province and 50 percent sample data of Yanbian Autonomous Prefecture from the 1990 Chinese Census are used for the analysis of sex ratios of the Korean child population in China. As an indicator of recent trends in sex ratios at birth for Koreans in China, data on births reported for the 18 months before the 1990 Chinese Census are analyzed.

In this study, above micro-level data are aggregated into the regional level to analyze differences in the sex ratio at birth. Multivariate analysis of the determinants of the sex of child at the individual level is also conducted, but the results appear to be limited by the range of explanatory variables available in the data sets.

## SON-SELECTIVE REPRODUCTIVE BEHAVIORS OF KOREANS

A conceptual scheme of son-selective reproductive behaviors is developed to provide plausible explanations responsible for the sudden uprising of sex ratios at birth. In this study, son-selective reproductive behaviors refer to prenatal sex screening and sex-selective abortion. It is hypothesized that son-selective reproductive behaviors are a function of four factors: son preference, number and sex composition of previous

**FIGURE 1.** A CONCEPTUAL FRAMEWORK OF SON-SELECTIVE REPRODUCTIVE BEHAVIORS

children, desired number of children, and medical technology.

Excessively masculine sex ratio at birth can be interpreted as people's attitudinal and behavioral expressions of son preference. There is little doubt that motivations for prenatal sex screening and sex-selective abortion stem from strong son preference along with gender discrimination against women. The risk and insecurity that patriarchy imposes on women represent a powerful systematic incentive for sons. The desire for sons is not simply due to the productivity or their role in reducing the economic uncertainty facing households. Women who, for whatever reason, have no son on whom to depend face a very uncertain and potentially disastrous future. Thus, they are likely to formulate strong motivations for son-selective reproductive behaviors.

In this study, it is assumed that the sociocultural structure of the community develops certain norms and values, which permits and prescribes individual decision making on reproductive behaviors. It is further assumed that strong son preference is associated with these norms and institutionalized values, which are influenced by the community settings. This implies that the sociocultural structure of the community may have effects on reproductive behaviors above and beyond the effects of the couple's own characteristics. The community with conservative cultural tradition is likely to be characterized by high sex ratios at birth. At the individual level, those in the communities with a strong son preference, male domination and gender discrimination against women are likely, other things being equal, to practice son-selective reproductive behaviors.

Given the very strong son preference, it is reasonable to postulate that motivations for son-selective reproductive behaviors are influenced by previous fertility and the desired number of children. Previous fertility refers to the sex composition as well as the number of children a woman already has. The desired number of children is the number of surviving children a woman wants to have. It is hypothesized that the motivations for son-selective reproductive behaviors would be stronger for women with higher parity. Couples who want at least a son, if they have only daughters

and the number of children they already have is close to or above the desired number of children, are more likely to formulate motivations for prenatal sex screening and sex-selective abortion. Such a motivation would be weak for those who already have one or more sons.

It is also postulated that the extent of son-selective reproductive behaviors among women in a certain parity depends on the desired number of children. The smaller the desired number of children is, the higher the probability of women without a son. Consequently, a larger proportion of women will opt to prenatal sex screening and sex-selective abortion. Therefore, as the desired number of children becomes small, other things being equal, the effects of son-selective reproductive behaviors on sex ratios at birth for a given population are likely to be greater (Chang 1994).

Although son preference is a necessary condition for prenatal sex screening and sex-selective abortion, it is not a sufficient condition. Expression of son preference depends on, and can be strengthened by, medical technology. Without medical technology which enables identification of the sex of a fetus and sex-selective abortion, there are not many paths through which son preference affects the level of sex ratio at birth.

There are three medical technologies currently available to identify the sex of a fetus: chorionic villi sampling, amniocentesis, and ultrasonar testing (Zeng et al. 1993). Chorionic villi sampling can be performed during 8-12 weeks of pregnancy. But this method is very expensive, and only a small number of couples can afford it. The amniocentesis method cannot be applied in the early stage of pregnancy, and is not always safe. Ultrasonar testing is the least expensive and simplest method, and thus is performed most often in Korea and China (Hull 1990; Park and Cho 1994).

The practice of prenatal sex screening and sex-selective abortion depends on the availability and accessibility of medical technology in comparison with the strength of motivations to get a son. Given the strength of the motivations, those who have easy access to the medical technology at low market and psychological costs are likely to practice son-selective reproductive behaviors. At the community level, differences in sex ratios at birth by residence, geographical regions and socioeconomic status groups are likely to be dependent on the availability and accessibility of the medical technology for prenatal sex determination.

## THE SEX RATIOS AT BIRTH IN KOREA

*Recent Demographic Profiles*

The mid-1980s can be recorded as an important turning point in the history of Korean demography. Korea completed the full pattern of demographic transition, and has been approaching a stationary population even with negative growth potential in the outset (Kim 1992). Despite traditional cultural factors such as strong son preference, motivations for small families arose and spread widely over the course of rapid industrialization and urbanization (Kwon and Kim 1990; Kim 1994). The total fertility rate was estimated as low as 1.6 in 1988, and the same level was maintained until 1991. Quite recently, the total fertility rate has risen slightly to 1.75 in 1993, but fertility is now believed to be under the replacement level (KIHSA 1995). The annual growth rate of the population was estimated at 9.3 per thousand in 1990, as low as those of developed countries (Kim 1994). Under the current age structure, the Korean population is likely to experience a decrease in the absolute number after the year 2020.

Since the mid-1980s, when Korea was stabilized with a low level of fertility, distorted sex composition has become a serious issue. Table 1 presents the trends in sex ratios for total population and population under 5 years old during 1960-1995. It is clear that the pattern of sex ratios for the total population appears to be fairly balanced and stable. No drastic change

**TABLE 1.** TRENDS IN SEX RATIOS FOR TOTAL POPULATION AND POPULATION UNDER FIVE YEARS OLD, KOREA, 1960-1995

Year	Total Population	Population under 5 Years Old
1960	100.7	108.0
1965	101.4	107.6
1970	102.4	108.1
1975	101.4	109.5
1980	101.8	107.2
1985	101.7	107.8
1990	101.3	112.0
1995	100.8	114.5

Source: National Statistical Office (1988, 1991, 1996).

Note: Based on different data sources, figures for 1985 and 1990 are not consistent with the ones in table 2.

is observed in table 1. The sex ratio for total population continued to increase slightly during the 1960s, and peaked at 102.4 in 1970. But the trend was reversed afterwards, and declined slightly to 100.8 in 1995.

According to a UN report, sex ratios at birth have been measured at about 102-107 in most countries in the absence of social and behavioral interference (United Nations 1973; Weeks 1989). Along with a strong son preference, Korea has maintained a relatively high level of sex ratio at birth. It is clear in table 1 that the sex ratio for population under 5 years old, which reflects sex ratios of newborns during the past 5 years, is much higher than the sex ratio for the total population. In particular, the sex ratio for population under 5 years old was 114.5 in 1995, revealing an increase of 6.7 points from that in 1985. It was 13.7 points higher than the one for total population in 1995. This implies that there has been a substantial excess of sons over daughters at birth since the mid-1980s, when the fertility of Korea became stable at a low level.

There has been substantial research on the mechanisms of an excessively masculine sex ratio at birth (Arnold and Liu 1986; Chahnazarian 1988; Hull 1990; Johansson and Nygren 1991; Zeng et al. 1993; Gu and Li 1994; Roy 1994; Park and Cho 1994; Chang 1994; Anderson and Silver 1995; Kim 1995; Wongboonsin and Ruffolo 1995). Major causes proposed are female infanticide, underreporting of female births, prenatal sex screening followed by sex-selective abortion, and adoption out of unwanted female children.

Unlike the situation in China, female infanticide, underreporting of female births and adoption out of unwanted females are not practiced in Korea. It is also unlikely that the rise in sex ratios at birth is due to excess female infant mortality prior to registration (Park and Cho 1994; Roy 1994). Thus, it is postulated in this study that the sudden rise in sex ratio at birth is mainly due to prenatal sex screening and sex-selective abortion.

It is important to note that medical technology for prenatal sex screening became widely available and accessible around the mid-1980s in Korea. The market and psychological costs associated with the medical technology appear not to be a heavy burden. Given the low level of fertility, the practice of prenatal sex screening and sex-selective abortion have become popular among those who have strong motivations to have at least one son.

As is widely known, sex identification is a by-product of technology performed for health and genetic reasons. Korean law prohibits testing to identify the sex of a fetus. In spite of harsh penalties and regulations imposed for its violation, however, prenatal sex screening and sex-selective abortion have been practiced widely. Access to medical technology has not been limited to those in urban areas and among the middle class. Korea has

experienced a relative uniformity of son-selective reproductive behaviors using the medical technology irrespective of residence, geographical regions, and socioeconomic status. This explains the nation-wide uprising of sex ratios at birth after the mid-1980s.

### *Regional Differences*

It is assumed in this study that son preference is associated with norms and institutionalized values which are influenced by the sociocultural structure of the community. Evidence indicates that geographical region plays a significant role in the variations in sex ratios. In order to gain a better understanding of the mechanism, this study explores the regional differences in the sex ratio of newborns in Korea and China.

Table 2 clearly shows a rising trend of masculine sex ratios of newborns since 1985. As the medical technology became accessible nation-wide in the late 1980s, the pace of the increase became faster in the rural areas. The sex ratio for the population under 5 years old in rural areas reached 116.1 in 1995, almost two points higher than that in urban areas.

According to the 1995 Census of Korea, distortions in sex ratios of the child population turn out to be most serious in the cities of Taegu and Pusan, and in the provinces of Kyongbuk and Kyongnam. As shown in table 2, in 1995, sex ratios reached 126.2 and 124.0 in Kyongbuk and Taegu, respectively, and measured over 120 in two other regions. In particular, Taegu and Kyongbuk, having strong parochial ties popularly known as the TK, disclosed record high sex ratios in 1990<sup>1</sup> and 1995.

In an effort to explain the causes of high sex ratios at birth, multivariate analysis at the micro level is undertaken in this study. However, it is found that social characteristics of the couple do not provide a plausible explanation for high sex ratios at birth in these regions.

The regions of Taegu, Kyongbuk, Pusan, and Kyongnam are well known for their conservative cultural tradition. Salient distortions in sex ratios in these regions can be attributed to their strong son preference, male domination, and gender discrimination against women.

By contrast, in the cities of Kwangju and Incheon, sex ratios for population under 5 years old appear to be substantially lower than the national

<sup>1</sup> It deserves our attention that 1990 was a 'year of horse'. Still many Koreans tend to believe that girls born in the year of horse will have troublesome characters, and that girls born in the year of horse are hard to get married. Therefore, we cannot exclude the possibility that not a few couples avoided having girl babies registered especially at the end of the year 1990, and thus affect the level of sex ratios for 1990 in Table 2.

**TABLE 2.** TRENDS IN SEX RATIOS FOR POPULATION UNDER FIVE YEARS OLD BY RESIDENCE AND ADMINISTRATIVE REGION, KOREA, 1985-1995

	Population under 5 Years Old		
	1985	1990	1995
Whole Country	108.0	111.2	114.5
Urban	108.6	111.4	114.2
Rural	106.7	110.5	116.1
Major Cities			
Seoul	108.9	110.2	111.5
Pusan	108.6	111.6	121.1
Taegu	112.3	125.2	124.0
Inchon	107.6	107.4	106.5
Kwangju	-	108.0	106.1
Taejon	-	115.4	119.4
Provinces			
Kyonggi	106.5	108.0	111.9
Kangwon	106.4	107.4	103.9
Chungbuk	107.0	111.1	112.9
Chungnam	107.6	109.2	115.9
Jeonbuk	106.8	106.6	112.5
Jeonnam	107.4	107.5	117.2
Kyongbuk	109.0	121.7	126.2
Kyongnam	107.9	115.2	120.3
Cheju	107.3	111.0	118.9

Source: National Bureau of Statistics (1987); National Statistical Office (1992, 1996).

Note: In 1985, the population of Kwangju and Taejon was included in the population of Jeonnam and Chungnam, respectively.

average. In table 2, Kangwon Province shows the lowest level of sex ratio, measured at 103.9 in 1995.

Particularly noteworthy is the trend of sex ratios for Pusan. In 1985, the sex ratio for Pusan was estimated at 108.6, the same level as the urban average. During the period 1990-1995, however, the sex ratio for Pusan rose very rapidly from 111.6 to 121.1. It is interesting to note a coincidence that Pusan and Kyongnam began to form strong parochial ties, labeled as the *PK*, since the formation of the current presidency in the early 1990s. This leads to the conjecture that couples exposed to such a regional environment have been likely to formulate strong motivations to have a son, which, in turn, have facilitated the son-selective reproductive behaviors.

A further examination of the sex ratio distribution by region and parity suggests that high sex ratios at birth keep growing unacceptably as birth



**TABLE 3. SEX RATIOS AT BIRTH BY ADMINISTRATIVE REGION AND PARITY ORDER, KOREA, 1994**

	First Birth	Second Birth	Third Birth	Fourth+ Birth	Total
Whole Country	106.1	114.3	205.6	237.0	115.5
Major Cities					
Seoul	107.1	112.2	215.9	232.1	113.4
Pusan	104.5	120.4	334.6	310.1	119.0
Taegu	104.3	125.9	320.1	351.1	121.4
Inchon	109.5	112.3	191.1	202.6	114.6
Kwangju	103.6	110.6	152.7	217.5	111.9
Taejon	108.1	113.2	220.2	300.0	116.9
Provinces					
Kyonggi	105.2	110.6	206.4	272.1	112.9
Kangwon	107.1	109.8	177.1	257.6	114.9
Chungbuk	106.2	109.8	187.1	269.4	114.7
Chungnam	110.5	107.3	176.8	212.4	116.2
Jeonbuk	105.9	106.1	131.1	180.0	110.0
Jeonnam	106.3	108.9	134.8	196.0	113.1
Kyongbuk	105.4	128.9	279.0	269.6	124.3
Kyongnam	103.9	122.7	270.2	304.9	120.2
Cheju	108.9	112.3	144.5	198.7	115.6

Source: National Statistical Office (1995, pp. 82-87).

order progresses. Vital registration data, composed of 710 thousand babies, in 1994 show a clear positive correlation between the sex ratio at birth and the parity, with a minor exception of Chungnam Province (table 3). Sex ratios at birth at parity 1, for most regions, were found to be relatively moderate. However, table 3 shows a steep rise of sex ratios for the third and fourth child. Sex ratios at parity 3 were estimated over 270 in the regions of Pusan, Taegu, Kyongbuk, and Kyongnam. In particular, sex ratios for Taegu recorded 320.1 for the third and 351.1 for the fourth child.

An analysis of the sex ratio distribution according to administrative region and age of mother discloses a similar pattern. Table 4 clearly shows that sex ratios maintain a relatively low level if age of mother is under 25. However, a clear pattern of marked rise emerges in all regions as mother's age increases. The national average of the sex ratio for those whose mothers belong to age group 20-24 was 107.7 in 1994. The corresponding figures for the age groups 30-34 and 35-39 were 127.1 and 140.0, respectively. Such a rising pattern is particularly apparent in Kyongbuk, Taegu, Kyongnam, and Pusan as mother's age goes beyond 30. Due to the small number of cases, in

**TABLE 4.** SEX RATIOS AT BIRTH BY ADMINISTRATIVE REGION AND AGE OF MOTHER, KOREA, 1994

	Age of Mother						Total
	10-19	20-24	25-29	30-34	35-39	40+	
Whole Country	108.8	107.7	112.7	127.1	140.0	142.4	115.5
Major Cities							
Seoul	106.6	107.8	110.7	120.9	133.4	134.5	113.4
Pusan	94.4	108.6	114.7	135.9	158.9	167.9	119.0
Taegu	110.4	111.3	115.8	143.0	167.8	121.6	121.4
Inchon	121.3	110.5	112.7	121.1	128.4	125.9	114.6
Kwangju	107.8	99.3	111.9	122.5	133.9	125.6	111.9
Taejon	121.5	115.5	112.5	126.2	137.5	135.3	116.9
Provinces							
Kyonggi	112.1	104.4	111.4	122.9	134.0	132.0	112.9
Kangwon	109.7	107.6	112.9	125.1	133.4	137.5	114.9
Chungbuk	116.3	108.8	110.2	134.3	135.7	-	114.7
Chungnam	105.6	109.6	113.6	129.8	143.9	144.2	116.2
Jeonbuk	97.5	106.4	109.3	115.3	122.8	136.5	110.0
Jeonnam	125.2	104.3	111.0	125.6	142.4	151.9	113.1
Kyongbuk	106.1	110.8	120.2	151.3	172.3	169.7	124.3
Kyongnam	94.3	110.2	116.4	141.8	156.1	148.9	120.2
Cheju	140.5	105.5	111.7	130.4	129.9	-	115.6

Source: National Statistical Office (1995, pp. 82-87).

Note: The sex ratio is not calculated if the number of boys or girls is less than 30.

table 4, relatively high sex ratios for those whose mother's age was below 20 are observed in several regions.

This pattern is markedly contrary to the normal trend that sex ratios at birth declines as parity and age of mother rise (Chahnazarian 1988). If we assume equal probability of male births across birth orders and mother's age, these variations in sex ratios in tables 3 and 4 imply that there must be some kind of artificial manipulations to control gender. The peculiar distribution of sex ratios according to birth order and mother's age appears to be a joint product of widespread preference for small families as well as sons and son-selective reproductive behaviors by birth order.

Considering the unacceptably high sex ratios in tables 3 and 4, it can be concluded that regional differences in sex ratios are related to prenatal sex screening and sex-selective abortion. To explain high sex ratios at birth in the regions of Taegu, Kyongbuk, Pusan, and Kyongnam, various analyses are undertaken in this study. It is found, however, that these geographical regions do not have any peculiar characteristics in the level of fertility,

family and household structure, practice of family planning, medical facilities, etc. The only common factors drawn from the analysis are that these four regions have a long history of conservative cultural traditions, and that these regions have been the origin of top-ranking political elites.

Now, in the face of rising sex ratios at birth, the following questions can be raised: how many pregnant women are willing to go through prenatal sex screenings and sex-selective abortions? And how many of them take these actions?

A fairly large proportion of Korean women do not seem to have objections against son-selective reproductive behaviors. Results from a sampling survey conducted in 1991 reveal that 31.9% of women, with the experience of induced abortion, are in favor of prenatal sex screening and sex-selective abortion. The corresponding figure is 24.8% for those without the experience of induced abortion. It is also surprising that women in rural areas have more favorable attitudes than those in urban areas (Kong et al. 1992, p. 179).

The abortion rate has been maintained at the maximum level in Korea. Under the strong fertility control policies during the past three decades, induced abortion has been somehow regarded as a means of family planning (Kong et al. 1992, p. 287). According to a government report, the number of induced abortions conducted in 1990 was estimated as 422,000 (MHSA 1994). This implies that 39.6% of total pregnancies of married women was terminated by induced abortions, and that there were 66 abortions for every 100 live births. This estimate does not begin to account for induced abortions among unmarried women, and underenumeration due to self-reporting.

Unfortunately, we do not have hard information available on son-selective reproductive behaviors. Due to the problem of small sample size and low reliability, data on induced abortions or sex-selective abortions do not allow in-depth analyses such as regional differences.

Using simulation techniques, Kim (1995) examined the mechanism of how prenatal sex screening and sex-selective abortion raise sex ratios at birth, and, at the same time, play a role in lowering the level of fertility. The results indicate that, given the unusually high sex ratios at birth during the past decade in Korea, about 10 percent of pregnant women must have performed prenatal sex screenings and sex-selective abortions.

## THE SEX RATIOS AT BIRTH OF KOREAN POPULATION IN CHINA

*Recent Trends*

The recent rise of sex ratios at birth is not a phenomenon exclusively observed in Korea. Evidence indicates that several East Asian countries such as China, Taiwan, and Hong Kong also experienced a rise in the sex ratio at birth around the mid-1980s. The sex ratio at birth in China increased abruptly from 108.5 in 1981 to 110.9 in 1986, 111.0 in 1987, and further jumped to 113.8 in 1989 (Zeng et al. 1993). Taiwan has been maintaining the sex ratio at birth around 106-107 during 1960-1986. But the sex ratio rose to 108 in 1987, and recorded 110 in 1990 (Park and Cho 1994).

In an effort to provide comparative insights on the causal mechanism, this study explores the sex ratio of newborns of the Korean population in China. Koreans have a long history of immigration to northeast China since the mid 19th century. According to the 1990 Chinese Census, Korean population was estimated at 1.9 million, and ranked the 13th ethnic minority in terms of population size. The Korean population is heavily concentrated in Jilin, Liaoning and Heilongjiang Provinces. In 1990, Korean population in Jilin Province and Yanbian Autonomous Prefecture was about 1.2 million and 0.8 million, respectively, which comprises 61.5% and 42.8% of the Koreans in China.

The fertility level of Koreans in China is substantially lower than those of Hans and other ethnic minorities. This appears to be particularly true for Koreans residing in regions densely populated with Koreans (Kim 1996). Table 5 presents the sex ratios for the Korean population in Jilin Province and Yanbian Autonomous Prefecture.

Despite the recent uprising of the sex ratio at birth in China,<sup>2</sup> it appears in Table 5 that the pattern of sex ratios for Koreans in Jilin Province and Yanbian Autonomous Prefecture has been fairly balanced and stable. The sex ratios for child population under 5 years old were 105.7 and 103.6 in

<sup>2</sup> Zeng and his colleagues argued that the high sex ratio at birth in China in the 1980s is mainly the result of underreporting of female births and sex-selective induced abortion, ruling out the possibility of widespread female infanticide (Zeng et al. 1993). Johansson and Nygren (1991) argued that adoption out of unwanted girls accounted for half of the 'missing girls' among newborns in China in the late 1980s. However, it is assumed in this study that underreporting of female births and adoption out of unwanted girls do not provide plausible explanations for the differences in sex ratios according to the ethnic group and place of residence. Detailed analysis on the underreporting of births is beyond the scope of this paper. This paper focuses on the effects of medical technology for prenatal sex determination.

**TABLE 5.** SEX RATIOS IN JILIN PROVINCE AND YANBIAN AUTONOMOUS PREFECTURE, CHINA BY AGE AND ETHNIC GROUP, 1990

	Jilin Province			Yanbian Prefecture		
	Korean	Han	All Ethnic Groups	Korean	Han	All Ethnic Groups
Whole Pop.	98.0	105.3	105.0	98.3	106.2	102.9
Pop. under						
5 Yrs. Old	105.7	107.5	107.2	103.6	105.0	104.4
Age 0	102.4	106.8	106.2	103.7	106.6	104.9
Age 1	109.1	108.7	109.0	102.5	105.3	104.2
Age 2	105.0	107.4	107.0	104.6	106.5	105.3
Age 3	107.6	108.0	107.4	103.0	104.9	104.4
Age 4	104.1	106.6	106.3	104.2	101.3	103.2

Source: 10% sample tape of Jilin Province from the 1990 Chinese Census; 50% sample tape of Yanbian Autonomous Prefecture from the 1990 Chinese Census.

Jilin Province and Yanbian Autonomous Prefecture, respectively. Koreans are found to have lower level of masculine sex ratios at birth than Hans and other ethnic minority groups (Kim 1996).

However, a closer examination of Korean babies reported as born during the 18 months before the 1990 Chinese Census reveals a sudden rise in the sex ratio at birth.<sup>3</sup> Table 6 presents the sex ratio of newborns during the last 18 months by the place of residence and ethnic group. The sex ratio of reported recent births for Koreans living in cities in Jilin Province turns out to be 123.4.

To provide an explanation of the mechanism behind this figure, a multivariate analysis of the determinants of the sex of the child was conducted, using a variety of social factors at the individual level. The urban residence was expected to be associated with a higher probability of access to sex-selective medical technology. It was also assumed that those with high socioeconomic status are more likely to have easy access to medical technology, and to have an increased probability of having sons. The results, however, illustrate that, other than residence in urban areas

<sup>3</sup> In the 1990 Chinese Census, each woman was asked whether she had born a child or children in each of the three six-month periods prior to 1 July 1990, and if she had, the sex of the child. Zeng *et al.* (1993) argued that there was some underreporting of births during this reference period. It is also speculated that premarital conceptions, which constituted more than 5% of pregnancies in the 1980s, are more likely to be underreported during this period (Wang and Yang 1996). However, this study uses this information to examine recent sex ratios at birth. It is unlikely that such underreporting would make a substantial difference in the results reported here.

**TABLE 6.** SEX RATIOS AT BIRTH IN JILIN PROVINCE AND YANBIAN AUTONOMOUS PREFECTURE, CHINA BY RESIDENCE AND ETHNIC GROUP, JAN 1989 - JUN 1990

	Jilin Province			Yanbian Prefecture		
	Korean	Han	All Ethnic Groups	Korean	Han	All Ethnic Groups
Residence						
City	123.4	104.8	105.9	101.5	106.4	103.8
Town	106.8	111.7	111.2	106.2	104.0	104.6
Rural	101.6	109.8	109.2	101.2	110.5	105.5
Total	107.1	109.6	109.3	103.2	106.5	104.7

Source: 10% sample tape of Jilin Province from the 1990 Chinese Census; 50% sample tape of Yanbian Autonomous Prefecture from the 1990 Chinese Census.

with Korean majorities, social characteristics such as education and occupation are not important in accounting for this excessively masculine sex ratio. Table 6 also confirms that the sex ratios for Koreans tend to be lower than those for Hans.

In table 6, the sex ratios for Koreans in Yanbian prefecture appear to be somewhat lower than expected. But an interesting pattern is found in table 7, where the interval between January 1989 and June 1990 is divided into three six-month periods. The reported sex ratios for Koreans in Yanbian Prefecture significantly increased over this interval. This is true regardless of the place of residence. In particular, the sex ratio for Koreans living in cities jumped to 116.5 during the first half of 1990. It appears that the increase in the sex ratios in such a short period is too steady to be explained as random fluctuations.

It is reasonable to speculate that the extremely high sex ratios for Koreans

**TABLE 7.** RECENT TRENDS IN SEX RATIOS AT BIRTH FOR KOREAN POPULATION IN YANBIAN AUTONOMOUS PREFECTURE, CHINA BY RESIDENCE AND TIMING OF BIRTH, JAN 1989 - JUN 1990

	Timing of Birth			Total
	1st Half 1989	2nd Half 1989	1st Half 1990	
Residence				
City	95.4	94.2	116.5	101.5
Town	102.6	108.1	108.8	106.2
Rural	97.9	100.0	106.2	101.2
Total	99.3	102.0	109.3	103.2

Source: 50% sample tape of Yanbian Autonomous Prefecture from the 1990 Chinese Census.

living in cities in tables 6 and 7 are likely to be related to the introduction of a market economy system in China. The reformation and opening policy over the past decade dismantled communes and gave Chinese people a large degree of control over their own activities. The resulting greater efficiency in the industrial production and increasing job opportunity in the urban sector have expedited income inequality and the diversified stratification system. In particular, the strengthened diplomatic and economic relationships between Korea and China since the late 1980s have given Koreans in China a lot of job opportunities. These reforms and socioeconomic transformations must have increased the potential value of sons.

Jilin is one of the provinces where son preference is less pronounced, although levels of socioeconomic development are high and the medical technology for prenatal sex determination is widespread (Zeng et al. 1993). It could be argued that, as a result of the reforms and socioeconomic transformations, Koreans in Jilin Province and Yanbian Autonomous Prefecture may have reinforced strong motivations to have a son. It is particularly true for those residing in the large and medium-sized urban areas and having an access to son-selective medical technology.

#### *Regional Differences in Yanbian*

This study also examines whether geographical region in the Yanbian Autonomous Prefecture plays a significant role in the variations of sex ratios. The Yanbian Autonomous Prefecture is composed of 5 cities and 3 counties. Table 8 shows a population profile of the region.

According to the 1990 Chinese Census, the Korean population in Yanbian was estimated as 821 thousand, composing 39.5% of the total population in the prefecture. Koreans are densely populated in Longjing, Yanji, Tuman, Huichun, and Helong, all of which are close to the border to the Korean Peninsula. By contrast, the proportion of Korean population in Dunhuan was only 5.2% in 1990.

It is indicated that Yanbian Autonomous Prefecture is stabilized with low levels of fertility, mortality and natural increase. In table 8, the crude birth rate, the crude death rate and the natural increase rate for the whole prefecture are 16.4‰, 6.4‰, 10.0‰, respectively. These are substantially lower than the Chinese national averages in 1990: CBR 21.1‰, CDR 6.7‰, and NIR 14.4‰ (SSB 1991a; 1991b). The corresponding figures for Korea in 1990 were 15.6‰, 5.8‰, and 9.8‰ (Kim 1994).

The total fertility rate for Korean population in Yanbian reached 6.4 in

**TABLE 8.** POPULATION PROFILE OF YANBIAN AUTONOMOUS PREFECTURE, CHINA BY ADMINISTRATIVE REGION, 1990

Region	Population		Crude Birth Rate (%)	Crude Death Rate (%)	Natural Increase Rate (%)
	All Ethnic Groups	Korean (%)			
Whole Prefecture	2,079,902	821,479 (39.5)	16.4	6.4	10.0
Cities					
Yanji	293,069	177,547 (60.6)	14.7	5.8	8.9
Tuman	122,579	69,166 (56.4)	14.5	6.5	8.0
Dunhuan	477,127	24,745 (5.2)	17.8	6.1	11.7
Huichun	183,755	92,100 (50.1)	17.0	6.5	10.6
Longjing	279,611	183,994 (65.8)	14.9	7.7	7.2
Counties					
Helong	238,730	136,894 (57.3)	15.3	6.8	8.5
Wangging	268,642	85,049 (31.7)	16.3	5.9	10.5
Antu	216,389	51,984 (24.0)	19.7	6.5	13.2

Source: Kim (1996).

1962. However, Koreans have responded positively to the government's population control policies launched in 1962. Very rapid and drastic reduction in fertility has taken place during the cultural revolution (1966-1976) and afterwards. The total fertility rate was estimated as 3.6 in 1967, and it declined further to 2.9 in 1972 (Han et al. 1988, p. 45). Currently, the fertility of the Korean population appears to be below the replacement level in urban areas of Yanbian Autonomous Prefecture (Kim 1996).

Table 8 shows that the regions densely populated with Koreans tend to have low levels of the crude birth rate and the natural increase rate. The natural increase rates for Yanji, Tuman, Longjing and Helong were estimated to be below 9%. Minor deviations are observed for Huichun, which obtained city status in 1988. By contrast, table 8 does not reveal a clear pattern of regional differences in the crude death rate.

Table 9 also shows a similar pattern of regional differences in fertility, a negative association between the proportion of Korean population in the region and the level of fertility. Koreans residing in regions with higher Korean populations are likely to have a smaller number of children ever born. The results of multivariate analysis confirm that the ethnic factor does have a significant effect on the level of fertility, after adjusting for the effects of demographic and socioeconomic characteristics of the couple and the household (Kim 1996). Table 9 also indicates that Hans residing in regions



**TABLE 9.** AVERAGE NUMBER OF CHILDREN EVER BORN IN YANBIAN AUTONOMOUS PREFECTURE, CHINA BY ADMINISTRATIVE REGION AND ETHNIC GROUP, 1990

	Korean	Han	All Ethnic Groups
Whole Prefecture	2.0	2.3	2.2
Cities			
Yanji	1.8	1.9	1.8
Tuman	1.9	2.0	1.9
Dunhuan	2.2	2.4	2.4
Huichun	2.2	2.2	2.2
Longjing	2.1	2.3	2.2
Counties			
Helong	2.2	2.3	2.2
Wangging	2.1	2.4	2.3
Antu	2.2	2.5	2.4

Source: 50% sample tape of Yanbian Autonomous Prefecture from the 1990 Chinese Census.

densely populated with Koreans tend to have fewer children.

It is clear in table 10 that the sex ratio for the Korean population under 5 years old is positively associated with the proportion of the Korean population in the region. Cities of Yanji, Huichun, and Longjing as well as Helong county show high sex ratios. By contrast, the sex ratio for Koreans under 5 years old in Dunhuan city, where Koreans constitute only 5.2% of the total population, was estimated as low as 95.6. In table 10, the low sex ratio (86.6) for age 0 population of Tuman city with a Korean majority appears to be an exception. Considering the relatively high sex ratios for other age groups in Tuman, it could be speculated that this exception is partly due to the incompleteness of the data, such as underreporting or delayed reporting of the births. A similar speculation could be applied to the low sex ratios for age 0 of Helong and Wangging counties.

The differences in the sex ratio according to the age groups are not apparent in table 10. However, a closer look at the sex ratios of Korean newborns during the last 18 months suggests that there has been a rise in sex ratios in Yanbian. As shown in table 11, this is particularly true for the cities of Yanji and Longjing. Among the 5 regions with Korean majorities, Yanji, Huichun, Longjing and Helong are found to have relatively high sex ratios. The fluctuation of the sex ratios for Tuman city appears to be exceptional and unrealistic. In table 11, the sex ratios for Dunhuan city are far below the normal range, but they were estimated based on the relatively small number (355) of newborns during the reference period. Therefore, the

**TABLE 10.** SEX RATIOS FOR KOREAN CHILD POPULATION IN YANBIAN AUTONOMOUS PREFECTURE, CHINA BY ADMINISTRATIVE REGION AND AGE, 1990

Region	Population under 5 Years Old					Total
	Age 0	Age 1	Age 2	Age 3	Age 4	
Whole						
Prefecture	103.7	102.5	104.6	103.0	104.2	103.6
Cities						
Yanji	105.6	101.1	111.2	102.1	108.5	105.7
Tuman	86.6	111.2	109.9	97.4	105.0	102.2
Dunhuan	84.2	88.8	102.2	104.8	96.0	95.6
Huichun	110.2	109.1	99.1	91.2	95.3	100.1
Longjing	110.7	92.5	99.9	104.2	107.1	102.6
Counties						
Helong	109.4	97.8	107.8	111.0	104.2	106.0
Wangging	95.7	112.9	101.2	107.5	105.2	104.6
Antu	99.1	118.5	103.0	104.2	100.7	105.0

Source: 50% sample tape of Yanbian Autonomous Prefecture from the 1990 Chinese Census.

**TABLE 11.** RECENT TRENDS IN SEX RATIOS AT BIRTH FOR KOREAN POPULATION IN YANBIAN AUTONOMOUS PREFECTURE, CHINA BY ADMINISTRATIVE REGION AND TIMING OF BIRTH, JAN 1989 - JUN 1990

	Timing of Birth			Total
	1st Half 1989	2nd Half 1989	1st Half 1990	
Whole				
Prefecture	99.3	102.0	109.3	103.2
Cities				
Yanji	91.3	103.2	116.6	102.5
Tuman	116.3	78.8	92.4	95.7
Dunhuan	70.3	85.0	76.1	76.6
Huichun	121.7	114.6	108.7	115.2
Longjing	97.4	103.1	120.7	106.3
Counties				
Helong	95.5	112.7	111.4	105.3
Wangging	97.9	94.3	108.6	99.8
Antu	106.6	105.0	95.8	102.5

Source: 50% sample tape of Yanbian Autonomous Prefecture from the 1990 Chinese Census.

Note: Total number of babies born to Korean women in the data set during this reference period is 9,815.

**TABLE 12.** SEX RATIOS AT BIRTH FOR KOREAN POPULATION IN YANBIAN AUTONOMOUS PREFECTURE, CHINA BY ADMINISTRATIVE REGION AND AGE OF MOTHER, JAN 1989 - JUN 1990

	Age of Mother				Total
	10-24	25-29	30-34	35+	
Whole Prefecture	105.2	97.0	109.2	136.5	103.2
Cities					
Yanji	102.3	104.0	93.3	120.5	102.5
Tuman	109.2	89.5	91.4	-	95.7
Dunhuan	75.8	73.7	-	-	76.6
Huichun	115.1	105.7	134.1	-	115.2
Longjing	110.0	102.7	101.6	138.7	106.3
Counties					
Helong	109.7	90.8	121.3	-	105.3
Wangging	95.6	85.1	141.3	-	99.8
Antu	101.6	101.9	100.0	-	102.5

Source: 50% sample tape of Yanbian Autonomous Prefecture from the 1990 Chinese Census.

Note: Total number of babies born to Korean women in the data set during this reference period is 9,815. The sex ratio is not calculated if the number of boys or girls is less than 30.

general picture of a significant increase in sex ratios can be taken as valid.

In this study, sex ratio distribution of Korean newborns according to the region and age of mother is explored. Contrasting our expectation, a U-pattern is noticed in table 12. In most of the regions, the sex ratios are found to be at the lowest level for mothers aged 25-29, and tend to increase as the age of mother goes up. The overall sex ratio for mothers aged 35 or older was estimated at 136.5. Interestingly, the level of sex ratios for mothers younger than 25 years old are found to be higher than the normal range in Huichun, Longjing, Tuman, and Helong.

It cannot be certain, but the regional differences in the reported sex ratio at birth in Yanbian may support the role of prenatal sex determination using medical technology. The high sex ratios of newborns from young Korean mothers in the regions with Korean majority are likely to be an outcome of son-selective reproductive behaviors. In the absence of social and behavioral interference, there is no other plausible explanation for the sudden rise in the sex ratio at birth in urban areas densely populated with Koreans. Having more economic opportunities recently, Koreans in Yanbian Korean community appear to have reinforced the traditional son preference. And it is not just coincidence that, around the late 1980s, sex-selective medical

technology became available in urban areas of Yanbian Autonomous Prefecture.

This is contradictory to the argument of Anderson and Silver (1995) that mechanisms other than sex-selective abortion are important in Xinjiang Province, China. Based on data from the 1990 Chinese Census, they found that characteristics such as urban residence and education that are linked to greater access to sex-selective medical technology are not important in explaining the masculinity of the sex ratio at birth in Xinjiang.

## DISCUSSION AND CONCLUDING REMARKS

Over the past decade, a significant change in reproductive behavior has been underway in Korea and China. The rapid transition to low fertility as well as broad socioeconomic transformation has collided with traditional cultural values. As a result, several demographic distortions have recently emerged, and pose challenges for societal adaptations. A highly masculine sex ratio at birth represents one good example.

It is postulated in this study that masculine sex ratio at birth is mainly caused by son-selective reproductive behaviors. This study develops a conceptual scheme of son-selective reproductive behaviors, which are hypothesized as a function of four factors: son preference, number and sex composition of previous children, desired number of children, and medical technology. This study does not claim to be exhaustive about the path from son preference to the masculine sex ratio at birth dynamics. It is rather illustrative, and highlights the effects of the sociocultural structure of the community above and beyond the effects of the couple's own characteristics.

Since the mid-1980s, when Korea was stabilized with low levels of fertility, remarkably high sex ratios at birth have been noticed nation-wide. It is particularly true in the regions of Taegu, Kyongbuk, Pusan, and Kyongnam. It is indicated in the vital registration data that masculine sex ratios at birth keep growing unacceptably as parity or age of mother progresses. As the key force behind the regional differences in sex ratios at birth, the effects of son-selective reproductive behaviors, which in turn are affected by community characteristics such as conservative cultural tradition, are stressed.

Of interest is the question of why the sex ratio at birth for Pusan has been rising so fast during the period 1990-1995. The results from multivariate analysis at the micro level imply that social characteristics of the couple do not provide a plausible explanation for the sudden rise of the sex ratio for

Pusan. Therefore, it is tempting to hypothesize the effects of community level variables. In this study, a link between strong parochial ties of the community and son preference are postulated. It is well known that Koreans have maintained strong political orientation. Since the launch of the current presidency in the early 1990s and the formation of strong parochial ties thereafter, couples residing in Pusan are more likely to reinforce strong son preference than ever. A similar explanation can be applied to the extremely high sex ratios in Taegu and Kyongbuk, from where a great number of key political elites have been produced over the past three decades.

It is found in this study that sex ratios at birth at parity 1 for most regions are not too high in Korea. For mothers under 25 years old, sex ratios maintain a relatively low level. However, a large proportion of couples tends to practice prenatal sex screening and sex selective abortion as parity or age of mother progresses. Regional differences in sex ratios at birth in Korea can also be explained by such son-selective reproductive behaviors.

Despite strong son preference, before 1980, the sex ratio at birth in China was by and large within the normal range (Gu and Li 1995). There is no doubt that normal sex ratios at that time were mainly due to the relatively high level of fertility. In addition, they could also be attributed to the Chinese government's efforts to improve women's status, which aimed at eradicating so-called feudal influences. China has introduced a series of measures in the form of laws and political campaigns to lift restrictions imposed on women. For example, women's inheritance rights were legalized in 1950 (Wang and Yang 1996). It is reasonable to suppose that, under the communist regime, fertility-related traditional norms and values such as son preference have been oppressed in China.

Since the early 1980s, however, changes in reproductive behaviors of Chinese have been propelled by socioeconomic transformation: the introduction of a market economy system, China's opening to the outside world, and the weakened control of the socialist state over the private lives of citizens. In particular, Koreans in China have been provided a lot of economic opportunities as the diplomatic and economic relationships between Korea and China have been strengthened since the late 1980s. As a result, a rapid alteration in norms and value systems regarding reproductive behaviors has occurred among Koreans in China. Koreans in China are more likely to formulate strong son preference in the course of the socioeconomic transformation.

It has been agreed that the level of fertility of Koreans in China is substantially lower than those of Hans and other ethnic minorities. It has

also been argued that, despite recent rise of sex ratios at birth in China, the sex ratio of Korean babies in China maintains the normal range (Kim 1996). However, based on the analysis of births reported for the 18 months before the 1990 Chinese Census, this paper has highlighted a phenomenon of increasing tendency of the sex ratio at birth for the Korean population in China, residing in urban areas densely populated with Koreans and having access to son-selective medical technology. This supports the proposition of this study that the sociocultural structure of the community develops certain norms and values, such as son preference, which permit and prescribe individual decision making on son-selective reproductive behaviors.

This paper does not claim to be exhaustive about the policy implications of excessively masculine sex ratio at birth. What comes through quite clearly is that stronger and more effective policy measures to prevent people from misusing medical technology have to be implemented, through medical guidelines, norms, codes, and efficient means of enforcement.

It is also important to note that long-term population policies should be geared toward advancing gender equality and equity, and the eradication of all forms of discrimination against women. As far as medical technology fits normative structures of Korean society, they will be adopted despite legal barriers, costs, and inconveniences. To eradicate son-selective reproductive behaviors, in the long run, more efforts should be made to induce changes in gender role norms, values, and attitudes. Improving the status of women through effective programs of education, employment, and mass communication in all spheres of life is essential for the long-term success of population policies.

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